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LIST OF ACRONYMS

µCi/mL	microcuries per milliliter
µg/g	micrograms per gram
µg/L	micrograms per liter
µm	micron
ABB-ES	ABB Environmental Services, Inc.
ACM	asbestos containing materials
AEC	Atomic Energy Commission
Allegheny	Allegheny Ludlum Corporation
ARAR	applicable or relevant and appropriate requirement
ARS	American Radiation Services, Inc.
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	bioaccumulation factor
BCF	bioconcentration factor
BCG	biota concentration guides
bgs	below ground surface
BERA	baseline ecological risk assessment
Bi	Bismuth
BqKg-1	becquerel per kilogram
BRA	baseline risk assessment
BTV	background threshold value
CEDE	committed effective dose equivalent
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cm	centimeter
cm/sec	centimeter per second
CME	central mine equipment
COC	chain of custody
COC	constituent of concern (Executive Summary, Section 5)
COPC	constituent of potential concern
COPEC	constituent of potential ecological concern
cpm	counts per minute
CSM	conceptual site model
CV	coefficient of variation
DAC	derived air concentration
DAF	dilution attenuation factor
DCF	dose conversion factor
DGAR	data gap analysis report
DOE	Department of Energy
DOT	Department of Transportation
dpm/100 cm^2	disintegration per minute per 100 square centimeters
DPT	direct-push technology
DQCSR	daily quality control summary report
DQO	data quality objective
DSR	dose to source ratio
EDE	effective dose equivalent
EM	engineer manual
EPC	exposure point concentrations
ERAGS	Ecological Risk Assessment Guidance for Superfund
ERTC	environmental response team center
EU	exposure unit
f	fraction
FBDU	Ford, Bacon & Davis Utah, Inc.
FGR	Federal Guidance Report

FIR	food ingestion rates
FS	Feasibility Study
FSP	field sampling plan
ft	feet
FUSRAP	Formerly Utilized Sites Remedial Action Program
g	gram
g/mg	gram per milligram
GFPC	gas flow proportional counting
GIS	geographic information system
gpd	gallons per day
gpm	gallons per minute
GPS	global positioning system
GWS	gamma walkover survey
Ha	hectares
HEAST	health effects assessment summary tables
HELP	hydrologic evaluation of landfill performance
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive wastes
HTW	hazardous and toxic waste
IA	investigative area
IAEA	International Atomic Energy Agency
ICP-MS	inductively coupled plasma – mass spectrometry
ICRP	International Commission on Radiation Protection
ID	identification (when referring to samples)
ID	inner diameter (when referring to materials of construction)
IDW	investigation derived waste
IIWA	immediate investigative work assignment
in	inches
in/yr	inches per year
IRIS	Integrated Risk Information System
K_d	distribution coefficient
keV	kiloelectron volt (1 keV = 1.6 × 10–16 J)
kg	kilogram
L	liter
LQAM	Laboratory Quality Assurance Manual
$m\ s^{-1}$	meters per second
m	meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCL	maximum contaminant level
MDC	Minimum Detectable Concentration
MED	Manhattan Engineer District
mg/day	milligram per day
mg/kg	milligrams per kilogram
mg/kg-d	milligram per killigram-day
mg/L	milligrams per liter
mGy	meter Gray
mi	mile
mL	milliliter
mL/day	milliliter per day
mL/g	milliters per gram
mph	miles per hour
mrem	millirem

mSv	millisievert (1 mSv =100 mrem)
MW	monitoring well
NAD	North American Datum
NaI	sodium iodide
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCRP	National Council on Radiation Protection
NGVD	National Geodetic Vertical Datum
NIOSH	National Institute for Occupational Safety and Health
NLO	National Lead Company of Ohio
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no observable adverse effects level
Np	neptunium
NRC	Nuclear Regulatory Commission
NY	New York
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OD	outside diameter
ORAU	Oak Ridge Associated Universities
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
ORP	Oxidation-Reduction Potential
OSHA	Occupational Safety and Health Administration
PA/SI	Preliminary Assessment/Site Inspection
Pb	lead
PCB	polychlorinated biphenyl
pCi/g	picocuries per Gram
pCi/L	picocuries per Liter
PID	photo ionization detector
PPE	personal protective equipment
ppm	parts per million
PRG	preliminary remediation goal (USEPA Region 9)
PSA	preliminary site assessment
Pu	plutonium
PVC	polyvinyl chloride
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
Ra	radium
RA	remedial action
rad/d	radiation absorbed dose per day
RAGS	risk assessment guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
Rn	radon
RPP	radiation protection plan
RQD	rock quality designation
RSR	risk to source ratio
SD	standard deviation
SIR	sediment ingestion rate
SJB	SJB Services, Inc.
SLC	Secure Landfill Contractors, Inc.

SLERA	screening level ecological risk assessment
SMDP	scientific management decision endpoint
SOP	standard operating procedure
SOR	sum of ratios
SOW	scope of work
SRSO	site radiation safety officer
SSHP	site safety and health plan
STL	Severn-Trent Laboratories, Inc.
SVOC	semivolatile organic compound
TBC	to-be-considered
TCLP	toxicity characteristic leaching procedure
TENORM	Technically Enhanced Naturally Occurring Radioactive Material
Th	thorium
THA	task hazard analysis
TOC	total organic carbon
TPP	technical project planning
TRV	toxicity reference value
TSS	total suspended solids
U	uranium
UCL	upper confidence limit
UF	uptake factor
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDOE	United States Department of Energy
USEDA	United States Economic Development Association
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USRADS	ultra-sonic ranging and data system
UTL	upper tolerance limit
VOC	volatile organic compound
WIR	water ingestion rates
XRF	x-ray fluorescence
y	year

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EXECUTIVE SUMMARY

INTRODUCTION

The Former Guterl Specialty Steel Corporation Site (Guterl Site), included in the Formerly Utilized Sites Remedial Action Program (FUSRAP), is an approximately 70-acre site located in Lockport, Niagara County, New York. The Guterl Site is located approximately 20 miles northeast of Buffalo, New York, and can be found within the Lockport 7.5-minute topographic quadrangle (United States Geological Society, 1980). Figure ES-1 presents the Site Location Plan.

Between 1948 and 1952, the New York Operations Office of the Atomic Energy Commission (AEC) managed a contract with Simonds Saw and Steel (Simonds), a predecessor owner of the property currently under investigation, to roll uranium (U) steel billets (sometimes referred to as ingots) into rods. The uranium metal billets were received from offsite sources via rail car and were shipped back offsite via rail car after rolling to contract specifications. Between 1952 and 1956, Simonds continued rolling work under subcontract to National Lead Company of Ohio (NLO); NLO was under contract to AEC New York Operations Office. Records indicate that Simonds processed between 25 million and 35 million pounds of natural uranium metal (i.e., processed uranium metal without enrichment supplied as metal ingots) and approximately 30,000 to 40,000 pounds of thorium (Th) metal (supplied as metal ingots) between 1948 and 1956 (ORISE, 1999).

Between 1948 and 1952, when Simonds performed work under the AEC contract, documents indicated that Simonds conducted approximately 312 rolling turns of metal annually. Each turn processed between 15,000 and 20,000 pounds of uranium metal ingot, resulting in an average processing of approximately 4.6 million to 6.2 million pounds of uranium metal annually (approximately 500,000 to 600,000 pounds of uranium metal per month).

Under the NLO subcontract, Simonds continued the same type of work that it had performed under the AEC contract. During 1953, 1954, 1955, and 1956, records indicate there were production of 29, 56, 58, and 22 turns of uranium metal, respectively. At an average of 15,000 to 20,000 pounds of uranium metal ingot per turn, the average annual production during this period would have been approximately 385,000 to 1 million pounds (approximately 40,000 to 80,000 pounds per month).

In a May 25, 2005 site profile the Oak Ridge Associated Universities (ORAU) Dose Reconstruction Project Team prepared for the National Institute of Occupational Safety and Health (NIOSH), the authors stated that more than 99 percent of all material processed at Simonds Saw and Steel contained natural uranium; i.e., uranium that has not been enriched or depleted and with uranium isotopic ratios consistent with naturally occurring abundances. ORAU reported that there was evidence to support the processing of small quantities of depleted uranium and enriched uranium (up to 2.5 percent) during the latter portions of the contract work, but their fractions of contribution to worker radiation dose would be small compared to the amount of natural uranium present (NIOSH, 2005).

AUTHORITY

In the Energy and Water Development Appropriations Act, 1998 (Title I, Public Law 105-62, 111 Stat. 1320, 1326), Congress transferred the responsibility for the administration and execution of cleanup at eligible FUSRAP sites to the United States Army Corps of Engineers (USACE). In the Energy and Water Development Appropriations Act, 2000 (Title VI, Public Law 106-60, 113 Stat. 483, 502), Congress indicated that response actions taken under the FUSRAP program by the Secretary of the Army, Acting through the Chief of Engineers, shall be subject to the process outlined in Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (United States Environmental Protection Agency [USEPA], 1988b) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA, 1990).

The United States Department of Energy (DOE) declared the Guterl Site eligible for FUSRAP in a letter to the US Army Corps of Engineers (USACE) dated May 19, 2000, stating that the Guterl Site met several preliminary conditions for inclusion in the FUSRAP. Under the Memorandum of Understanding (MOU) between USACE and the DOE, once this determination has been made by the DOE, responsibility for action is transferred to USACE (USACE, 2001). USACE conducted a Preliminary Assessment/Site Inspection (PA/SI) during 2001. The purpose of PA/SI under Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) is to identify if chemical or radioactive material releases have occurred, or if the site can be eliminated from further action. The purpose of the assessment was to review information in order to determine if the site posed a threat to public health or the environment and to determine if there was a need for further action by USACE under FUSRAP. The PA/SI concluded that there was no immediate threat to human health, safety and the environment at the Guterl Site. However, because of the potential for the contaminants to pose a threat to human health and the environment in the future, it was recommended that the Guterl Site proceed to the remedial investigation (RI) phase to further characterize radioactive residuals associated with Manhattan Engineer District (MED) - and AEC activities.

SITE DESCRIPTION

The Guterl Site is comprised of a combination of parcels that make up three general areas referred to as the 52-acre Allegheny Ludlum Corporation property, the 9-acre Landfill Area, and the 9-acre Excised Area, plus a small (1.76-acre) parcel located immediately north of the Landfill Area. Although the Erie Canal is physically separated from the property operated by Simonds, it is included in this RI as industrial cooling water and/or storm water originating at the Guterl Site may have been discharged to the Erie Canal. Figure ES-2 presents the Site Plan.

The Allegheny Ludlum Corporation operates an active specialty steel manufacturing facility in the southwest portion of the 52-acre Allegheny Ludlum Corporation property. The 9-acre landfill area is no longer operated as a waste disposal area (since 1981). The 9-acre Excised Area that contains the buildings once used to roll the U metal is abandoned with chain link security fence surrounding the dormant buildings.

Topography at the Guterl Site is relatively flat, with a relief of approximately 25 ft from the north side of the Site at Route 31 (elevation 620 ft) to the south side of the Guterl Site at New York State Route 93 (elevation 595 ft).

The vegetated areas on the Guterl Site contain herbaceous, scrub/shrub, and woodland habitats. The northern portion of the Guterl Site contains large swaths of old fields that occupy the former building and landfill sites and are currently strewn with construction debris (e.g., concrete, wood, etc.). In the southwest portion of the Guterl Site there are limited wooded and scrub/shrub area habitats. Other small habitats of unmanaged open areas occur randomly in the eastern portion of the Guterl Site around the abandoned buildings and a rail spur.

The Guterl Site is not located in a 100-year or 500-year floodplain and no New York State or federal regulated wetlands have been identified at the Guterl Site. Unregulated, isolated, seasonal wetlands were noted within the Guterl Site and vary from scrub/shrub and forested wetlands to small, ephemeral wet depressional areas. The Guterl Site does not contain any ponds or streams and has no visible natural connection to other surface water bodies, including the Erie Canal located south-southeast of the Guterl Site. A culvert pipe connects the eastern and western drainage ditches along NY Route 93 Bypass in the southwestern corner of the site, although the culvert did not appear to be functioning properly at the time of the RI as evidenced by ponded water on both sides of the culvert pipe.

Land use near the Guterl Site is mixed, consisting of private residences, small farms, and light industries. To the north of the Excised Area, along Simonds Street, land use includes light industrial/warehouse operations. To the west of the former railroad right-of-way, land use consisted of light industry (concrete batch plant operations and warehousing); to the east of the former railroad right-of-way are private residences. To the west of the operating facility, east of Route 93 bypass, there is an active dolostone

quarry. To the south-southeast of the Guterl Site, the Erie Canal separates the Guterl Site from private farmlands.

INVESTIGATIVE LIMITATIONS

MED/AEC activities at the Guterl Site occurred between 1948 and 1956. As a result, the quantity and quality of operational records was limited. Material handling and waste disposal records were not directly located; i.e., much of the conceptual site model (CSM) was developed based on review of surviving employee interviews, review of aerial photographs, assumptions based on typical steel rolling processes, and review of available background file memoranda and prior investigative reports.

INVESTIGATIVE METHODS, TOOLS, AND ACTIVITIES

As an initial step of the project planning phase for the Guterl Site RI, a Technical Project Planning (TPP) Meeting was conducted August 9 and 10, 2005. The purpose of the TPP Meeting was to gather the project stakeholders for informational discussions, and to begin development of site-specific project Data Quality Objectives (DQOs) for the RI/FS (Feasibility Study).

Following the TPP Meeting, the next step of the RI included formal development of preliminary DQOs and identification of potential Applicable or Relevant and Appropriate Requirements (ARARs). The preliminary DQOs and potential ARARs were presented in a report entitled *Preliminary Identification of Data Quality Objectives and Applicable or Relevant and Appropriate Requirements* (USACE, 2005c). The Preliminary DQO/ARAR report established the framework for the data quality requirements for data to be used to delineate the nature and extent of radiological contamination at the Guterl Site. Several of the project DQOs were accomplished prior to development of the RI project work plans (discussed below), or were not directly applicable to the RI field data collection and management program. The project DQOs that were determined to be directly applicable to the RI data acquisition phase are presented in Table ES-1. The potential ARAR list was reviewed and updated as part of this RI Report. Potential Federal and State ARARs are presented in Table ES-2 and ES-3, respectively.

Following development of preliminary DQOs and potential ARARs, a data gap assessment[1] was performed. The data gap assessment included review and evaluation of prior investigations and available historical data (see Section 2.3). The available data were evaluated relative to achieving the project DQOs/potential ARARs. The data gap analysis grouped existing environmental data into investigative areas (IA). The list of IAs was used to provide manageable units for data organization and summary. Each matrix was evaluated for potential data gaps in each IA. The IAs were also designed to approximate the anticipated exposure units (EU) to be used during the baseline risk assessment.

The data gap analysis identified documentation for, or, in some cases, a strong probability for, MED/AEC-related constituents present in one or more media within seven of the eight evaluated IAs (thus making the site eligible for FUSRAP). Recommendations for additional data collection to fill the data gaps for the remaining seven IAs and develop data of sufficient quality and quantity to meet the project objectives were presented in the Data Gap Analysis Report (USACE 2006a); see Table ES-1 for data gathering requirements. The DGAR proposed a list of radiological constituents of potential concern (COPC)[2] and preliminary screening levels. The COPCs identified for the RI phase of work included uranium (^{238}U, ^{235}U, and ^{234}U), thorium (^{232}Th, ^{230}Th, and ^{228}Th), and radium (^{228}Ra and ^{226}Ra).

Following development of the Data Gap Analysis Report (DGAR), a set of site-specific project work plans were developed in accordance with USEPA and USACE guidance documents for conducting remedial investigations. The project work plans were developed based on agreements made during the TPP

[1] A "data gap assessment" assesses whether significant data gaps exist that would require additional investigation. Some of the data gaps identified may require additional field investigations while others may require additional review of historic records or the compilation of reference materials cited in the RI.

[2] "Constituents of potential concern" are potentially harmful substances found at a site at concentrations above acceptable levels. Identification of COPCs is the first step in a Risk Assessment.

Meeting and on information in the DQO/potential ARAR report and the DGAR. The site-specific project work plans included a field sampling plan (FSP) and quality assurance project plan (USACE, 2007a and 2007b), gamma walkover survey plan (USACE, 2006c), and a site safety and health plan with a radiation protection plan (USACE, 2006d).

Figure ES-3 presents the IAs for the Guterl Site. The list of IAs was refined during the preparation of project plans to provide better investigative flexibility[3]. The list of IAs used for the data acquisition phase of work was as follows:

IA01 Excised Area – Building Surfaces and Interiors (including Building 24)

IA02 Excised Area – Building Exterior Areas

IA03 Landfill Area (Allegheny Ludlum Corporation Property)

IA04 Allegheny Ludlum Corporation Property (Allegheny Ludlum operations area, not including Excised Area, Landfill Area, or Building 24); for this investigation, IA04 was subdivided into subunits IA04A, IA04B, IA04C, and IA04D

IA04A Area North of Excised Area, North of Active Allegheny Ludlum Operations, East of IA03, and South of IA05

IA04B Area of Active Allegheny Ludlum Operations

IA04C Area South of Active Allegheny Ludlum Operations

IA04D Area South of Excised Area

IA05 Former Railroad Right-of-Way North of Site Proper; for this investigation, IA05 was subdivided into subunits IA05A and IA05B

IA05A Former Railroad Right-of-Way North of IA04A

IA05B Undeveloped Area East of IA05A and North of IA04A

IA06 Offsite Northeast Properties[4]

IA07 Site-wide Groundwater

IA08 Site Utilities (sewers and drains)

IA09 Erie Canal (southeast of Guterl Site)

IA10 Lot 7.1[5]

In addition to being developed to approximate EUs for the baseline risk assessment, the IAs were also developed considering the need to identify MARSSIM[6] Final Status Survey units for future Guterl Site

[3] IA01 through IA08 were developed during the TPP/data gap analysis phase. Addition of IA09 and IA10, and breakout of IA05 and IA04 into subunits, was introduced during development of the FSP.
[4] IA06 was identified as potentially impacted during the initial phase of the data gap analysis because these offsite lands were at one time owned by Simonds. However, during the data gap analysis it was determined that these offsite lands had been sold by Simonds prior to the period of MED/AEC activity. Therefore, IA06 was dropped from further consideration and IA06 is presented solely as a placeholder on the IA list.
[5] In some historical reports, this property is also sometimes referred to as the “Lombardi property.”

closeout activities. During RI work plan development, Class 1, Class 2, and Class 3 survey units were preliminarily identified for the Guterl Site (including Excised Area building interiors). The units were based on guidance provided in MARSSIM on the contamination potential and sizes for these various units.

Between June 2007 and December 2007, Earth Tech completed the RI field data acquisition phase of work in accordance with the project work plans. A USACE representative was available onsite throughout the data acquisition phase of work. The RI field data acquisition consisted of sampling and analysis of soil, sediment, surface water, groundwater, and building materials from each IA, as appropriate. Sampled media were analyzed for Guterl Site COPCs by one or more of the following analytical methods: gamma spectroscopy; alpha spectroscopy; gas flow proportional counting, and inductively coupled plasma-mass spectroscopy. A mobile radiological laboratory was established onsite for the purpose of screening soil samples by gamma spectroscopy prior to selection of soil samples for off-site (fixed) laboratory analyses.

FIELD SAMPLING RESULTS

The RI confirmed the results of previous studies that indicated the presence of thorium and uranium contamination at the Guterl Site. The RI also added much new information about the nature and extent of thorium and uranium contamination at the Guterl Site. No evidence was found for primary ^{226}Ra contamination (i.e., ^{226}Ra was always found in equilibrium with its ^{230}Th precursor when data were available to make the comparison), except for a single soil location in IA05A (the reason for the atypical isotopic ratios at this location was not able to be determined using the current RI and historical data sets). The extent of MED/AEC-related constituents was found to be consistent with prior site investigations and the RI CSM. A summary of significant observations, by media, is presented in bullet format under the following headings. Unless otherwise noted, the stated finding was consistent with prior data and the CSM (refer to Figure ES-3 for Site Plan):

Surface and Subsurface Soil:

- COPC concentrations were at or near background levels in the active Allegheny Ludlum Corporation production areas and in historically undisturbed areas of the Guterl Site.[7]
- COPC contamination was found to be greatest in and around then-active MED/AEC support operations handling areas, and in then-undeveloped portions of the property where miscellaneous land disposal of MED/AEC-related materials may have occurred.
- Some degree of MED/AEC-related constituents was found in each Excised Area building. Buildings 6 and 8 were the most significantly affected; this is consistent with the CSM as these were the buildings that were used for uranium metal rolling and shipping during MED/AEC support operations.
- Outside of the Excised Area buildings, MED/AEC-related constituents were found to occur in several localized outdoor areas of the undeveloped parcel including IA02, IA03, IA04A, and IA05A. Horizontal and vertical distribution of MED-AEC-related constituents within these areas was variable. This is consistent with miscellaneous land disposal practices.
- Uranium concentrations on the Guterl Site were detected in subsurface samples collected on the eastern portion of IA10. Uranium COPCs were detected at concentrations less than two times background in 13 of 16 borings, and above background but less than half the individual COPC screening levels in the remaining three borings.

[6] *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM), NUREG-1575, Rev.1. Washington, DC: U.S. Nuclear Regulatory Commission. August 2000.

[7] As determined in this survey, all COPC background concentrations are between about 0.2 pCi/g and 1.4 pCi/g, not counting ^{235}U, which occurs at concentrations 4.5 percent that of ^{238}U . Variability between results depend on the COPC, surface soil or subsurface soil, and the type of analysis (onsite gamma spectroscopy, offsite gamma spectroscopy, alpha spectroscopy, gas flow proportional counting, and inductively coupled plasma-mass spectroscopy; see Tables 3-25, 3-26, 3-27, 3-28, and 3-29, respectively).

- The horizontal extent of MED/AEC-related constituents in surface and subsurface soil was successfully bounded in all areas of the site; i.e., sufficient data exist to conclude that soils with MED/AEC-related constituents that exceed screening level criteria are limited to areas located within the Guterl Site.
- Vertical bounding of MED/AEC-related constituents in surface and subsurface soil was successfully completed to within 2-foot tolerance. The RI data show that there are areas where surface soils contain MED/AEC-related constituents in excess of work plan screening levels but subsurface soils in the same boring location do not; there are areas where surface soils do not contain MED/AEC-related constituents in excess of work plan screening levels but subsurface soils do; there are areas where both surface and subsurface soils contain MED/AEC-related constituents in excess of work plan screening levels; and, there are areas where neither surface nor subsurface soil contains MED/AEC-related constituents in excess of work plan screening levels (i.e., unaffected areas of Guterl Site).
- Additional data were collected to evaluate the presence of enriched, depleted and recycled uranium. Twelve soil samples that displayed significantly elevated uranium concentrations as determined by onsite laboratory gamma spectroscopy analysis were selected for isotopic uranium analysis by inductively coupled plasma – mass spectroscopy. The vast majority of samples show that impacts from uranium found on the Guterl Site are from the processing and handling of natural uranium. Though a small fraction of the samples show trace amounts of ^{236}U, this does not contribute to human health risks nor create disposal issues.

Groundwater:

- Overburden groundwater appears to fluctuate seasonally with variations in precipitation and evapotranspiration. Overburden groundwater was not present during this RI; however, other investigators have reported measureable groundwater in overburden wells. No overburden groundwater samples were collected during this RI as groundwater was not observed in overburden wells during the July/August 2007 and November 2007 sampling events.
- The shallow bedrock hydrogeology is heterogeneous due to the presence of fractured bedrock, and the presence of the Erie Canal and dolostone quarry (dewatering at the quarry affects groundwater flow patterns on the southwestern portion of the Guterl Site).
- Uranium was the only COPC in shallow bedrock groundwater that exceeded USEPA maximum contamination limits (seven of 30 locations sampled). Prior investigations had not specifically documented the presence of uranium in groundwater, as only gross alpha/gross beta data had been collected in the area of the landfill.
- The occurrence of uranium-contaminated groundwater is consistent with leaching of uranium-contaminated soil (source material) to the bedrock groundwater zone, which then follows the northwest to southeast trending groundwater flow pattern.
- The current shallow bedrock monitoring well network is sufficient to determine shallow bedrock groundwater flow patterns and shallow bedrock geochemistry on the Guterl Site.
- Two data gaps were identified with respect to groundwater (i.e., new findings):
    1. The horizontal extent of shallow bedrock groundwater contamination at the southwestern and southeastern limits of the Guterl Site is undetermined.
    2. The vertical extent of bedrock groundwater contamination at shallow bedrock wells with uranium screening level exceedances is also undetermined.

Surface Water:

- Naturally occurring surface water was observed in the Erie Canal and in seasonally wet depression areas in undeveloped portions of the Guterl Site. MED/AEC-related constituents were not detected in surface water samples collected from the Erie Canal. Prior investigations had not characterized this investigative area.

Sediment:

- Naturally occurring sediment was observed in the Erie Canal and in seasonally wet areas along the western and southern perimeter of the landfill area. MED/AEC-related constituents were not detected in naturally occurring sediment in seasonally low areas of landfill and the Erie Canal. Prior investigations had not characterized this investigative area.

Excised Area Site Utilities:

- MED/AEC-related constituents were detected in non-native surface water in Excised Area utility trenches, drains, pits, catch basins, and in the basement of Building 1. The nature and location of detections is consistent with proximity to MED/AEC-related material handling areas and MED/AEC-related constituents in surface soil.
- MED/AEC-related materials were detected in non-native sediment in Excised Area utility trenches, drains, pits, catch basins, and in the basement of Building 1. Prior investigations had not characterized this site feature. The nature and location of detections is consistent with proximity to MED/AEC-related material handling and MED/AEC-related constituents in surface soil.
- Although comprehensive design and/or construction record drawings for all Excised Area utilities was not able to be located during this phase of the RI, sufficient information was located and/or generated (e.g., utility surface water and sediment samples) to allow for determination of nature and extent of COPCs.

Building Materials:

- About 25 percent of the static measurements of average surface contamination (that is, measurements of fixed plus removable contamination) for IA01 buildings exceeded a surface screening level.[8] However, only three of 4,594 swipe measurements of removable surface contamination for IA01 buildings were greater than the applicable thorium screening level and none were greater than the applicable uranium screening level. This confirms earlier conclusions that COPC contamination of interior building surfaces is essentially fixed.
- Radioactivity on building exterior surfaces and roofs was found to be below surface radioactivity limits. Exterior roof samples (volumetric) were not collected for safety reasons. In addition, observations and review of scanning surveys indicated that build-up of contamination was unlikely (e.g., absence of soot, soil like material, etc.).

FATE & TRANSPORT

An evaluation of the fate and transport of constituents at the Guterl Site was performed to identify the mechanisms and pathways by which radionuclides present at the Guterl Site could be released from their current locations, move through environmental media, and potentially impact human and ecological receptors.

A physical-setting CSM was developed to evaluate the impacts of historical operations at the Guterl Site on the distribution, and potential fate and transport mechanisms of COPCs. The CSM for the Guterl Site is presented as Figure ES-4. The basic elements of the CSM for the Guterl Site are:

[8] "Screening levels" for the purposes of this report are the same as the "Acceptable Surface Contamination Levels" in Table 6-4 of USACE Engineer Manual 385-1-80, *Radiation Protection Manual*, 30 May 1997.

- Contamination Mechanism (Rolling Mill Operations)
- Source Media (Building Surfaces and Surface Soil)
- Transportation Mechanisms (Wind, Surface Water Runoff/Sewers and Drains, Leaching, and Land Disposal/Disturbance)
- Physical Features of the Study Area (Land Development, hydrology, surface water, geology, hydrogeology, groundwater)
- Matrices of Interest (Building Surfaces, Soil (Surface and Subsurface), Surface Water/Sediment, and Groundwater)
- Exposure Routes (Ingestion, Dermal Contact, Inhalation (Fugitive Dust), External Radiation, and Ingestion of Produce)
- Current and Future Human Receptors (Trespasser, Future Onsite Worker, Future Construction Worker, and Future Resident)

Based on an evaluation of RI data, ^{238}U is the dominant COPC at the Guterl Site and therefore the focus of the fate and transport evaluation. The original source of the COPCs was dust and debris generated by the Rolling Mill operations. Through land disposal/disturbance, surface and subsurface soil came into contact with waste products containing COPCs. Land disposal/disturbance would result in exposure of underlying native soil to COPCs. Where the native soil was thin or nonexistent, the bedrock surface and bedrock groundwater may have been exposed. Also, groundwater could be exposed by leaching of radionuclides from surface soil through subsurface soil.

Groundwater concentrations of COPCs, while small in most cases, indicate these constituents have been transported from source materials to groundwater. Transport of COPCs via groundwater is greatly affected by geochemical conditions. Under some conditions, COPC transport by groundwater is minimized due to adsorption and precipitation. Groundwater at the Guterl Site occurs in the fractured dolostone bedrock, and groundwater flow is mainly toward the Erie Canal. Mechanisms such as wind erosion and surface water transport are not considered significant mechanisms for contaminant releases.

Transport by groundwater is an important potential migration pathway for the COPCs. Thorium and radium (Ra) concentrations in groundwater are controlled by their low solubilities in groundwater. Uranium solubility is dependent on its oxidation state. Although originally present as uranium metal, historical processing resulted in oxidation to U^{4+}, which has low solubility, and to more soluble U^{6+}. Adsorption will be less effective under some conditions: where adsorptive capacity is exhausted, where native soil does not occur between fill and bedrock, or where fluctuating water levels result in groundwater movement into soil and especially into fill. Once in groundwater, uranium will tend to migrate along fracture and bedding plane flow paths as long as groundwater conditions remain oxidizing.

A series of computer models were used to evaluate transport of uranium to and in groundwater. SESOIL was used to evaluate transport of uranium through the unsaturated (vadose) zone. For SESOIL modeling, uranium was distributed between a dissolved, porewater phase and an adsorbed phase based on the assigned solubility and distribution coefficients. Uranium solubility was determined using MINEQL+ (Schecher and McAvoy, 2003), a menu-driven version of MINTEQA2 which includes the USEPA MINTEQA2 database and additional species, including uranium.

The Hydrologic Evaluation of Landfill Performance (HELP) model was used to generate groundwater recharge estimates. The recharge results from the HELP model and RESRAD model were used to calibrate adjustable parameters in SESOIL to obtain a comparable infiltration rate.

The concentration in leachate, derived from the SESOIL model, was used as input to the saturated zone model, AT123D (Yeh, 1981), to compute a resulting concentration in groundwater beneath the modeled location. The AT123D model was used to predict resulting groundwater concentrations when pore water

from the vadose zone mixes with water in the underlying aquifer. The SEVIEW© (Schneiker, 2006) program simplifies transport and fate modeling by linking the SESOIL vadose zone model to AT123D.

The modeling indicated that if the uranium source was fully oxidized (entirely U^{6+}), groundwater concentrations would eventually be much higher than currently observed at the Guterl Site. However, the actual percent of U^{6+} in the soil is not known because soil sample data does not distinguish the actual oxidation state of the uranium detected. The source material, uranium metal oxidized during milling, was dominantly uranium dioxide (UO_2) in which uranium is present as immobile U^{4+}. The more easily dissolved form of uranium (U^{6+}) may have been produced due to further oxidation during historical milling operations or slow oxidation of UO_2. Since the relative percent of U^{6+} (soluble form) or U^{4+} (insoluble form) is not known and may vary throughout the site, transport modeling used the conservative approach of assuming a fully oxidized (U^{6+}) source. Consequently, modeling results are overly conservative.

Historical land disposal and disturbance practices could allow direct contact of contaminated material (containing unoxidized or oxidized uranium) with the dolostone aquifer or with soil that is seasonally in contact with groundwater. Groundwater levels are shallow at the Guterl Site and fluctuate seasonally. These fluctuations appear to result in contact of the water table and soil contaminated with uranium. Therefore, uranium in groundwater may be a result of two sources: 1) uranium that was oxidized during milling operations and leached to groundwater through soil, and 2) ongoing oxidation of uranium in soil, present due to historical disposal and land disturbance practices, that is seasonally in contact with groundwater.

HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment (HHRA) was conducted for the Guterl Site as part of the RI. This HHRA evaluated potential risks, doses, and systemic effects to both current and future human receptors from exposure to contaminated building materials within the Excised Area, surface and subsurface soil, groundwater, and sediment and surface water within ditches, trenches, etc. and within the Erie Canal. While current receptors include the juvenile trespasser and the onsite worker, potential future receptors include the juvenile trespasser/recreational visitor, the onsite worker, the construction worker, and the hypothetical resident. The COPCs evaluated in the HHRA were ^{226}Ra, ^{228}Ra, ^{228}Th, ^{230}Th, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U. The potential routes of exposure include ingestion of all media, inhalation of particulates, and exposure to external gamma radiation.

The RESRAD computer model was used to support the HHRA. The RESRAD code was used to estimate the cancer risk and doses for all receptors and all media with the exception of sediment, surface water, and groundwater, which were estimated using Risk Assessment Guidance for Superfund equations (USEPA, 1989). The noncarcinogenic effects of the uranium isotopes were also estimated using the RAGS equations because the RESRAD code was developed to estimate cancer risks. The RESRAD-Build code was used to estimate risks and doses for the building interiors.

To support the risk assessment processes, the Guterl Site was divided into 20 EUs based upon historical activities and potential exposures in IAs across the previous rolling mill site. Exposure units represent areas over which a given receptor would be likely to average his or her exposure to potential contaminants of concern. EUs 1-9 are the building interiors within the Excised Areas, while EUs 10-20 are considered the outdoor EUs. EU locations are shown in Figure ES-5 and are listed below with their corresponding IA:

- EU1, Building 1 – part of IA01, Excised Area Building Interiors
- EU2, Building 2 – part of IA01, Excised Area Building Interiors
- EU3, Building 3 – part of IA01, Excised Area Building Interiors
- EU4, Building 4/9 – part of IA01, Excised Area Building Interiors
- EU5, Building 5 – part of IA01, Excised Area Building Interiors

- EU6, Building 6 – part of IA01, Excised Area Building Interiors
- EU7, Building 8 – part of IA01, Excised Area Building Interiors
- EU8, Building 24 – part of IA01, Excised Area Building Interiors
- EU9, Building 35 – part of IA01, Excised Area Building Interiors
- EU10, East of Buildings – part of IA02, Excised Area Building Exterior Areas
- EU11, Between Buildings – part of IA02, Excised Area Building Exterior Areas
- EU12, Landfill – IA03, Landfill Area
- EU13, IA04A – part of IA04, Allegheny Ludlum Corporation Property
- EU14, IA04B – part of IA04, Allegheny Ludlum Corporation Property
- EU15, IA04C – part of IA04, Allegheny Ludlum Corporation Property
- EU16, IA04D – part of IA04, Allegheny Ludlum Corporation Property
- EU17, IA05A – part of IA05, Railroad Right-of-Way
- EU18, IA05B – part of IA05, Railroad Right-of-Way
- EU19 – IA09, Erie Barge Canal
- EU20 – IA10, Lot 4.1 ("Lombardi Property")

The HHRA evaluated both current and future risks, doses, and hazards for human receptors including the juvenile trespasser, onsite worker (non-intrusive), construction worker (intrusive), and onsite resident. Since the nature and extent of contaminants may vary over time as contamination transports and degrades, RESRAD and RESRAD-Build were used to model contaminant fate and transport and to estimate the current and future dose and risk to receptors. The risks, doses, and hazard indexes were evaluated by receptor and by exposure unit relative to the following key screening criteria (based on USEPA, 1997c):

- Radiological carcinogenic risk of 1×10^{-4}, which is a maximum risk level considered to be acceptable from exposure to carcinogenic chemicals
- Annual dose of 25 millirem (mrem)/year, which is considered a maximum safe annual dose from exposure to radionuclides
- Hazard Index of 1.0 for evaluating non-carcinogenic hazards from exposure to uranium

Risk and dose were evaluated at year zero (currently sampled conditions) and at several selected years in the future (year 1, year 10, year 25, year 58, and year 1000). Selected cancer risks, doses, and hazard indices for current and future receptors are shown in Table ES-4 and summarized below.

Modeling current contaminant conditions, several receptors exceeded one or more of the above screening criteria in one or more EUs (values in parentheses are the maximum risks/doses/HIs estimated for a receptor at that EU). For EUs 1-9 (all within IA01), the receptors most at risk are the onsite worker and the construction worker and the primary exposure pathway is in-building soil (flooring). For EUs 10-20 (IA02 through IA05B, IA09, IA10), the most at-risk receptor is a hypothetical resident and the primary exposure pathways are external gamma radiation and consuming home-grown produce.

EUs with Risks Exceeding 1 x 10^{-4} at year zero: Nine EUs/IAs had risks (excluding contribution from background) exceeding 1 x 10^{-4}, the upper bound of the NCP risk range. The highest estimated risk was 1 x 10^{-2} at EU7/Bldg. 8. EUs with risks exceeding 1 x 10^{-4} included: EU6/Bldg. 6 (1 x 10^{-3}), EU7/Bldg. 8 (1 x 10^{-2}), EU10/IA02 East (3 x 10^{-4}), EU11/IA02 West (2 x 10^{-4}), EU12/IA03 (2 x 10^{-4}) EU13/IA04A (3 x 10^{-4}), EU14/IA04B (3 x 10^{-4}), EU16/IA04D (3 x 10^{-4}), and EU17/IA05A (3 x 10^{-3}),.

EUs with Doses Exceeding 25 mrem/year at year zero: Nine EUs/IAs had annual dose estimates (excluding contribution from background) greater than 25 mrem/year: EU1/Bldg. 1 (591 mrem/y), EU2/Bldg. 2 (470 mrem/y), EU3/Bldg. 3 (120 mrem/y), EU4/Bldg. 4/9 (30 mrem/y), EU6/Bldg. 6 (84 mrem/y), EU7/Bldg. 8 (765 mrem/y), EU8/Bldg. 24 (65 mrem/y), EU14/IA04B (32 mrem/y), and EU17/IA05A (166 mrem/y).

EUs with HIs Exceeding 1.0 at year zero: Only four EUs had HIs (excluding contribution from background) exceeding 1.0: EU7/Bldg. 8 (9), EU8/Bldg. 35 (9), EU14/IA04B (2), and EU17/IA05A (8).

Future cancer risks and doses estimated by RESRAD and RESRAD-Build revealed several receptors exceeding the screening criteria in one or more EUs (values in parentheses are the maximum risks/doses estimated for a receptor at that EU). As in current conditions, for EUs 1-9 (all within IA01), the receptors most at risk are the onsite worker and the construction worker and the primary exposure pathway is in-building soil (flooring). For EUs 10-20 (IA02 through IA05B, IA09, IA10), the most at-risk receptor is a hypothetical resident and the primary exposure pathways are external gamma radiation and consuming home-grown produce.

EUs with Risks Exceeding 1 x 10^{-4} in future years: Incorporating contaminant degradation and transport, estimated cancer risks (excluding contribution from background) for twelve EUs/IAs exceeded 1 x 10^{-4}, the upper bound of the NCP risk range. The highest estimated risk was 6 x 10^{-2} at year 58 for EU17/IA05A. EUs with risks exceeding 1 x 10^{-4} included: EU6/Bldg. 6 at year 1000 (1 x 10^{-3}), EU7/Bldg. 8 at year 58 (2 x 10^{-3}), EU7/Bldg. 8 at year 1000 (2 x 10^{-4}),EU10/IA02 East at year 58 (1 x 10^{-3}), EU10/IA02 East at year 1000 (1 x 10^{-4}), EU11/IA02 West at year 58 (4 x 10^{-3}), EU12/IA03 at year 58 (2 x 10^{-3}), EU13/IA04A at year 58 (6 x 10^{-3}), EU13/IA04A at year 1000 (1 x 10^{-4}), EU14/IA04B at year 58 (4 x 10^{-4}), EU15/IA04C at year 58 (2 x 10^{-4}), (EU16/IA04D at year 58 (8 x 10^{-4}), (EU16/IA04D at year 1000 (1 x 10^{-4}), EU17/IA05A at year 58 (6 x 10^{-2}), EU17/IA05A at year 1000 (1 x 10^{-3}), EU18/IA05B at year 58 (2 x 10^{-4}), and EU20/IA10 at year 58 (2 x 10^{-4}).

EUs with Doses Exceeding 25 mrem/year in future years: Fourteen EUs/IAs had annual dose estimates (excluding contribution from background) greater than 25 mrem/year(y): EU1/Bldg. 1 at year 1 (591 mrem/y), EU2/Bldg. 2 at year 1 (462 mrem/y), EU3/Bldg. 3 at year 1 (113 mrem/y), EU3/Bldg. 3 at year 58 (105 mrem/y), EU4/Bldg. 4/9 at year 1 (26 mrem/y), EU6/Bldg. 6 at year 58 (117 mrem/y), EU6/Bldg. 6 at year 1000 (54 mrem/y), EU7/Bldg. 8 at year 1 (94 mrem/y), EU7/Bldg. 8 at year 58 (6481 mrem/y), EU7/Bldg. 8 at year 1000 (55 mrem/y), EU8/Bldg. 24 at year 1 (61 mrem/y), EU10/IA02 East at year 58 (162 mrem/y), EU11/IA02 Between Buildings at year 58 (436 mrem/y), EU12/IA03 Landfill at year 58 (292 mrem/y), EU13/IA04A at year 58 (789 mrem/y), EU14/IA04B at year 58 (47 mrem/y), (EU16/IA04D at year 58 (87 mrem/y), EU17/IA05A at year 58 (7368 mrem/y), and EU17/IA05A at year 1000 (96 mrem/y).

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

A SLERA was performed to evaluate potential risks to avian and mammalian receptors from both external and internal exposure to radionuclides and total uranium from soil, sediment, surface water, and food items that may have bioaccumulated site-related contaminants. The screening level assessment served to identify exposure pathways and COPCs which would require further evaluation in a baseline ecological risk assessment (BERA) by eliminating contaminants and exposure pathways that pose negligible risks (USEPA, 1997). These estimates ensured that the appropriate constituents of concern (COC) were selected for further evaluation, and identified the potential for data gaps, additional sampling, or uncertainties to be addressed in the BERA. The ecological CSM is presented in Figure ES-6.

A site reconnaissance was performed by a senior field biologist on May 2, 2008 to provide information on the habitat types found on the Guterl Site; examine the presence of potential ecological receptors using visual sitings, tracks, and scat; and finalize the USEPA Ecological Risk Assessment Guidance for

Superfund (ERAGS) (USEPA, 1997) checklist that was partially completed by USACE biologists. The ERAGS checklist and accompanying photo log from the reconnaissance are found in Appendix W of this RI report. Information on the presence of endangered or threatened species was provided by United States Fish and Wildlife Service (USFWS) and the New York Natural Heritage Program.

Vegetated areas of the Guterl Site contain herbaceous, scrub/shrub, and woodland habitats. The northern portion of the Guterl Site contains large swaths of old (late successional) fields that occupy the areas between buildings and the landfill areas which contain construction debris (e.g., concrete, wood, etc.). The southwest portion of the Guterl Site has limited wooded and scrub/shrub area habitats. There are also small areas of old fields located in the eastern portion of the Guterl Site around the abandoned buildings and a rail spur. Wetlands are present within the Guterl Site and vary from scrub/shrub and forested wetlands to small, ephemeral wet depressional areas. No wetland delineations have been performed; however, a wetland determination was performed by USACE personnel.

Potential risks from radiation doses were screened using RESRAD BIOTA (United States Department of Energy (USDOE, 2004) which follows the methodology outlined in the DOE standard: A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota (USDOE, 2002). This standard provides a dose evaluation approach and meets the requirements for protection of biota in DOE Orders 5400.1, "General Environmental Protection Program" (USDOE, 1990), 5400.5 (USDOE, 1993), and the dose limits for protection of biota developed or discussed by the National Council on Radiation Protection and Measurement (NCRP, 1991) and International Atomic Energy Agency (IAEA, 1992).

The intent of the graded approach is to protect the most sensitive populations of terrestrial plants, animals and aquatic animals. The RESRAD BIOTA program developed default exposure parameter values based on a range of organisms, which are provided in USDOE (2002). Reference organisms are categorized into terrestrial plants and animals for terrestrial systems, and aquatic animals and riparian animals for aquatic systems. The receptors evaluated in RESRAD BIOTA are the most sensitive terrestrial organisms no matter what trophic level they are in and as such if no potential risk is found during the screening analysis then it is assumed that there would be no potential risk to other ecological receptors on the Guterl Site as well. The receptors that will be evaluated for exposure to radionuclides have adequate habitat to either reside on or use the Guterl Site as a foraging habitat.

In addition to examining the potential radiological risks from uranium the potential risks to terrestrial and aquatic biota from exposure to the toxic effects of uranium in its inorganic form (i.e., non-radiological toxicity) were evaluated using Steps 1 and 2 of the USEPA ERAGS process. ERAGS Step 1 includes a screening-level problem formulation and an ecological-effects evaluation; Step 2 consists of a screening-level exposure estimate utilizing conservative assumptions to estimate exposure point concentrations (EPC) for representative receptors of exposure pathways identified as complete under the exposure pathway evaluation (USEPA, 1997).

Receptors for the evaluation of inorganic uranium may either reside on the Guterl Site or use the Guterl Site for foraging; that is, they are considered representative terrestrial and riparian receptors which may actually use the Guterl Site. Adequate habitat exists on both the terrestrial and aquatic areas of the Guterl Site for these species to either reside or use the Guterl Site as a forage base.

The presence of endangered species was investigated through contacts with the New York State Natural Heritage Program and USFWS. Based on these requests no endangered species were known to exist on the Guterl Site.

The results of the radiological screening indicate that the summed ratio (soil concentration/BCG) for terrestrial animal exposures to maximum radionuclide concentrations in soil exceeds the acceptable threshold of 1.0×10^{0} at 2×10^{1} for the 0 to 6 inch soil depth and 2×10^{1} for the total soil depth. An elevated concentration of ^{228}Ra in EU17/IA05A (screening ratio = 9.34×10^{-1}) combined with elevated ^{238}U and ^{234}U in EU7/Bldg. 8 caused the exceedance of the 1.0×10^{0} threshold; in addition, the ^{234}U ratio was 3.61×10^{0} and ^{238}U ratio was 1×10^{1}.

The summed ratio for terrestrial plants exposure to maximum radionuclide concentrations in soil is 2×10^0 for the 0 to 6 inch depth and 2×10^0 for the total soil depth. An elevated concentration of ^{238}U in EU7/Bldg. 8 caused the exceedance of the 1.0×10^0 threshold at 1.1×10^0.

Potential risk of radionuclides to aquatic animals from exposure to maximum surface water and sediment radionuclide concentrations are below the level of concern (i.e., ratio of one) at 2×10^{-1} and 2×10^{-4}, respectively. Potential risks to riparian animals from exposure to maximum surface water and sediment radionuclide concentrations are below the level of concern (i.e., ratio of one) at 4×10^{-1} and 3×10^{-2}, respectively.

Radiological risk from exposure to maximum radionuclide concentrations in soil for terrestrial animals and plants indicates that further evaluation of this direct contact exposure pathway is required. An elevated concentration of ^{228}Ra in EU17/IA05A and elevated concentrations of ^{238}U and ^{234}U within EU7/Bldg. 8 were the primary contributions to the exceedance of the screening threshold. Potential risks to aquatic and riparian receptors from exposure to maximum sediment and surface water radionuclide concentrations were calculated to be below the level of concern.

In a refinement of the radiological risk the 95 percent UCL for each of the exposure units evaluated in the RI were compared to the DOE's acceptable concentrations of radionuclides in environmental media, Biota Concentration Guides (BCG) for ^{234}U (5.13×10^3 pCi/g) and ^{238}U (1.58×10^3 pCi/g). Only soils in EU7/Bldg. 8 (surface and subsurface) exceed the DOE's BCG for ^{234}U and ^{238}U, and soils in EU17/IA05A (surface only) exceeded the DOE's BCG for and ^{238}U.

Based on the conservative nature of this SLERA and the food web modeling used to evaluate the potential risk to terrestrial receptors, there is the potential for increased risk to receptors that may use the upland portions of the Guterl Site for foraging. The uranium hazard quotient (HQ) for the terrestrial species which may inhabit the Guterl Site exceeded 1.0 for the short-tailed shrew, American robin, eastern cottontail, red fox, and red-tailed hawk through ingestion of contaminated food. HQ exceedances are based on the use of the maximum uranium concentration in soil (EU7/Bldg. 8). This exceedance of an HQ = 1.0 indicates that a potential exists for risk to site plants, birds and terrestrial mammal species. For plants there is a potential for phytotoxic effects, for avian species effects may include mortality, liver or kidney effects or effects on blood chemistry and for terrestrial mammals there is a potential for reduced litter size and smaller offspring.

Exposure to the maximum uranium concentration in sediment did not result in any riparian ecological receptors (i.e., mink, belted kingfisher, or great blue heron) exceeding an HQ =1.0. Therefore, there is no potential for increased risk to the riparian receptors that may use the Erie Canal (EU19/IA09) for foraging.

In a refinement for uranium in its inorganic form, EPCs for total uranium in soil were compared to calculated preliminary remediation goals (PRGs) for total uranium for several terrestrial receptors. Soils in the following EUs/IAs exceeded the calculated PRGs for one or more potential terrestrial receptors for surface soil and total (subsurface) soil: EU2/Bldg. 2, EU3/Bldg. 3, EU4/Bldg. 4&9, EU 6/Bldg. 6, EU7/Bldg. 8, EU8/Bldg. 24, EU9/Bldg. 35, EU10/IA02 East, EU11/IA02 Between Buildings, EU12/IA03, EU13/IA04A, EU14/IA04A, EU15/IA04C, EU16/IA04D, EU17/IA05A, and EU20/IA10.

Soils in EU18/IA05B did not exceed any terrestrial receptor calculated PRGs.

Some potential risks to ecological receptors at the site were identified based on the screening level ecological risk assessment. The site will proceed into the FS phase in which human health concerns will be addressed. The development of remedial action objectives which are protective of human health should also be protective of ecological receptors at the Guterl Site, consistent with the premise for biota protection from exposure to radiation (ICRP 1977). Therefore, no further evaluation of potential ecological concerns needs to be considered in the FS.

CONCLUSIONS

MED/AEC-related constituents in soil and groundwater were documented above RI screening levels within the Guterl Site boundary. This study saw no evidence that MED/AEC-related constituents in soil have migrated outside the Guterl Site boundary. In the outdoor IAs, COPCs in soil tend to be

heterogeneously distributed in both the horizontal and vertical directions; this is consistent with miscellaneous disposal and re-working of materials.

The highest concentration of COPCs in buildings in the Excised Area was observed in Building 6 and Building 8. This is consistent with the CSM in that these were the primary buildings used for receiving, heating, rolling, packaging, and shipping uranium metal. Some degree of MED/AEC-related constituents was detected above background in each Excised Area building in soil and utility surface water/sediment (if present).

Shallow bedrock groundwater on the Guterl Site is affected by MED/AEC-related constituents and further assessment, both vertical and horizontal, is recommended. The primary mechanism for transport of COPCs from soil to groundwater includes direct contact of oxidized uranium and/or oxidizing conditions in groundwater.

Surface water and sediment samples collected from the Erie Canal did not indicate MED/AEC-related constituents exceeding background or screening levels.

Although the final constituent of concern (COC) determination will be made in the FS and will consider additional information, six of the eight COPCs evaluated in the HHRA individually exceeded the risk or dose levels at least once for a given receptor in a given EU, and may be considered potential COCs. Since ^{226}Ra and ^{228}Ra only exceeded target risk or dose levels at EU17 and since ^{228}Th and ^{230}Th were not detected in exceedance of target risk or dose levels in any EU, potential COCs would include ^{226}Ra, ^{228}Ra, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U. By media, potential COCs for soil include ^{226}Ra, ^{228}Ra, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U, while potential COCs for groundwater are limited to ^{234}U and ^{238}U.

PRGs were derived for each receptor and each media using a combination of spreadsheet calculations, RESRAD results, and RESRAD-Build results. Groundwater, surface water, and sediment PRGs were calculated by spreadsheet, soil PRGs were determined using a combination of RESRAD results and spreadsheets, and building material PRGs were developed using RESRAD-Build results and spreadsheets. Dose PRGs were based upon the drinking water maximum contaminant level of 4 mrem/yr for groundwater and surface water and upon 25 mrem/yr for all other media. All risk PRGs were based upon radiological carcinogenic risk of 1×10^{-4}. Table ES-5 presents the most health protective PRGs across receptors in building EUs (EU1 – EU9) and in EUs without buildings (EU10-20). PRGs per media per receptor are presented in Tables V4-1 through V4-4.

NEXT STEPS

MED/AEC-related constituents have been identified at the Guterl Site in excess of media-specific, HHRA, and SLERA screening levels. Therefore, the appropriate next step in the CERCLA process is performance of an FS to evaluate actions that can be taken to reduce the risk from exposure to MED/AEC-related constituents.

TABLE ES-1
PROJECT DATA QUALITY OBJECTIVES AND DATA NEEDS TO BE ACHIEVED IN RI/FS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL FUSRAP SITE
LOCKPORT, NEW YORK

Project Data Quality Objective	Data Needed	Data Acquired	Project Completeness Assessment Evaluation
1. Determine the nature and extent of MED/AEC related constituents present at the site (i.e., uranium, thorium, radium and the media and locations in which they are present).	Isotope-specific data for the COPCs in each Investigative Area. Preliminary Gamma Walkover Survey to target areas for intrusive investigation. Subsurface sampling in IAs 01, 02, 03, 04, 05, 08, and 10. Also need to establish local background conditions for COPCs.	Gamma walkover survey conducted as planned. Field investigation included field scanning of cores; selecting 6-inch intervals for on-site gamma spectroscopy analysis; and identification of samples submitted for off-site gamma spec and alpha spec. Background area identified and 12 surface and 12 subsurface soil samples analyzed for isotopic U, Th, and Ra COPCs.	This DQO has been met with respect to sampling and analysis to determine nature of contamination; affected matrices (surface soil, subsurface soil, groundwater, building materials) have been confirmed; no data gap exists for soil or building material matrices, however, a potential data gap exists for groundwater extent (see DQO No. 10).
2. Acquire information to define the fate and transport of contaminants from the site.	Same as DQO 1; also geotechnical data (soil properties – porosity, conductivity, pH, bulk density). Also requires groundwater sampling (IA 07) and surface water/sediment sampling (IA 09).	See DQO 1. Geotechnical data collected as described in the FSP. Groundwater data collected from IA 07 (see DQO 10). Surface water/sediment sampling (IA 09) colleted as described in the FSP.	This DQO has been met; sampling and analysis is complete; no significant data gaps noted for surface soil, subsurface soil, surface water, sediment, or shallow bedrock groundwater.
4. Provide sufficient characterization data to allow completion of subsequent Feasibility Study (FS), Remedial Design (RD), and Remedial Action (RA).	Same as DQO 2. Additional data relevant to the FS, RD, and RA to be obtained from subcontractor-generated IDW characterization data and from the ongoing NYSDEC RI/FS.	See DQO 2. Data not generated during this RI, NYSDEC conducting concurrent HTW (i.e., non-radiological) RI.	Radiological data set is complete; other data sources exist for conventional data (e.g. NYSDEC/Mactec RI 2006/2007).
6. Identify the underground utility system within the site, including if possible, utilities in place at the time of AEC contracted efforts and utilities installed after the AEC contracted efforts. Includes both between-building and within-building utilities.	Acquire as-built utility drawings (completed; quality is low). Evaluate other geophysical and/or remote sensing methods (see FSP).	Collected additional as-built utility drawings to the extent available (sanitary sewer location drawings in IA01, IA02, and parts of IA04A through IA04D). Conducted geophysical surveys in IA 04B and IA 04D at planned boring locations.	This DQO has been met. The field investigation was completed as planned and included sampling of subsurface conduits where located. However, depending on location, additional pre-design investigation may be required.

TABLE ES-1
PROJECT DATA QUALITY OBJECTIVES AND DATA NEEDS TO BE ACHIEVED IN RI/FS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL FUSRAP SITE
LOCKPORT, NEW YORK

Project Data Quality Objective	Data Needed	Data Acquired	Project Completeness Assessment Evaluation
9. Define nature and extent of isotopic uranium and thorium in surface soils, subsurface soils, and buildings to support risk assessment (using Nuclear Regulatory Commission screening levels for human health and Department of Energy [DOE, 2002] for ecological) and development and evaluation of FS alternatives (volume determination).	See DQO 1 and 2, above. Review of DOE 2002 suggests that ecological risk unlikely to be a driver at Guterl. Discuss with USACE using RESRAD models (including RESRAD-BUILD) for human health risk assessment. (See also DQO 4).	See DQO 1 and 2. Data reviewed and appropriate data sets established for nature and extent, and also for human health and ecological risk assessments. RESRAD software determined to be appropriate for human health risk assessment.	This DQO has been met; sampling and analysis of soils and building material is complete; no significant data gaps noted in the RI.
10. Determine whether groundwater has been impacted by isotopic uranium, thorium, or radium above screening levels; and if so, determine nature and extent to support risk assessment, and development and evaluation of FS alternatives.	Additional monitoring wells to be installed; groundwater to be sampled for radiological constituents (radiological COPCs and gross alpha/beta radiation).	Additional wells installed. Two rounds of sampling conducted during RI for U, Th, and Ra COPCs, gross alpha/beta,and total suspended solids. USACE acquired additional geochemical parameters March 2008.	This DQO has been met with respect to nature of contamination; groundwater sampling and analysis is complete; however, a potential data gap exists for extent of contamination to southeast and southwest of Guterl Site, and additional investigation to determine if groundwater in bedrock greater than 15 feet below top of rock is affected by MED/AEC materials is recommended.
11. Determine whether surface water and sediments (IA03, IA09) have been impacted by isotopic uranium, thorium, or radium above screening levels (screening levels for these media will need to be researched and developed during RI/FS tasks).	Determine location(s) of historical outfalls to Erie Canal (see DQO 6). Limited sediment sampling upstream, at discharge location, and downstream for COPCs. Surface water (IA09) and sediment (IA03/IA09) sampling to be conducted.	Conducted field surveys to confirm location of historical outfall. Collected surface water (IA09) and sediment samples (IA03, IA09) as needed.	This DQO has been met; sampling and analysis of surface water and sediment complete; no significant data gaps noted in the RI.
13. Determine if isotopic uranium, thorium, and radium has contaminated underground utilities (IA08).	Sample solids from sewers, drains, trenches (in conjunction with DQO 6). Contingency for water sampling if present.	Performed field surveys, reviewed available drawings, and collected aqueous and non-aqueous samples (IA08).	This DQO has been met. The field investigation was modified to accommodate more locations than anticipated. Depending on location, additional pre-design sampling may be necessary to locate entire utility.

TABLE ES-1
PROJECT DATA QUALITY OBJECTIVES AND DATA NEEDS TO BE ACHIEVED IN RI/FS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL FUSRAP SITE
LOCKPORT, NEW YORK

Project Data Quality Objective	Data Needed	Data Acquired	Project Completeness Assessment Evaluation
14. Determine the magnitude of any chemical contamination to support establishing transportation and disposal requirements (e.g., waste classification) and associated costs to be included in various FS alternatives.	See DQO 4.	No chemical analyses (other than isotopic U by ICP-MS) obtained. Chemical contamination to be assessed using data generated by historical and concurrent NYSDEC site investigation(s).	This DQO has been met. Radiological data set is complete; other data sources exist for conventional data (e.g. NYSDEC/Mactec 2006/2007).
15. Conduct an inventory of building content/structures to support FS alternatives and evaluations.	Compile observations from structural survey and field sampling activities in IA 01 and IA 02.	Numerous photographs collected for each building. Inventory of furnaces and rolls acquired during radiological surveys of Excised Area buildings. Note that an exhaustive inventory was not complied; small items such as lockers, ancillary support equipment, etc., not included.	Data acquired during radiological surveys of Excised Area buildings. Additional pre-design inventory may be required depending on disposition of building.
19. Gather sufficient data to complete a Baseline Human Health Risk Assessment (HHRA) and a screening level ecological risk assessment.	See DQOs 9 and 10 (for use in future DQOs 17 and 18).	At least 12 samples form each IA/EU from each depth interval (defined as surface and subsurface) analyzed by for COPCs by alpha spectroscopy.	This DQO has been achieved. HHRA and SLERA developed as part of this RI Report. No significant data gaps have been identified.

Note:
DQO numbering, as presented in the Data Gap Analysis Report (USACE, 2006), has been retained. DQOs 5, 7, 8, 12, and 16 were addressed prior to RI field investigation. DQOs 3, 17, 18, 20, and 21 are to be addressed in tasks subsequent to completion of the RI/FS.

TABLE ES-2
FEDERAL POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

MEDIUM/AUTHORITY	CITATION	STATUS	REQUIREMENT SYNOPSIS
WATER			
Safe Drinking Water Act 42 USC § 300f et seq.: *National Primary Drinking Water Regulations*	40 CFR § 141	ARAR	Regulations (40 CFR Part 141) promulgated under the Safe Drinking Water Act establish enforceable MCLs for chemical contaminants and non-enforceable maximum contaminant level goals (MCLGs) for finished water provided to consumers. The MCLs for radionuclides are specified in 40 CFR 141.66; analytical methodologies to demonstrate compliance with the MCL are identified in 40 CFR 141.25. The drinking water MCL for radionuclides is an ARAR because groundwater in the State of New York has a default classification of "GA", for which potable water supply is the best usage. In addition, runoff from the site flows indirectly into the Erie Canal, immediately upstream of the City of Lockport's emergency water supply. The MCL for uranium is 30 µg/L (40 CFR 141.66(e)). The MCL for gross alpha particle activity (excluding radon and uranium but including radium 226) is 15 pCi/L (40 CFR 141.66(c)); and the MCL for beta particle and photon radioactivity from man-made radionuclides must not produce an annual dose to the total body or any internal organ greater than 4 millirem/ year (40 CFR 141.66(d)).
AIR			
No promulgated Federal ARARs identified for air.			
SOIL/SEDIMENT			
US NRC: *Radiation Protection Programs*	10 CFR 20 Subpart B	ARAR	To implement the ALARA requirements, a constraint on air emissions of radioactive material to the environment, excluding Radon-222 and its daughters, shall be established by licensees such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 10 mrem per year from these emissions.
US NRC: *Radiation Protection Programs*	10 CFR 20 Subpart C	ARAR	The licensee shall control the occupational dose to individual adults, except for planned special exposures, to the following dose limits. (1) An annual limit, which is the more limiting of: (i) The total effective dose equivalent to 5 rems; or (ii) The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rems. (2) The annual limits to the lens of the eye, to the skin of the whole body, and to the skin of the extremities, which are: (i) A lens dose equivalent of 15 rems, and (ii) A shallow-dose equivalent of 50 rem to the skin of any extremity.

TABLE ES-2
FEDERAL POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

MEDIUM/AUTHORITY	CITATION	STATUS	REQUIREMENT SYNOPSIS
SOIL/SEDIMENT (CONTINUED)			
US NRC: *Radiation Dose Limits for Individual Members of the Public*	10 CFR 20 Subpart D	ARAR	The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem in a year, exclusive of the dose contributions from background radiation and certain other sources. The dose in any unrestricted area from external sources, (with some exceptions) does not exceed 0.002 rem/hr, and 0.05 rem/yr (10 CRF 20.1302).
US NRC: *Environmental Radiation Protection Standards for Nuclear Power Operations - Standards for normal operations.*	40 CFR §190.10	ARAR	The limits in the relevant part of this regulation state that the annual dose equivalent should not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public as the result of exposures to planned discharges of radioactive materials, radon and its daughters excepted, to the general environment from uranium fuel cycle operations and to radiation from these operations. The Guterl site is not covered by this definition (applicable to the nuclear fuel cycle) so these regulations are not 'applicable'. However, the specification of maximum dose to members of the public may be relevant and appropriate.

TABLE ES-3
NEW YORK STATE POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

MEDIUM/AUTHORITY	CITATION	STATUS	REQUIREMENT SYNOPSIS
WATER			
New York State Department of Environmental Conservation: *Environmental Conservation Law (ECL) Article 15, Title 3 and Article 17, Titles 3 and 8; Surface Water And Groundwater Quality Standards and Groundwater Effluent Limitations*	6 NYCRR Parts 700 though 706	ARAR	Groundwater classification (GA) and best usage (potable water supply) established at § 701.15. New York Ambient Water Quality Standards (including groundwater) established at § 703.5. For radiation in groundwater the values for protection of human health as a water source are (a) 15 pCi/L for gross alpha radiation, excluding radon and uranium; and (b) 1,000 pCi/L gross beta radiation, excluding strontium-90 and alpha emitters. Limits for radium are 3 pCi/L for Ra-226 and 5 pCi/ for Ra 226/228 combined.
AIR			
No promulgated New York ARARs identified for air.			
SOIL/SEDIMENT			
New York State Department of Labor: *Regulations for Ionizing Radiation Protection*	12 NYCRR Part 38	ARAR	Appendix A-10, Table 5 of Part 38 specifies acceptable levels of surface radiological contamination when decontamination of a licensed facility occurs. May be relevant for structures at Guterl site.

TABLE ES-4
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Scenario	Time (years)	Total Dose (mrem/yr)	Total Risk	Hazard Index
Exposure Unit 1				
Juvenile Trespasser	0	0.10	3E-07	4E-03
On-site Worker	0	12	7E-06	2E-02
Construction Worker	0	**591**	5E-05	2E-02
Exposure Unit 1				
Juvenile Trespasser	1	0.048	1E-08	NC
On-site Worker	1	12	3E-06	NC
Construction Worker	1	**591**	5E-05	NC
Exposure Unit 1				
Juvenile Trespasser	10	0.042	9E-09	NC
On-site Worker	10	NC	NC	NC
Construction Worker	10	NC	NC	NC
Exposure Unit 1				
Juvenile Trespasser	25	0.032	3E-09	NC
On-site Worker	25	8.6	1E-06	NC
Construction Worker	25	0.00	0E+00	NC
Exposure Unit 2				
Juvenile Trespasser	0	0.48	3E-06	8E-03
On-site Worker	0	14	**1E-04**	3E-02
Construction Worker	0	**470**	5E-05	7E-02
Exposure Unit 2				
Juvenile Trespasser	1	0.029	7E-09	NC
On-site Worker	1	7.6	1E-06	NC
Construction Worker	1	**462**	4E-05	NC
Exposure Unit 2				
Juvenile Trespasser	10	0.028	5E-09	NC
On-site Worker	10	NC	NC	NC
Construction Worker	10	NC	NC	NC
Exposure Unit 2				
Juvenile Trespasser	25	0.026	3E-09	NC
On-site Worker	25	7.0	7E-07	NC
Construction Worker	25	0.00	0E+00	NC
Exposure Unit 2				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	19	8E-06	NC
Exposure Unit 2				
Juvenile Trespasser	1000	0.15	1E-06	NC
On-site Worker	1000	2.3	4E-05	NC
Construction Worker	1000	2.9	2E-06	NC
Exposure Unit 3				
Juvenile Trespasser	0	0.82	2E-06	7E-03
On-site Worker	0	**120**	**1E-04**	3E-02
Construction Worker	0	**55**	1E-05	3E-01

TABLE ES-4
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Scenario	Time (years)	Total Dose (mrem/yr)	Total Risk	Hazard Index
Exposure Unit 3				
Juvenile Trespasser	1	0.61	4E-07	NC
On-site Worker	1	**113**	7E-05	NC
Construction Worker	1	**46**	5E-06	NC
Exposure Unit 3				
Juvenile Trespasser	10	0.40	2E-07	NC
On-site Worker	10	NC	NC	NC
Construction Worker	10	NC	NC	NC
Exposure Unit 3				
Juvenile Trespasser	25	0.056	3E-08	NC
On-site Worker	25	9.5	5E-06	NC
Construction Worker	25	0.00	0E+00	NC
Exposure Unit 3				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	**105**	3E-05	NC
Exposure Unit 3				
Juvenile Trespasser	1000	0.039	3E-07	NC
On-site Worker	1000	0.59	1E-05	NC
Construction Worker	1000	1.7	9E-07	NC
Exposure Unit 4				
Juvenile Trespasser	0	0.31	1E-06	3E-03
On-site Worker	0	**30**	6E-05	1E-02
Construction Worker	0	14	3E-06	3E-02
Exposure Unit 4				
Juvenile Trespasser	1	0.14	8E-08	NC
On-site Worker	1	**26**	2E-05	NC
Construction Worker	1	10	1E-06	NC
Exposure Unit 4				
Juvenile Trespasser	10	0.092	5E-08	NC
On-site Worker	10	NC	NC	NC
Construction Worker	10	NC	NC	NC
Exposure Unit 4				
Juvenile Trespasser	25	0.013	8E-09	NC
On-site Worker	25	2.2	1E-06	NC
Construction Worker	25	0.00	0E+00	NC
Exposure Unit 4				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	11	4E-06	NC
Exposure Unit 4				
Juvenile Trespasser	1000	0.061	5E-07	NC
On-site Worker	1000	0.93	2E-05	NC
Construction Worker	1000	1.3	9E-07	NC

TABLE ES-4
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Scenario	Time (years)	Total Dose (mrem/yr)	Total Risk	Hazard Index
Exposure Unit 5				
Juvenile Trespasser	0	0.015	9E-09	0E+00
On-site Worker	0	3.0	2E-06	0E+00
Construction Worker	0	25	3E-06	0E+00
Exposure Unit 5				
Juvenile Trespasser	1	0.015	8E-09	NC
On-site Worker	1	2.9	2E-06	NC
Construction Worker	1	25	2E-06	NC
Exposure Unit 5				
Juvenile Trespasser	10	0.010	5E-09	NC
On-site Worker	10	NC	NC	NC
Construction Worker	10	NC	NC	NC
Exposure Unit 5				
Juvenile Trespasser	25	0.0026	9E-10	NC
On-site Worker	25	0.57	2E-07	NC
Construction Worker	25	24	3E-06	NC
Exposure Unit 6				
Juvenile Trespasser	0	3.8	3E-05	1E-02
On-site Worker	0	**58**	**1E-03**	4E-02
Construction Worker	0	**84**	6E-05	2E-01
Exposure Unit 6				
Juvenile Trespasser	1	0.00	0E+00	NC
On-site Worker	1	0.00	0E+00	NC
Construction Worker	1	0.00	0E+00	NC
Exposure Unit 6				
Juvenile Trespasser	10	0.00	0E+00	NC
On-site Worker	10	NC	NC	NC
Construction Worker	10	NC	NC	NC
Exposure Unit 6				
Juvenile Trespasser	25	0.00	0E+00	NC
On-site Worker	25	0.00	0E+00	NC
Construction Worker	25	0.00	0E+00	NC
Exposure Unit 6				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	**117**	6E-05	NC
Exposure Unit 6				
Juvenile Trespasser	1000	3.6	3E-05	NC
On-site Worker	1000	**54**	**1E-03**	NC
Construction Worker	1000	**49**	4E-05	NC
Exposure Unit 7				
Juvenile Trespasser	0	**48**	**3E-04**	**3E+00**
On-site Worker	0	**765**	**1E-02**	**9E+00**
Construction Worker	0	**556**	**3E-04**	**2E+01**

TABLE ES-4
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Scenario	Time (years)	Total Dose (mrem/yr)	Total Risk	Hazard Index
Exposure Unit 7				
Juvenile Trespasser	1	0.50	3E-07	NC
On-site Worker	1	**94**	6E-05	NC
Construction Worker	1	**60**	6E-06	NC
Exposure Unit 7				
Juvenile Trespasser	10	0.33	2E-07	NC
On-site Worker	10	NC	NC	NC
Construction Worker	10	NC	NC	NC
Exposure Unit 7				
Juvenile Trespasser	25	0.048	3E-08	NC
On-site Worker	25	8.3	5E-06	NC
Construction Worker	25	0.00	0E+00	NC
Exposure Unit 7				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	**6481**	**2E-03**	NC
Exposure Unit 7				
Juvenile Trespasser	1000	0.72	5E-06	NC
On-site Worker	1000	11	**2E-04**	NC
Construction Worker	1000	**55**	2E-05	NC
Exposure Unit 8				
Juvenile Trespasser	0	0.43	8E-07	3E-03
On-site Worker	0	**65**	6E-05	1E-02
Construction Worker	0	19	5E-06	**9E+00**
Exposure Unit 8				
Juvenile Trespasser	1	0.33	2E-07	NC
On-site Worker	1	**61**	4E-05	NC
Construction Worker	1	16	3E-06	NC
Exposure Unit 8				
Juvenile Trespasser	10	0.22	1E-07	NC
On-site Worker	10	NC	NC	NC
Construction Worker	10	NC	NC	NC
Exposure Unit 8				
Juvenile Trespasser	25	0.030	2E-08	NC
On-site Worker	25	5.0	3E-06	NC
Construction Worker	25	16	3E-06	NC
Exposure Unit 8				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	10	4E-06	NC
Exposure Unit 8				
Juvenile Trespasser	1000	0.042	3E-07	NC
On-site Worker	1000	0.64	1E-05	NC
Construction Worker	1000	1.7	1E-06	NC

TABLE ES-4
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Scenario	Time (years)	Total Dose (mrem/yr)	Total Risk	Hazard Index
Exposure Unit 9				
Juvenile Trespasser	0	0.19	1E-06	9E-04
On-site Worker	0	3.7	4E-05	3E-03
Construction Worker	0	17	7E-06	2E-02
Exposure Unit 9				
Juvenile Trespasser	1	0.0048	3E-09	NC
On-site Worker	1	0.95	5E-07	NC
Construction Worker	1	8.6	8E-07	NC
Exposure Unit 9				
Juvenile Trespasser	10	0.0034	2E-09	NC
On-site Worker	10	NC	NC	NC
Construction Worker	10	NC	NC	NC
Exposure Unit 9				
Juvenile Trespasser	25	0.00089	3E-10	NC
On-site Worker	25	0.20	5E-08	NC
Construction Worker	25	0.00	0E+00	NC
Exposure Unit 9				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	15	8E-06	NC
Exposure Unit 9				
Juvenile Trespasser	1000	0.087	7E-07	NC
On-site Worker	1000	1.3	2E-05	NC
Construction Worker	1000	5.5	4E-06	NC
Exposure Unit 10				
Juvenile Trespasser	0	0.12	9E-07	2E-03
On-site Worker	0	1.8	3E-05	7E-03
Construction Worker	0	5.1	4E-06	4E-02
Resident - Adult	0	15	**3E-04**	1E-01
Resident - Child	0	NA	NA	3E-01
Exposure Unit 10				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	16	6E-06	NC
Resident - Adult	58	**162**	**1E-03**	NC
Exposure Unit 10				
Juvenile Trespasser	1000	0.031	2E-07	NC
On-site Worker	1000	0.47	9E-06	NC
Construction Worker	1000	2.1	1E-06	NC
Resident - Adult	1000	6	**1E-04**	NC
Exposure Unit 11				
Juvenile Trespasser	0	0.25	2E-06	1E-02
On-site Worker	0	3.1	5E-05	4E-02
Construction Worker	0	5.3	3E-06	2E-01
Resident - Adult	0	18	**2E-04**	5E-01
Resident - Child	0	NA	NA	9E-01

TABLE ES-4
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Scenario	Time (years)	Total Dose (mrem/yr)	Total Risk	Hazard Index
Exposure Unit 11				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	**38**	1E-05	NC
Resident - Adult	58	**436**	**4E-03**	NC
Exposure Unit 11				
Juvenile Trespasser	1000	0.018	1E-07	NC
On-site Worker	1000	0.27	5E-06	NC
Construction Worker	1000	1.0	7E-07	NC
Resident - Adult	1000	4.98	7E-05	NC
Exposure Unit 12				
Juvenile Trespasser	0	0.046	3E-07	2E-03
On-site Worker	0	0.64	1E-05	6E-03
Construction Worker	0	3.3	2E-06	1E-01
Resident - Adult	0	12	**2E-04**	4E-01
Resident - Child	0	NA	NA	7E-01
Exposure Unit 12				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	**25**	8E-06	NC
Resident - Adult	58	**292**	**2E-03**	NC
Exposure Unit 12				
Juvenile Trespasser	1000	0.0055	4E-08	NC
On-site Worker	1000	0.082	2E-06	NC
Construction Worker	1000	0.51	3E-07	NC
Resident - Adult	1000	2.8	4E-05	NC
Exposure Unit 13				
Juvenile Trespasser	0	0.12	1E-06	6E-03
On-site Worker	0	1.6	4E-05	2E-02
Construction Worker	0	6.4	4E-06	2E-01
Resident - Adult	0	18	**3E-04**	5E-01
Resident - Child	0	NA	NA	**1E+00**
Exposure Unit 13				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	**69**	2E-05	NC
Resident - Adult	58	**789**	**6E-03**	NC
Exposure Unit 13				
Juvenile Trespasser	1000	0.11	9E-07	NC
On-site Worker	1000	1.7	3E-05	NC
Construction Worker	1000	2.1	1E-06	NC
Resident - Adult	1000	9.8	**1E-04**	NC

TABLE ES-4
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Scenario	Time (years)	Total Dose (mrem/yr)	Total Risk	Hazard Index
Exposure Unit 14				
Juvenile Trespasser	0	0.0024	2E-08	1E-04
On-site Worker	0	0.035	6E-07	4E-04
Construction Worker	0	2.2	7E-07	1E-01
Resident - Adult	0	**32**	**3E-04**	**2E+00**
Resident - Child	0	NA	NA	**2E+00**
Exposure Unit 14				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	3.7	1E-06	NC
Resident - Adult	58	**47**	**4E-04**	NC
Exposure Unit 14				
Juvenile Trespasser	1000	0.000010	7E-11	NC
On-site Worker	1000	0.00015	3E-09	NC
Construction Worker	1000	0.035	2E-08	NC
Resident - Adult	1000	0.26	3E-06	NC
Exposure Unit 15				
Juvenile Trespasser	0	0.061	5E-07	7E-04
On-site Worker	0	0.85	1E-05	3E-03
Construction Worker	0	2.2	2E-06	6E-03
Resident - Adult	0	6.1	**1E-04**	1E-03
Resident - Child	0	NA	NA	1E-02
Exposure Unit 15				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	2.7	1E-06	NC
Resident - Adult	58	18	**2E-04**	NC
Exposure Unit 15				
Juvenile Trespasser	1000	0.027	2E-07	NC
On-site Worker	1000	0.41	8E-06	NC
Construction Worker	1000	0.82	6E-07	NC
Resident - Adult	1000	2.2	5E-05	NC
Exposure Unit 16				
Juvenile Trespasser	0	0.12	8E-07	1E-03
On-site Worker	0	1.7	3E-05	5E-03
Construction Worker	0	4.4	3E-06	8E-02
Resident - Adult	0	22	**3E-04**	9E-01
Resident - Child	0	NA	NA	1E+00
Exposure Unit 16				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	9.6	4E-06	NC
Resident - Adult	58	**87**	**8E-04**	NC

TABLE ES-4
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Scenario	Time (years)	Total Dose (mrem/yr)	Total Risk	Hazard Index
Exposure Unit 16				
Juvenile Trespasser	1000	0.077	6E-07	NC
On-site Worker	1000	1.2	2E-05	NC
Construction Worker	1000	2.2	2E-06	NC
Resident - Adult	1000	6.2	**1E-04**	NC
Exposure Unit 17				
Juvenile Trespasser	0	7.1	5E-05	3E-01
On-site Worker	0	**104**	**2E-03**	8E-01
Construction Worker	0	**75**	5E-05	**2E+00**
Resident - Adult	0	**166**	**3E-03**	8E-01
Resident - Child	0	NA	NA	**8E+00**
Exposure Unit 17				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	**653**	**2E-04**	NC
Resident - Adult	58	**7368**	**6E-02**	NC
Exposure Unit 17				
Juvenile Trespasser	1000	1.4	1E-05	NC
On-site Worker	1000	21	**4E-04**	NC
Construction Worker	1000	22	1E-05	NC
Resident - Adult	1000	**96**	**1E-03**	NC
Exposure Unit 18				
Juvenile Trespasser	0	0.038	3E-07	7E-07
On-site Worker	0	0.57	1E-05	2E-06
Construction Worker	0	0.90	7E-07	5E-04
Resident - Adult	0	2.9	5E-05	9E-03
Resident - Child	0	NA	NA	9E-03
Exposure Unit 18				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	1.6	7E-07	NC
Resident - Adult	58	19	**2E-04**	NC
Exposure Unit 18				
Juvenile Trespasser	1000	0.021	2E-07	NC
On-site Worker	1000	0.32	6E-06	NC
Construction Worker	1000	0.43	3E-07	NC
Resident - Adult	1000	1.1	3E-05	NC
Exposure Unit 19				
Juvenile Trespasser	0	0.0014	1E-08	7E-06
On-site Worker	0	NA	NA	NA
Construction Worker	0	NA	NA	NA
Resident - Adult	0	0.00072	2E-08	3E-06
Resident - Child	0	NA	NA	3E-03

TABLE ES-4
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Scenario	Time (years)	Total Dose (mrem/yr)	Total Risk	Hazard Index
Exposure Unit 20				
Juvenile Trespasser	0	0.082	6E-07	2E-04
On-site Worker	0	1.2	2E-05	5E-04
Construction Worker	0	0.96	7E-07	5E-03
Resident - Adult	0	2.7	5E-05	2E-03
Resident - Child	0	NA	NA	2E-02
Exposure Unit 20				
Juvenile Trespasser	58	NC	NC	NC
On-site Worker	58	NC	NC	NC
Construction Worker	58	2.1	8E-07	NC
Resident - Adult	58	21	**2E-04**	NC
Exposure Unit 20				
Juvenile Trespasser	1000	0.022	2E-07	NC
On-site Worker	1000	0.34	6E-06	NC
Construction Worker	1000	0.25	2E-07	NC
Resident - Adult	1000	0.78	2E-05	NC

Notes:

Dose and Risk from Appendix V tables. Hazard Index from Table 6-14.

Bolded values exceed the target dose of 25mrem/yr, the target risk of $1x\ 10^{-4}$, or the target hazard index of 1.

Soil is surface soil for juvenile trespasser and on-site worker and total soil forconstruction worker and resident receptors.

EU = Exposure Unit

mrem/yr = millirem per year

-- = Media was not sampled or doesn't exist in this exposure unit.

NA = Not applicable; the receptor is assumed to not be exposed to this media.

NC = Not Calculated; this calculation is not performed for this receptor at this year.

TABLE ES-5
SELECTED PRELIMINARY REMEDIATION GOALS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Medium	Units	Year	Parameter [a]	Building Interiors (EUs 1 - 9)			Terrestrial (EUs 10 - 20)		
				Dose PRG (25 mrem/yr)	Risk PRG (1E-04)	Receptor Basis [b]	Dose PRG (25 mrem/yr)	Risk PRG (1E-04)	Receptor Basis [b]
Building Material [c]	pCi/m^2	t = 16.57	**Radium-226**	1.28E+01	5.29E+01	Construction Worker	---	---	---
	pCi/m^2	t = 2.135	**Radium-228**	1.52E+01	--	Construction Worker	---	---	---
	pCi/m^2	t = 82.3	**Thorium-232**	2.82E-01	4.16E+01	Construction Worker	---	---	---
	pCi/m^2	t = 57.9	**Uranium-234**	3.50E+00	1.50E+02	Construction Worker	---	---	---
	pCi/m^2	t = 58	**Uranium-235**	3.71E+00	1.52E+02	Construction Worker	---	---	---
	pCi/m^2	t = 57.9	**Uranium-238**	3.90E+00	1.69E+02	Construction Worker	---	---	---
Surface Soil	pCi/g	t = 16.57	**Radium-226**	9.98E+00	3.04E+00	Dose = CW; risk = OW	3.38E+00	6.98E-01	Resident
	pCi/g	t = 2.135	**Radium-228**	1.15E+01	8.08E+00	Dose = CW; risk = OW	4.15E+00	1.91E+00	Resident
	pCi/g	t = 0	**Thorium-228**	1.29E+01	2.84E+01	Dose = CW; risk = OW	5.55E+00	8.87E+00	Resident
	pCi/g	t = 57.9	**Uranium-234**	4.66E+01	7.45E+02	Dose = CW; risk = CW	3.96E+00	2.27E+00	Resident
	pCi/g	t = 58	**Uranium-235**	4.06E+01	4.86E+01	Dose = CW; risk = OW	4.01E+00	2.01E+00	Resident
	pCi/g	t = 57.9	**Uranium-238**	4.72E+01	2.25E+02	Dose = CW; risk = OW	4.13E+00	1.80E+00	Resident
Total Soil	pCi/g	t = 16.57	**Radium-226**	9.98E+00	5.28E+01	Construction Worker	3.38E+00	6.98E-01	Resident
	pCi/g	t = 2.135	**Radium-228**	1.15E+01	6.02E+01	Construction Worker	4.15E+00	1.91E+00	Resident
	pCi/g	t = 0	**Thorium-228**	1.29E+01	6.81E+01	Construction Worker	5.55E+00	8.87E+00	Resident
	pCi/g	t = 57.9	**Uranium-234**	4.66E+01	7.45E+02	Construction Worker	3.96E+00	2.27E+00	Resident
	pCi/g	t = 58	**Uranium-235**	4.06E+01	4.68E+02	Construction Worker	4.01E+00	2.01E+00	Resident
	pCi/g	t = 57.9	**Uranium-238**	4.72E+01	5.51E+02	Construction Worker	4.13E+00	1.80E+00	Resident
Groundwater [d]	pCi/L	t = 0	**Radium-226**	6.06E+01	5.18E+03	Construction Worker	3.76E+00	1.07E+01	Resident
	pCi/L	t = 0	**Radium-228**	5.55E+01	1.92E+03	Construction Worker	3.45E+00	3.98E+00	Resident
	pCi/L	t = 0	**Thorium-232**	2.93E+01	1.98E+04	Construction Worker	1.82E+00	4.10E+01	Resident
	pCi/L	t = 0	**Uranium-234**	2.83E+02	2.83E+04	Construction Worker	1.76E+01	5.86E+01	Resident
	pCi/L	t = 0	**Uranium-235**	2.99E+02	2.79E+04	Construction Worker	1.86E+01	5.77E+01	Resident
	pCi/L	t = 0	**Uranium-238**	2.98E+02	2.30E+04	Construction Worker	1.85E+01	4.75E+01	Resident
Sediment	pCi/g	t = 0	**Radium-226**	3.03E+03	8.77E+02	Dose=CW/OW; risk=OW	3.03E+03	8.77E+02	Onsite Worker
	pCi/g	t = 0	**Radium-228**	2.77E+03	2.79E+02	Dose=CW/OW; risk=OW	2.77E+03	2.79E+02	Onsite Worker
	pCi/g	t = 0	**Thorium-232**	1.47E+03	2.77E+03	Dose=CW/OW; risk=OW	1.47E+03	2.77E+03	Onsite Worker
	pCi/g	t = 0	**Uranium-234**	1.41E+04	4.05E+03	Dose=CW/OW; risk=OW	1.41E+04	4.05E+03	Onsite Worker
	pCi/g	t = 0	**Uranium-235**	1.50E+04	3.93E+03	Dose=CW/OW; risk=OW	1.50E+04	3.93E+03	Onsite Worker
	pCi/g	t = 0	**Uranium-238**	1.49E+04	3.05E+03	Dose=CW/OW; risk=OW	1.49E+04	3.05E+03	Onsite Worker
Surface Water [d]	pCi/L	t = 0	**Radium-226**	4.84E+02	1.66E+03	Dose=CW/OW; risk=OW	4.84E+02	1.66E+03	Onsite Worker
	pCi/L	t = 0	**Radium-228**	4.44E+02	6.15E+02	Dose=CW/OW; risk=OW	4.44E+02	6.15E+02	Onsite Worker
	pCi/L	t = 0	**Thorium-232**	2.34E+02	6.34E+03	Dose=CW/OW; risk=OW	2.34E+02	6.34E+03	Onsite Worker
	pCi/L	t = 0	**Uranium-234**	2.26E+03	9.05E+03	Dose=CW/OW; risk=OW	2.26E+03	9.05E+03	Onsite Worker
	pCi/L	t = 0	**Uranium-235**	2.39E+03	8.91E+03	Dose=CW/OW; risk=OW	2.39E+03	8.91E+03	Onsite Worker
	pCi/L	t = 0	**Uranium-238**	2.38E+03	7.35E+03	Dose=CW/OW; risk=OW	2.38E+03	7.35E+03	Onsite Worker

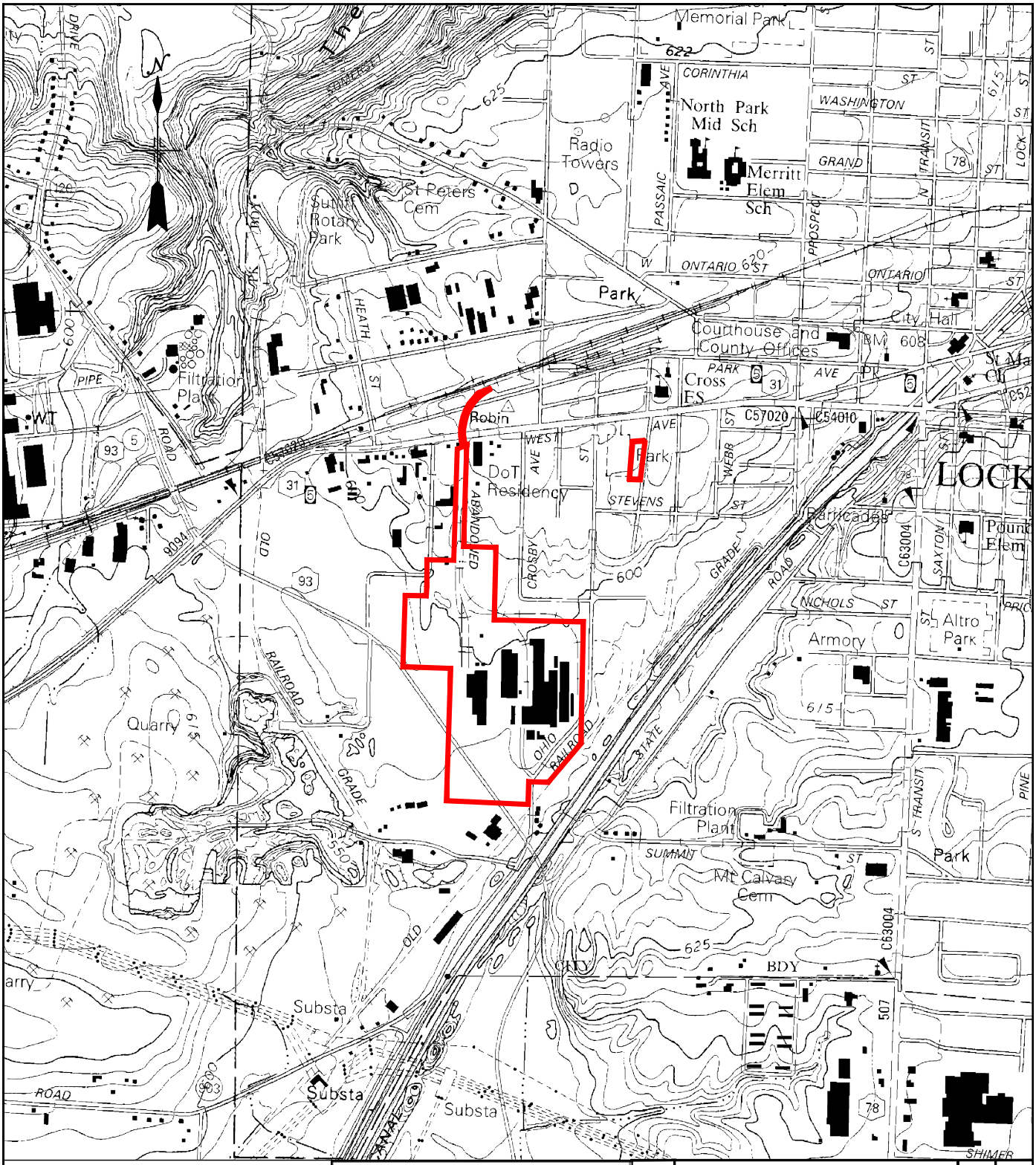
Notes:
--- = Not applicable
CW = construction worker
EU = exposure unit
mrem/yr = millirems per year
OW = onsite worker
pCi/g = picocuries per gram
pCi/L = picocuries per liter
PRG = preliminary remediation goal. Dose PRG is based upon 25 mrem/yr for solid sources and 4 mrem/yr for water sources. Risk PRGs are based upon $1x10^{-4}$ risk.

[a] PRGs presented in this table are only for isotopes with exceedances of target risks or doses. Radium-226 and -228 exceedances were only detected in EU17. Full PRG development is presented in Tables V4-1 through V4-4.

[b] PRG for each isotope for each medium was selected based on the most health-protective PRG among all the receptors.

[c] Building material PRGs are based on beta allocations from static measurements taken from building interiors.

[d] The dose PRGs for groundwater and surface water are based on the drinking water maximum contaminant level of 4 mrem/yr.



LEGEND

SITE LOCATION

750 0 750 1500

GRAPHIC SCALE

Topo Map Reference:
NYS DOT Quad Code: O9
USGS Quad Code: o43078b6
County: Niagara

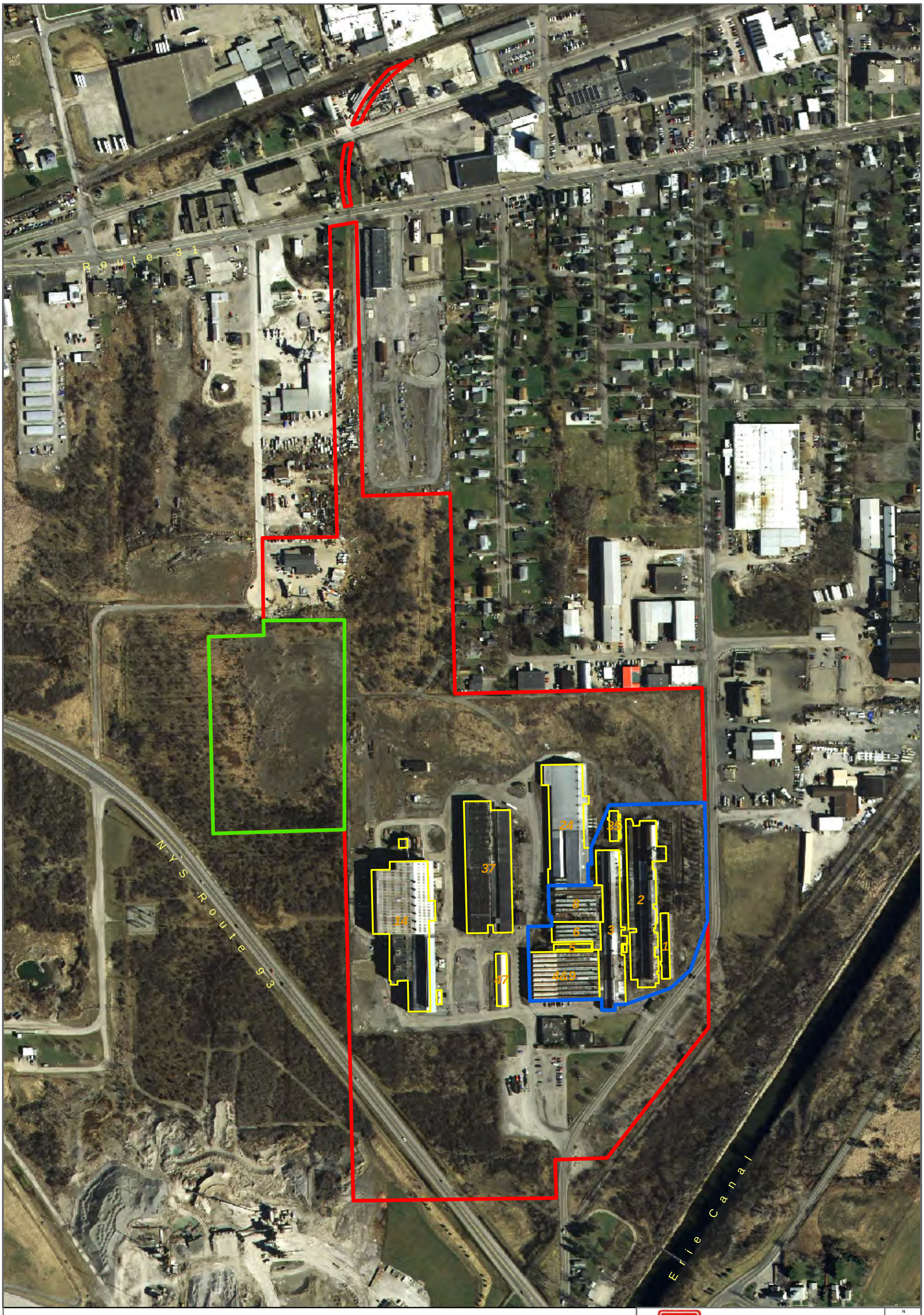
SYMBOL	DESCRIPTIONS	DATE	APPROVED
	REVISIONS		

United States Army Corps of Engineers
Buffalo District

GUTERL SPECIALTY STEEL CORPORATION
LOCKPORT, N.Y.

SITE LOCATION MAP

DATE :	SCALE :	FIGURE NO. :
11/23/09	AS SHOWN	ES-1



Guterl Landfill Boundary
Guterl Excised Area Boundary
Guterl NCIDA Boundary
37 Guterl Buildings

United States Army Corps of Engineers
Buffalo District

GUTERL SPECIALTY STEEL CORPORATION
LOCKPORT, NY

SITE PLAN

Date:	Scale:	Figure No. :
11/23/09	1 inch = 350 feet	ES-2

- IA01 - Excised Area - Building Surfaces and Interiors
- IA02 - Excised Area - Building Exteriors
- IA03 - Landfill Area
- IA04 - NCIDA Property
- IA05 - Railroad Right-of-Way
- IA09 - Erie Canal
- IA10 - Lot 7.1
- Guterl Buildings

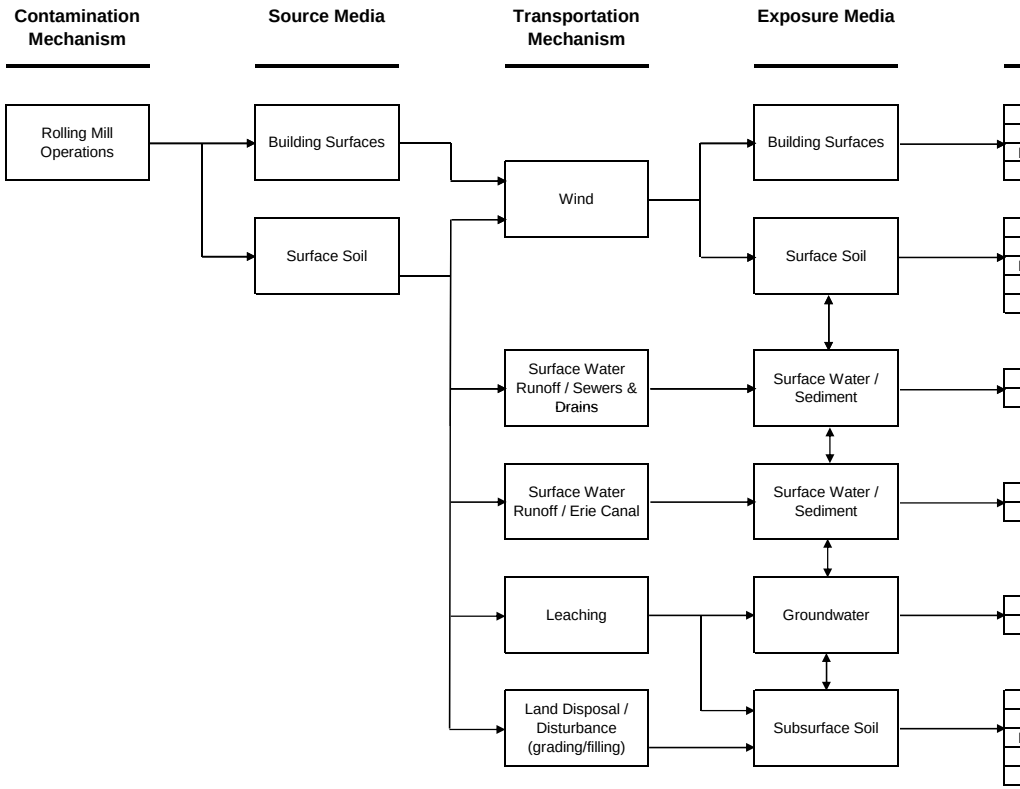
United States Army Corps of Engineers
Buffalo District

GUTERL SPECIALTY STEEL CORPORATION
LOCKPORT, NY

INVESTIGATIVE AREAS

Date:	Scale:	Figure No. :
11/23/09	1 inch = 650 feet	ES-3

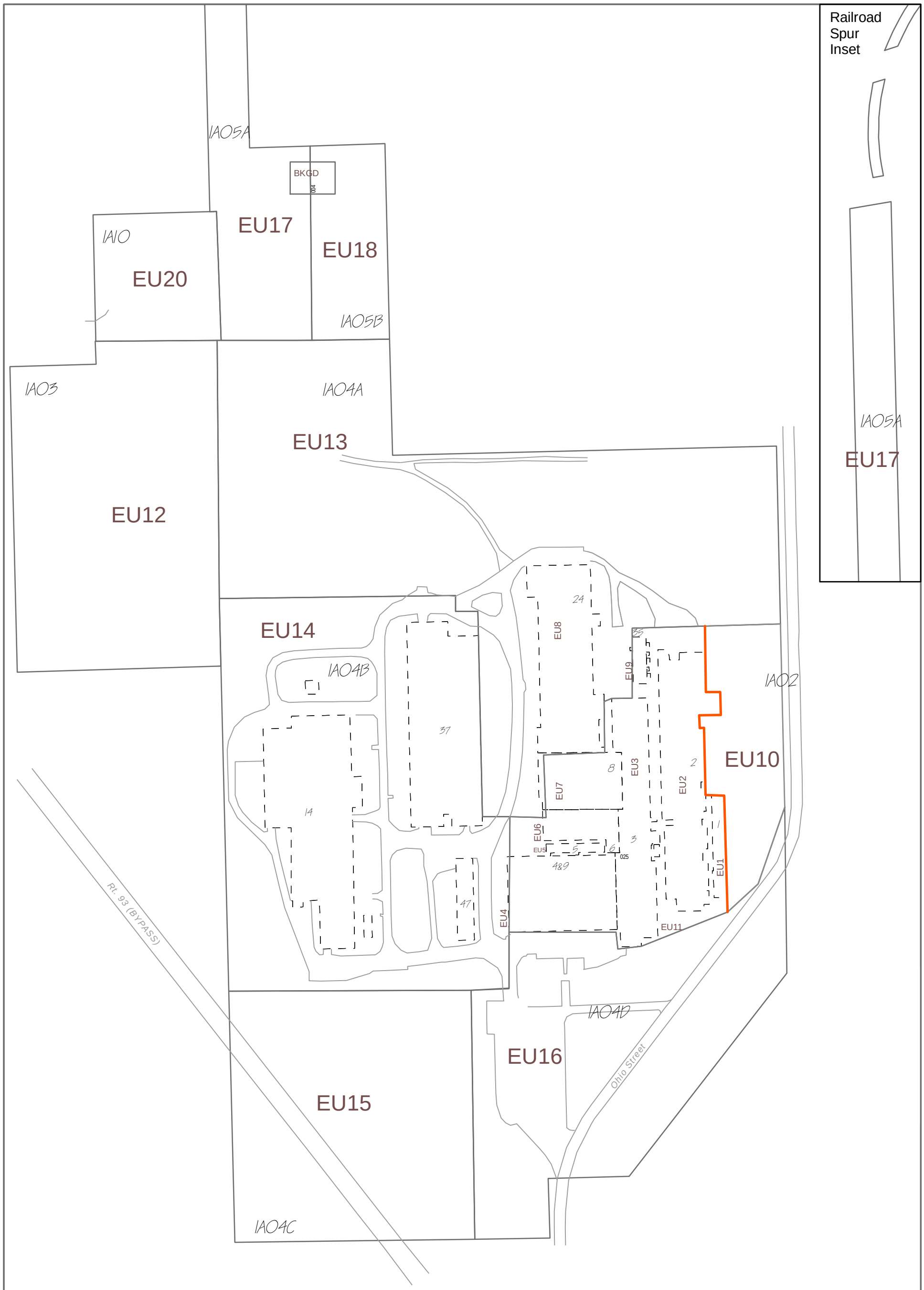
Figure ES-4
Generalized Conceptual Site Model
Potential Pathways for Human Exposure
Former Guterl Specialty Steel Corporation FUSRAP Site
Lockport, New York



Exposure Routes	Human Receptors: Current		Future		
	Juvenile Trespasser	Onsite Worker	Construction Worker	Onsite Worker	Hypothetical Onsite Resident
Building Surfaces					
Ingestion					----
Dermal Contact	Note 1	Note 1	Note 1	Note 1	----
Inhalation (Fugitive Dust)					----
External Radiation					----
Surface Soil					
Ingestion					
Dermal Contact	Note 1	Note 1	Note 1	Note 1	Note 1
Inhalation (Fugitive Dust)					
External Radiation					
Ingestion of Produce	----	----	----	----	
Surface Water / Sediment					
Ingestion					----
Dermal Contact	Note 1	Note 1	Note 1	----	----
Surface Water / Sediment					
Ingestion		----	----	----	
Dermal Contact	Note 1	----	----	----	Note 1
Groundwater					
Ingestion	----	----		----	
Dermal Contact	----	----	Note 1	----	Note 1
Subsurface Soil					
Ingestion	----	----		----	
Dermal Contact	----	----	Note 1	Note 1	Note 1
Inhalation (Fugitive Dust)	----	----		----	
External Radiation	----	----		----	
Ingestion of Produce	----	----	----	----	

Potentially Complete Exposure Pathway
Incomplete Exposure Pathway ----

Note 1: Dermal contact with this medium is possible for this receptor but is not significant for the radionuclides present at this site because of their very low absorption rates. Therefore, this exposure route will not be evaluated quantitatively in the human health risk assessment.



EU10-EU11 Boundary
Paved Areas
EU 19 Exposure Units (EU)
37 Guterl Buildings

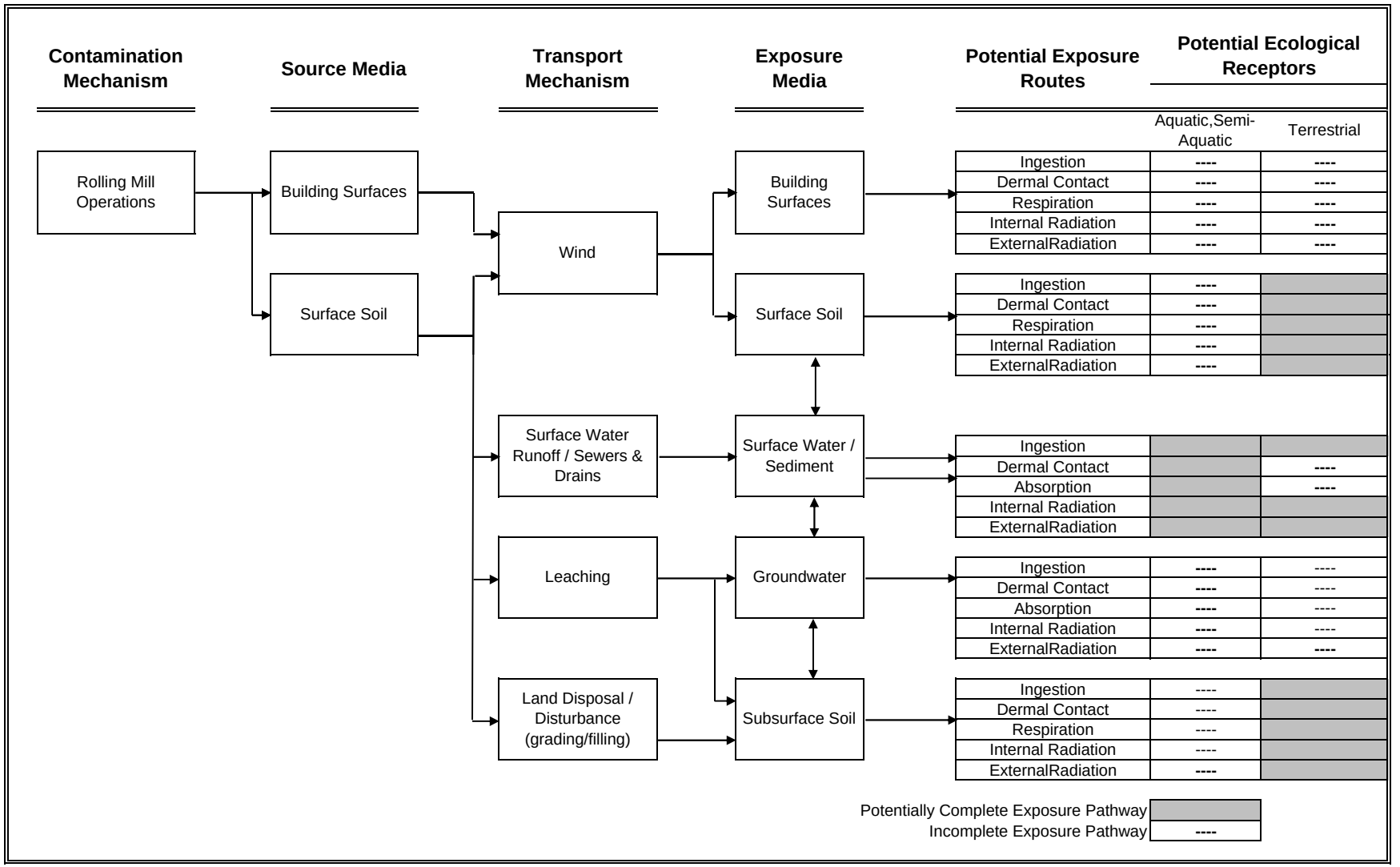
United States Army Corps of Engineers
Buffalo District

GUTERL SPECIALTY STEEL CORPORATION
LOCKPORT, NY

EXPOSURE UNITS FOR THE
BASELINE RISK ASSESSMENT

Date:	Scale:	Figure No. :
11/23/09	1 inch = 225 feet	ES-5

Figure ES-6
Generalized Conceptual Site Model
Potential Pathways for Ecological Exposure
Former Guterl Specialty Steel Corporation FUSRAP Site
Lockport, New York



1.0 INTRODUCTION

The Former Guterl Specialty Steel Corporation Site (the Guterl Site), included in the Formerly Utilized Sites Remedial Action Program (FUSRAP), is an approximately 70-acre site located in Lockport, Niagara County, New York. The Guterl Site is located approximately 20 miles northeast of Buffalo, New York, and can be found within the Lockport 7.5-minute topographic quadrangle (United States Geological Survey [USGS], 1980) as shown on Figure 1-1.

The Guterl Site is comprised of a combination of parcels that includes three general areas referred to as the 52-acre Allegheny Ludlum Corporation property, the 9-acre Landfill Area, and the 9-acre Excised Area, plus a small (1.76-acre) parcel located immediately north of the Landfill Area. Figure 1-2, Site Plan, presents the study area with the Landfill Area and the Excised Area outlined.

In the Energy and Water Development Appropriations Act, 1998 (Title I, Public Law 105-62, 111 Stat. 1320, 1326), Congress transferred the responsibility for the administration and execution of cleanup at eligible FUSRAP sites to the United States Army Corps of Engineers (USACE). In the Energy and Water Development Appropriations Act, 2000 (Title VI, Public Law 106-60, 113 Stat. 483, 502), Congress indicated that response actions taken under the FUSRAP program by the Secretary of the Army, Acting through the Chief of Engineers, shall be subject to the process outlined in Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (United States Environmental Protection Agency [USEPA], 1988b) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA, 1990).

In March 1999, USACE and US Department of Energy (DOE) signed a Memorandum of Understanding (MOU) between the agencies for the purpose of delineating the administration and execution of responsibilities of each party for the FUSRAP. Pursuant to that MOU, when a new site is considered for inclusion in the FUSRAP, DOE is responsible for performing historical research to determine if the site was used for activities that supported the Nation's early atomic energy program. If DOE concludes the site was used for that purpose, the agency will provide USACE with that determination. Under the FUSRAP program, USACE will address all Manhattan Engineer District (MED)- and Atomic Energy Commission (AEC)-related constituents at the Guterl Site (and adjacent properties, if necessary). The criteria established pursuant to CERCLA and the NCP will be used for site evaluation and remedy.

On May 15, 2000, after performing historical research regarding the Guterl Site, the DOE provided USACE with a determination that the facility was used in support of the Nation's early atomic energy program and, accordingly, would be eligible for inclusion in the FUSRAP program (USDOE, 2000).

In 2001, USACE conducted a Preliminary Assessment/Site Inspection as the initial step in the CERCLA process. Based on the review of existing data, USACE determined there was not a current threat to human health, safety and the environment at the Guterl Site. However, because of the potential for the contaminants to pose a threat to human health and the environment in the future, it was recommended the site proceed to the RI phase of the CERCLA process to further characterize radioactive residuals associated with early atomic energy program use (USACE, 2001).

In accordance with United States Army Corps of Engineers (USACE), Buffalo District contract number W912P4-05-D-0001, delivery order number 0003 (Modification No. 01), Earth Tech has prepared this Remedial Investigation Report (RI) for the Guterl Site, in accordance with Tasks 7 through 10 of the March 2005 delivery order Scope of Work (SOW) (USACE, 2005a).

1.1 Purpose of Report

The purpose of this RI Report is to document the data collection and analysis activities conducted during the RI and to use the data collected during the RI and previous investigations (by others) to address the MED- and AEC-related constituents at the Guterl Site. Specifically, the RI goals include establishing the

nature and extent of contamination, evaluating contaminant fate and transport, performing human health and screening-level ecological risk assessments, and developing data sufficient for use during the feasibility study (FS) in estimating quantities, and classifying contaminated material (e.g., hazardous or non-hazardous, low-level radioactive waste, etc.) of various matrices (i.e., soil, groundwater, surface water, sediment, and building materials).

1.2 RI Overview and Scope

The following sections summarize preliminary efforts performed from May 2005 through May 2007 (SOW Tasks 1 through 5) prior to execution of RI field data acquisition from June 2007 through December 2007 (SOW Task 6) and preparation of this RI Report (SOW Tasks 7 through 10).

1.2.1 Technical Project Planning

As an initial step of the project planning phase for the Guterl Site RI, a Technical Project Planning (TPP) Meeting was conducted August 9 and 10, 2005. The purpose of the TPP Meeting was to gather the project stakeholders for informational discussions, and to begin development of site-specific project Data Quality Objectives (DQOs) for the RI/FS. A total of 21 project DQOs were identified for the RI/FS during the TPP Meeting. Eleven of the 21 DQOs apply directly to the RI data collection phase of work; these DQOs are further discussed in Section 2.5[1].

1.2.2 Preliminary Identification of Data Quality Objectives and Applicable or Relevant and Appropriate Requirements

Following the TPP Meeting, the next step of the RI included formal development of preliminary DQOs and identification of potential Applicable or Relevant and Appropriate Requirements (ARARs). USACE prepared a report entitled *Preliminary Identification of Data Quality Objectives and Applicable or Relevant and Appropriate Requirements* (USACE, 2005c). The Preliminary DQO/ARAR report established the framework for the data quality requirements for data to be used to delineate the nature and extent of radiological contamination at the Guterl Site.

1.2.3 Data Gap Analysis

Following the TPP Meeting and the development of preliminary DQOs/ARARs, USACE performed a data gap assessment. The data gap assessment included review and evaluation of prior investigations and available historical data. The available data were evaluated relative to achieving the project DQOs/ARARs. USACE prepared a *Data Gap Analysis Report* (USACE, 2006a), referred to herein as DGAR, that summarized the findings of the data gap analysis. The DGAR was organized by investigative areas (IA).

The list of IAs was used during the data gap analysis phase to provide manageable units for data organization and summary; that is, each matrix was evaluated for data gaps in each IA. The list of IAs was refined during the preparation of project plans to provide better investigative flexibility[2]. The list of IAs used for the data acquisition phase of work was as follows:

IA01 Excised Area – Building Surfaces and Interiors (including Building 24)

[1] DQO numbering, as presented in the Data Gap Analysis Report (USACE, 2006a), has been retained in Section 2.5. DQOs 5, 7, 8, 12, and 16 were addressed during completion of SOW Tasks 1 through 5. DQOs 3, 17, 18, 20, and 21 are to be addressed in FS tasks subsequent to the completion of the RI data acquisition and reporting phase of work.
[2] IA01 through IA08 were developed during the TPP/data gap analysis phase. Addition of IA09 and IA10, and breakout of IA05 and IA04 into subunits, was introduced during development of the Field Sampling Plan.

IA02 Excised Area – Building Exterior Areas

IA03 Landfill Area (Allegheny Ludlum Corporation Property)

IA04 Allegheny Ludlum Corporation Property (Allegheny Ludlum operations area, not including Excised Area, Landfill Area, or Building 24); for this investigation, IA04 was subdivided into subunits IA04A, IA04B, IA04C, and IA04D

IA04A Area North of Excised Area, North of Active Allegheny Ludlum Operations, East of IA03, and South of IA05

IA04B Area of Active Allegheny Ludlum Operations

IA04C Area South of Active Allegheny Ludlum Operations

IA04D Area South of Excised Area

IA05 Former Railroad Right-of-Way North of Site Proper; for this investigation, IA05 was subdivided into subunits IA05A and IA05B

IA05A Former Railroad Right-of-Way North of IA04A

IA05B Undeveloped Area East of IA05A and North of IA04A

IA06 Offsite Northeast Properties[3]

IA07 Site-wide Groundwater

IA08 Site Utilities (sewers and drains)

IA09 Erie Canal (southeast of Guterl Site)

IA10 Lot 7.1[4]

The investigative areas are presented on Figure 1-3.

The data gap analysis identified documentation for, or, in some cases, a strong probability for, MED/AEC-related constituents present in one or more media within seven of the eight evaluated IAs (thus making the site eligible for FUSRAP). Recommendations for additional data collection to fill the data gaps and develop data of sufficient quality and quantity to meet the project objectives were presented in the DGAR.

1.2.4 Project Work Plans

Following development of the DGAR, USACE developed a set of site-specific project work plans in accordance with USEPA and USACE guidance documents for conducting remedial investigations. The

[3] IA06 was identified as potentially impacted during the initial phase of the data gap analysis because these offsite lands were at one time owned by Simonds (see Section 2.1.1). However, during the data gap analysis it was determined that these offsite lands had been sold by Simonds prior to the period of MED/AEC activity. Therefore, IA06 was dropped from further consideration and IA06 is presented solely as a placeholder on the IA list.
[4] In some historical reports, this property is also sometimes referred to as the “Lombardi property.”

project work plans built off the DQO/ARAR report and the DGAR. The site-specific project work plans included a field sampling plan (FSP) (USACE 2007a) and quality assurance project plan (QAPP) (USACE 2007b), gamma walkover survey (GWS) plan (USACE 2006b), site safety and health plan (SSHP), and radiation protection plan (RPP) (USACE, 2007c). The project work plans provided the framework for the RI field data acquisition phase of work.

1.2.5 RI Field Data Acquisition

Between June 2007 and December 2007, USACE completed the RI field data acquisition phase of work in accordance with the project work plans. The RI field data acquisition consisted of sampling and analysis of soil, sediment, surface water, groundwater, and building materials. Section 3.0 of this RI report presents a summary of the RI field data acquisition activities.

1.3 RI Report Organization

This RI report has been developed using available background information, and relevant guidance documents such as the *USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA – Interim Final* (EPA/540/G-89/004(USEPA October 1988)), and the USEPA, DOE, and US Department of Defense, *Multi-Agency Radiation Survey and Site Investigation Manual* (USEPA, 2000), referred to herein as MARSSIM. This RI report consists of Sections 1 through 9 and associated tables, figures, and appendices. This RI Report consists of two volumes. Volume I contains text, tables, and figures (oversize figures are folded and presented in sequence in acetate sleeves). Volume II contains appendices.

Section 1 describes the purpose, RI overview, and report organization.

Section 2 presents site-specific information including history, physical characteristics (topography, meteorology, geology, hydrogeology, demography and land use, ecology, including regional discussions, where appropriate), and previous investigations. This information was utilized to develop a conceptual site model. Project goals and analytical procedures to meet DQOs are also presented.

Section 3 summarizes the RI activities completed between June 2007 and December 2007 under the direction of USACE. Specific data objectives, methodology used for data collection and analysis, and the approach to data management are presented in this section.

Section 4 presents an evaluation of nature and extent of contamination using data gathered during the RI, as well as historical data from previous investigations at the Guterl Site. Nature and extent of contamination in soil is evaluated using site-specific background concentrations developed during the RI process and in relation to screening levels initially presented in the DGAR.

Section 5 includes contaminant fate and transport analysis for radionuclides present at the Guterl Site.

Section 6 and Section 7 present the radiological baseline risk assessment (BRA). Section 6 presents the human health risk assessment (HHRA), and Section 7 presents the screening level ecological risk assessment (SLERA). Data and evaluations supporting the BRA and the associated uncertainties are also presented in these sections.

Section 8 summarizes the results and conclusions drawn from the RI and other data relevant to the Guterl Site. Constituents of potential concern (COPCs) are discussed, as are data limitations and recommendations for future work.

References used in the preparation of this RI report are listed in Section 9.

Tables and figures referenced in the individual sections follow Section 9.

Appendices are presented at the end of the document (Volume II) in hard copy or electronic format depending on the items. In general, appendices that would have required significant quantities of paper to reproduce are presented on compact disc in electronic format; e.g., analytical laboratory reports.

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2.0 GUTERL SITE BACKGROUND

2.1 Guterl Site History and Operations

2.1.1 Ownership History

From 1910 to 1966, the Guterl Site was owned and operated by Simonds Saw and Steel Company (Simonds) to manufacture steel and specialty steel alloys (high-alloy) used in the production of saws and other tools. During World War I and World War II, normal plant operations were suspended, and the plant produced armor plating for the US Government under various contracts (Simonds Saw and Steel Company, 1943; and United States Ordnance Department, 1919).

In 1966, Simonds was acquired by the Wallace-Murray Corporation (Delaware Secretary of State, 1966). Wallace-Murray Corporation continued to operate the plant as a specialty steel mill until 1978, when Guterl Specialty Steel Corporation acquired the site property (Niagara County Clerks Department, 1978).

In 1982, Guterl Specialty Steel Corporation filed for Chapter 11 bankruptcy protection in the US Bankruptcy Court for the Western District of Pennsylvania (this was changed to a Chapter 7 bankruptcy in 1990). In 1984, using industrial development bonds received through the Niagara County Industrial Development Agency, Allegheny Ludlum Corporation (Allegheny) purchased Guterl Specialty Steel Corporation's assets at an auction (US Bankruptcy Court, 1984).

According to US Bankruptcy Court documents, "on information and belief, at the time, Allegheny was shown certain documents and learned from counsel for the United States Economic Development Association (USEDA), William Ogden, that the Guterl Site contained radioactive contamination. On information and belief, the USEDA had certain documents in its possession that reflected the significant radiological contamination at the Guterl Site. Allegheny refused to close" (US Bankruptcy Court, 1984).

As a result of the documents and information received from Mr. Ogden, Allegheny later agreed to close the deal, but only after the "contaminated" area was removed from the sale. This portion of the property, approximately nine acres of land, became known as the "Excised Area." Allegheny also excluded a portion of Guterl Specialty Steel Corporation's assets from the sale, including equipment utilized during AEC-related operations at the Guterl Site (US Bankruptcy Court, 1984). As a result, the Excised Area and equipment therein remains under ownership of Guterl Specialty Steel Corporation (a Chapter 7 bankrupt corporation).

The Guterl Site is currently being operated by Allegheny Ludlum Corporation under the name Allvac Steel. The operating facility occupies the portion of the Guterl Site that is not part of the Landfill Area or Excised Area.

2.1.2 Summary of MED/AEC Support Operations

In 1948, the NY Operations Office of the AEC negotiated a contract with Simonds. The contract, AT-30-1 Gen-339, was initiated in May of 1948 and was renewed annually through July 1952. Simonds continued work under subcontract S-4 (effective March 1952 through December 1956) to National Lead Company of Ohio (NLO) (under contract AT (30-1)-1156 with NY Operations Office) (NIOSH, 2005). Records indicate that Simonds processed between 25 million and 35 million pounds of natural uranium (U) metal (i.e., processed uranium metal without enrichment supplied as metal ingots) and approximately 30,000 to 40,000 pounds of thorium (Th) metal between 1948 and 1956 (ORISE, 1999).

Between 1948 and 1952, when Simonds performed work under the AEC contract, documents indicated that Simonds conducted approximately 312 rolling turns of metal annually. Each turn processed between 15,000 and 20,000 pounds of uranium metal ingot, resulting in an average processing of approximately

4.6 million to 6.2 million pounds of U metal annually (approximately 500,000 to 600,000 pounds of U metal per month).

Under the NLO subcontract, Simonds continued the same type of work that it had performed under the AEC contract. Records indicated production of 29, 56, 58, and 22 turns of metal during 1953, 1954, 1955, and 1956, respectively. At an average of 15,000 to 20,000 pounds of U metal ingot per turn, the average annual production during this period would have been approximately 385,000 to 1 million pounds of U metal (approximately 40,000 to 80,000 pounds of U metal per month).

In a May 25, 2005 site profile report published by the Oak Ridge Associated Universities (ORAU) Dose Reconstruction Project Team, the authors stated that more than 99 percent of all material processed at Simonds Saw and Steel was natural uranium; i.e., uranium that has not been enriched or depleted and with uranium isotopic ratios consistent with naturally occurring abundances. The report stated that there was some evidence to support the processing of small quantities of depleted uranium and enriched uranium (up to 2.5 percent) during the latter portions of the contract work, but their fractions of contribution to worker radiation dose would be small compared to the amount of natural uranium present (NIOSH, 2005). Recycled depleted uranium is known to be cross-contaminated with transuranic radionuclides; for the Guterl Site this would include neptunium (^{237}Np) and plutonium (^{239}Pu). Note that the estimate of contaminant activity fractions in a recycled depleted uranium source term is 0.00182 for ^{237}Np and 0.000261 for ^{239}Pu (NIOSH, 2005). These fractions are so small when compared to the 99 percent natural uranium that they are nearly immeasurable. Assuming 1 percent of the MED uranium at the Guterl Site is recycled uranium, the total ^{237}Np activity would be less than about $0.01 \times 0.002 = 2 \times 10^{-5}$ of the total ^{238}U activity. Similarly, the ^{239}Pu activity would be less than about 3×10^{-6} of the total ^{238}U activity.

Of the thorium that was processed, ^{232}Th and ^{228}Th were present in equal fractions. That is to say that of the thorium present, 50 percent was comprised of ^{232}Th and 50 percent was comprised of ^{228}Th (NIOSH, 2005). In nature, almost all thorium is ^{232}Th (Argonne National Laboratory [ANL], 2007), indicating that the source term for ^{230}Th directly attributable to the processed thorium metal should be small.

A summary of building uses is presented in Table 2-1. The majority of MED/AEC support operations involved the processing of uranium metal through the 16-inch mills in Buildings 6 and 8 at the Guterl Steel facility; thorium was also processed, to a lesser extent, during the latter part of the contract period. On average, the MED/AEC materials were processed one week per month over the period 1948 through 1956. Based on a review of USACE file information, routine MED/AEC operations for the Guterl Site are summarized as follows (Oak Ridge National Laboratory [ORNL], 1978; see also ORNL Figure 2 and Figure 3 presented in Appendix A):

- Uranium/thorium metal billets or ingots arrived at the Guterl Site via railroad car from the railroad spur located east and north of the landfill area.
- The uranium/thorium metal was offloaded from the railroad cars along the west side of Building 8 at the loading dock, and was subsequently weighed inside Building 8.
- The uranium/thorium metal was uncrated and stored for processing in the eastern portion of Building 8.
- The uranium/thorium metal was then processed through the 16-inch mills within Building 8. Several small lots were run through the 10-inch rolling mill located in Building 3.
    - Just before rolling, workers uncrated the ingots or billets and rigged them for transfer by crane to the weigh station. According to a report on rolling procedure in 1951 the billets were initially either 5-1/8-in. in diameter and 15 to 20 in. long or 4-1/4-in. in diameter and 20 to 22 in. long. The rolling reduced them to rods of 7/8-in. diameter each weighing

approximately 200 lb. Thus, each turning was approximately 75 to 100 billets. (NIOSH, 2005)

- After weighing, the ingots or billets were transferred into a furnace. A gas combustion furnace was used in the early years and occasionally thereafter. About January 1950, a heated lead bath furnace was installed to reduce the airborne radioactivity. The ingots or billets were loaded into the lead furnace, which was of a "Ferris wheel" type design for submerging and carrying the charge through the heated lead bath. It is not known how many billets the furnaces could handle at once, but it is known that each billet was in the furnace for about 40 minutes. (NIOSH, 2005)

- The heated ingots or billets were transferred using tongs and a roller table (a table with rollers on top to reduce friction and ease heavy material transfers) to the 16-inch mill and rolled in two of its four stands. Depending on size, the bar could have been cut at the shears midway in the rolling operation. (NISOH, 2005)

- After rolling, the rods were quenched (either pressure quenched or dipped in a tank) and transferred in bundles by crane to the shipping area. (NIOSH, 2005)

- At the shipping area, the rods were placed in tared H-beams, weighed, and loaded into railcars from the loading dock. (NIOSH, 2005)

- The processed uranium/thorium bars were then packaged for shipping adjacent to the loading dock, and were weighed for shipment.

- The processed uranium/thorium metal was shipped out of the facility via railroad car along the railroad spur east and north of the landfill.

Background information indicates that baghouse flue dust from the 16-inch rolling mills was not always completely accounted for during the work performed, and that the collection of flue dust was not always operational (AEC, 1950). An example of the impact of this is indicated in prior reports that indicate ^{238}U was detected in dust samples collected from the building rafters (NLO, 1953). The ORAU report (NIOSH, 2005) states "The process generated a considerable amount of waste as evidenced from a Tonawanda Progress Report (AEC 1952 as cited in NIOSH, 2005): Approximately fifty drums of [uranium-contaminated] scrap and oxide were received from Simonds at the completion of the January rolling."

Several reports indicate the development of the onsite landfill was not initiated until 1962, several years after the MED/AEC support work was completed. However, radioactivity above background levels has been detected in part of the landfill (New York State Department of Environmental Conservation [NYSDEC], 1994). Aerial photographs of the Guterl Site from the period preceding, during, and shortly following the contract performance period indicate significant areas of soil disturbance to the north and northwest of the Excised Area, extending westward to the railroad spur and north along the spur (United States Army Geospatial Center, 2009).

Significant development of the Guterl Steel property has taken place since the conclusion of the MED/AEC support period. Several new production and storage buildings have been constructed to the north, northwest, and west of the Excised Area buildings. Land disturbance (documented in the review of historical aerial photographs) during development could serve to bury or sporadically relocate wastes that may have been located in those areas (United States Army Geospatial Center, 2009). Such disturbance may account for the detection (and in some cases, visual observation) of radioactive materials outside of the areas known to have been utilized for processing the MED/AEC materials.

2.2 Site Characteristics

2.2.1 Topography

The Guterl Site is located in Lockport, Niagara County, NY, approximately 20 miles northeast of Buffalo, NY. The topography at the Guterl Site is relatively flat, with a gentle southward slope of approximately 25 feet (ft) per mile as measured from the north side of the Guterl Site at Route 31 (elevation 620 ft) to the south side of the Guterl Site at New York State Route 93 (elevation 595 ft).

The Guterl Site is located approximately 1.5 miles south of the Niagara Escarpment. The Niagara Escarpment is a regional-scale east-west trending ridge with significant elevation change from south (higher) to north (lower). (Niagara Falls flows over the Niagara Escarpment approximately 18 miles west of the Guterl Site, and the Genesee River flows over the Niagara Escarpment approximately 56 miles east of the Guterl Site in Rochester, NY.) As noted above, land elevation in the area of the Guterl Site ranges from approximately 620 ft to 595 ft. Land elevation north of the Niagara Escarpment is approximately 375 feet.

The Guterl Site does not contain any surface water bodies such as ponds or streams, and has no visible natural connection to the Erie Canal located approximately 300 feet south-southeast of the Guterl Site. A seasonal, unregulated wetland exists off the Guterl Site immediately south and west of the landfill area. This seasonal wetland may be drained by unmapped tributaries of the west branch of Eighteen Mile Creek that flows northward to Lake Ontario (NYSDEC 1994).

2.2.2 Meteorology

Niagara County, NY, has a humid, continental-type climate. The region has warm summers with moderate humidity, whereas winters have cold temperatures and snowfall (including lake effect snow). The close proximity of Lake Erie and Lake Ontario affects the regional climate. The lakes act as heat sinks, delaying the increase in air temperature in the spring, tempering extreme high temperatures in the summer, and inhibiting cooling in the fall. In the winter Lake Erie, and to a lesser extent Lake Ontario, influence snowfall amounts in Niagara County. Air traveling across the Great Lakes picks up moisture from the relatively warm waters, and deposits the moisture as snow as the air mass moves over colder inland areas. Lake-effect snowfalls can be heavy in November and December and tend to decrease later in winter as the lakes are covered with ice. There is little effect on weather from elevation because there is relatively little change in relief throughout Niagara County (United States Department of Agriculture [USDA], 1972).

For the period 1971-2000, the yearly average daily high temperature was 57.5 ºF and the daily average low temperature was 39.1 ºF. The average warmest and coldest months of the year are July and January, respectively. The average daily high and low temperatures for July are 81.8 ºF and 60.9 ºF, respectively; and the average daily high and low temperatures for January are 31.5 ºF and 16.9 ºF, respectively (National Oceanic and Atmospheric Administration [NOAA], 2008b). Niagara County receives an average of 34.9 inches of precipitation, including 67.5 inches of snowfall per year.[5] Generally, precipitation is distributed evenly throughout the year, although minimum monthly precipitation values are slightly lower during winter.

[5] Snowfall is usually evaluated with standard rain gauges having diameters of 100-millimeter (plastic) or 200-millimeter (metal). These gauges are adjusted to winter by removing the funnel and inner cylinder and allowing the snow/freezing rain to collect inside the outer cylinder. Once the snowfall/ice is finished accumulating, or as its height in the gage approaches 300 millimeters, the snow is melted and the water amount recorded.

2.2.3 Geology

2.2.3.1 Regional Geology

The geology of the Niagara region consists of a generally thin blanket of unconsolidated Wisconsin-age glacial sediments overlying a thick sequence of shales, sandstones, limestones and dolostones deposited in ancient seas during the Silurian and Devonian Periods (439-360 million years ago) (Buehler and Tesmer, 1963). Bedrock bedding generally strikes in an east-west direction, approximately paralleling the east-west trending Niagara and Onondaga Escarpments, and dips to the south at approximately 30 to 40 ft per mile (Johnston, 1964; La Sala, 1968; Yager and Kappel, 1987). Prominent regional jointing trends in the Lockport Group were reported as N65°E and N30°W (Johnson, 1964).

In the recent geological past[6], most of New York, including the region of the Guterl Site, was covered by a series of continental ice sheets (often referred to as glaciers). The activity of the ice sheets widened pre-existing valleys, and deposited widespread accumulations of till. The melting of the most recent ice sheets, ending approximately 12,000 years ago in western NY, produced large volumes of melt water; this water subsequently shaped channels and deposited thick accumulations of stratified granular sediments.

As the ice sheets retreated from the region, meltwater formed proglacial lakes along the ice margin. This region is covered by lake sediments, the most recent being from Lake Iroquois (a large predecessor to Lake Ontario) and from Lake Tonawanda (an elongated lake which occupied an east-west valley and drained north into Lake Iroquois as the ice sheet retreated northward into the Ontario basin). The sediments consist of blanket sands and beach ridges which are occasionally underlain by lacustrine silts and clays (indicating low energy or deeper water deposition). In some areas, bedrock is within a few feet of the ground surface, where sediments have been eroded away. Drainage channels carved into the Niagara Escarpment, including Eighteen Mile Creek, indicate positions of former outlets of Lake Tonawanda.

Granular deposits in this area frequently act as shallow aquifers, whereas lacustrine clays, as well as tills, often inhibit groundwater movement. However, fine-grained, water-lain sediments, such as silts and clays, frequently contain horizontal laminations and sand seams. These internal features facilitate lateral groundwater movement through otherwise low permeable materials.

The uppermost bedrock formation underlying the Lockport area south of the Niagara Escarpment is the Goat Island Dolostone Formation of the Lockport Group (19 to 25 ft thick); Figure 2-1 presents a generalized stratigraphic column of the area. The Goat Island Dolostone is generally a light olive-gray to brownish-gray, medium to fine crystalline, thick to massive bedded dolostone with a sugary texture (Tesmer and Bastedo, 1981). The upper 10 to 25 ft of this unit can be heavily weathered and often contain abundant bedding planes and vertical fractures enlarged by dissolution and glacial scour (Miller and Kappel, 1987). Stratigraphically below the Goat Island Formation is the Gasport Formation of the Lockport Group. The Gasport Formation (15 to 30 ft thick) contains dolomitic limestone of blue to grey color, generally coarsely crystalline but with some fine crystalline layers. Bedding is massive with discontinuous shale partings and stylolites are common. This unit is underlain by the very finely crystalline, medium to dark gray in color DeCew Dolostone (8 to 10 ft thick) of the Clinton Group. The Rochester Shale of the Clinton Group, a dark bluish to brownish gray, calcareous shale with atypical argillaceous limestone layers, is underlain by the DeCew Dolostone (Tesmer and Bastedo, 1981).

The major water-bearing units in the Niagara region are in the bedrock above the Rochester Shale. In the vicinity of the Guterl Site, this interval includes the rocks of the Goat Island and Gasport Members of the Lockport Group and the DeCew Formation of the Clinton Group. Physical features of the Goat Island Member observed within the region include horizontal and vertical fractures, vugs, physical weathering of

[6] The last glacial period ended about 10,000 years ago.

the bedrock surface (e.g., glacial effects), and solution weathering of the fractures (i.e., solution-widened secondary porosity) (Johnson, 1964; Yager and Kappel, 1987). Regional hydrogeology is discussed in more detail in Section 2.2.4.1.

An active dolostone quarry is located approximately 0.1 miles southwest of the Guterl Site. Earth Tech contacted the quarry to inquire about dewatering activity, and the quarry manager indicated that the open pit dewatering system operates constantly throughout the year, maintaining a dewatered condition within the pit (no elevation and no dewatering rates were provided).

2.2.3.2 Site-Specific Geology

2.2.3.2.1 Surface Soils

The nature and distribution of native soils present at the Guterl Site are identified based on information provided in the Niagara County Soil Survey (USDA, 1972). The USDA report identifies two types of soils in the area of the Guterl Site, as further described below:

- Hilton and Cayuga silt loams, limestone substratum (HmA; 0 to 3 percent slopes) – Areas of this undifferentiated group are all Hilton soils, all Cayuga soil, or some of both. These soils are identified over more than 80 percent of the Guterl Site, including the former railroad right-of-way. Key characteristics of this soil type include:
  - Hilton: Deep, moderately well drained, medium-textured soils. Formed in calcareous glacial till containing sandstone and limestone fragments.
  - Cayuga: Deep, moderately well drained, medium-textured soils. Formed in lacustrine silt and clay that is 20 to 36 inches thick over loamy calcareous glacial till.
- Farmington silt loam (FaA; 0 to 8 percent slopes) – These soils are identified along the western border of the active Allegheny Ludlum production area, extending northwestward to include the landfill area. Key characteristics of this soil type include:
  - Shallow, well-drained, medium-textured soils. Formed in thin glacial till deposits over limestone bedrock that is within 20 inches of the surface.
  - The dominant slope is less than 5 percent. This soil is poorly suited to most long-season cultivated crops because it is shallow, stony, and drought prone.

Based on observations made during the RI, native surface soils (top 0 to 6-inches of soil) are generally poorly developed except to the north of the active operating facility and are comprised of very thin layers of silty, marginally organic topsoil. Significant areas of the Guterl Site have been re-worked (i.e., disturbed during filling activity), and, as a result, the native soil sequence has been altered; therefore, the occurrence of well developed soil horizons is restricted to areas of the Guterl Site that have not been disturbed by filling or construction activity.

2.2.3.2.2 Overburden Lithology and Stratigraphy

Overburden lithology consists of man-made fill and native glacially-derived soil. As noted in the prior section, significant areas of the Guterl Site have been disturbed as the properties were developed and operated. Based on RI soil borings, overburden sequences consist of undisturbed native material (well to the north and south of the operating facility), man-made fill overlying native material (large areas immediately north of the operating facility), and man-made fill/re-worked native material with very little to no undisturbed native material present (limited areas of the landfill and around the operating facility buildings).

Outside the limits of the landfill area the fill material ranges from 0.2 to 9.25 ft in thickness where present. For borings performed during this RI, the number of borings with fill thickness reported at 4 ft or less was 615/664 (92 percent); the number with fill thickness reported at 3 ft or less was 573/664 (86 percent); and, 43 borings were assigned a fill thickness of 0 ft (6 percent). For RI borings performed in the landfill area, fill material ranged up to 15.6 ft in thickness. Figure 2-2 presents a Geographic Information System (GIS)-generated interpolation of overburden thickness based on RI boring and monitoring well data. Cross-section locations are shown on Figure 2-3. Cross-sections are presented as Figures 2-4 through 2-9.

Outside the immediate area of the operating facility, the fill material consists predominantly of production and miscellaneous plant wastes containing coal fragments, apparent ash and coke fragments, and brick or crushed stone (gravel). In the area of the production buildings, the fill is predominantly crushed stone (gravel).

Prior regional investigations reported native overburden as a combination of a thin, discontinuous glaciolacustrine deposit of silts and clays overlying a thin, discontinuous glacial till of silt and clay with lesser amounts of sand and bedrock fragments. Glaciolacustrine deposits were reported in borings and test pits at the Landfill Area (SB-6, TB-101, and TP3-94) performed by NYSDEC (NYSDEC, 2000b). The unit was noted to be mottled and to contain vertical desiccation cracks throughout its thickness. Borings and test pits that completely penetrated this deposit reveal that it directly overlies either glacial till or bedrock, and where encountered, ranges in thickness from 0.5 to 2.5 ft (NYSDEC, 2000b). Based on a review of boring logs from the 1980 landfill wells and the 1997 NYSDEC bedrock wells, the glacial till unit ranges from less than 1 to approximately 2.5 ft in thickness when encountered (NYSDEC, 2000b).

Observations made during the 2007 RI soil boring program supported the historical characterization of thin, discontinuous native overburden. Depth to bedrock, as determined from soil boring and well log information, ranges from 0.5 ft below ground surface (bgs) at Building 2 and 0.7 ft bgs south of the main gate to15.6 ft bgs in the Landfill Area. Outside the landfill area, the maximum depth to bedrock was 13.2 ft bgs at a location north of the north fence. In general, overburden is thinner (depth to bedrock is shallower) in the southern portion of the Guterl Site (south of the gated facility) and thicker in the northwest corner of the Guterl Site (north of the fenced facility).

Although differentiation between glaciolacustrine and glacial till deposits was not possible during the direct-push technology (DPT) soil boring program (i.e., the recovered soil sample was not removed from the DPT sleeve for characterization so that the sleeve could be passed through the core scanner intact), the onsite geologist was able to estimate the boundary between fill and native materials based on other information such as resistance to drilling and soil color/texture through the sleeve. As shown on Figure 2-2, 212 (of 664 RI borings) penetrated the full depth of overburden (i.e., noted as auger refusal, split-spoon refusal, or bedrock fragments). Overburden was noted to be completely fill (i.e., no native encountered) in 34 of the 212 borings (16 percent); 187 of 212 borings (88 percent) had native thickness of 4 ft or less; and, 180 of 212 borings (85 percent) had native thickness of 3 ft or less.

During RI well installation activities, characterization of soil samples was possible (split-spoon sampler was used). Glaciolacustrine deposits were observed at monitoring well (MW) boring locations MW-603D and MW-605D at thicknesses of 0.2 ft to 1.8 ft, respectively. Till deposits were observed at seven locations (MW-600D, MW-602D, MW-604D, MW-605D, MW-606D, MW-606DR, and MW-607D) ranging in thickness from 0.1 ft to 7.9 ft.

Table 2-2 presents a lithologic summary for monitoring wells installed during 1997, 2006, and 2007 (wells installed prior to 1997 are not considered reliable due to age and construction methods).

2.2.3.2.3 Bedrock Lithology and Stratigraphy

RI monitoring well borings confirmed that the uppermost bedrock unit at the Guterl Site is the east-southeast dipping Goat Island Member (dolostone) of the Lockport Group.

During RI well installation activities, bedrock observations were made in the top 15 to 18 feet of the Goat Island Member of the Lockport Group (i.e., the target depth of wells installed into bedrock). In addition to the features summarized above, bedrock observed during RI well installation activities also included shale partings, calcite filled vugs, calcite veins, rubble zones (gravel sized pieces observed), and clay infilling in some fractures. Numerous horizontal and vertical fractures were observed, with vertical fractures observed at a lesser frequency than horizontal fractures. Vertical fractures were primarily observed in the top 5 feet of bedrock, specifically at MW-600D in the top 1.5 feet of bedrock, at MW-601D and MW-602D in the top 5 feet of bedrock, at MW-604D (clay infilled) in the top 1.5 feet of bedrock, at MW-605D in the top 2 feet of bedrock, and at MW-607D in the top 3 feet of bedrock. Angled fractures were observed at MW-603D at depths of 10 to 15 feet into bedrock. In general, bedrock was observed to be weathered at the top (upper 0.5 to 2.8 feet was capable of being augured through) and less weathered and fractured with depth. Table 2-3 shows that Rock Quality Designation (RQD) – a system used to measure the number of fractures per foot of bedrock core, where a higher value indicates greater competence - generally increased with depth for the 2007 monitoring well installations. The observed low RQDs in the upper bedrock zone promote secondary porosity and permeability, which is supported by the relatively high hydraulic conductivity data discussed in Section 2.2.4.2.2.

2.2.4 Hydrogeology

2.2.4.1 Regional Hydrogeology

Regional hydrogeology has been described for the Guterl Site vicinity in several prior investigation reports. The following material is adapted from NYSDEC, 2000b (Section VI, pp 17-18).

Water bearing zones in the Lockport area include unconsolidated glacial deposits and bedrock of the Lockport Group and Rochester Shale (Johnson, 1964; GZA, 1981). Most of the unconsolidated deposits in the region consist of fine grained glacial deposits with hydraulic conductivities as low as 1×10^{-7} centimeters per second (cm/sec) (Earth Dimensions, 1980). These deposits, however, often contain horizontal laminations and sand lenses that can produce perched water-table conditions, or if areally extensive, can be utilized as sources of water (La Sala, 1968). Because the unconsolidated deposits in southwestern Lockport are relatively thin, and horizontal laminations and sand lenses are not common, groundwater yields from these deposits would be too low for domestic or industrial purposes. Overburden groundwater flow in the area, therefore, can be expected to be highly localized and discontinuous.

The Lockport Group consists predominately of dolostone, however, thin beds of limestone and shaly dolostone, and small irregularly shaped masses of gypsum are common. These thin beds and masses are subject to dissolution by groundwater, resulting in the enlargement of fractures and the formation of migration pathways that transmit large quantities of groundwater. Groundwater wells completed in the Lockport Group have yields commonly ranging from 10 to 100 gallons per minute (gpm) (Miller and Kappel, 1987), with yields up to 950 gpm reported (Yager and Kappel, 1987). Reported transmissivity values range from 330 to 68,000 gallons per day (gpd)/ft (Johnson, 1964). Groundwater in the Lockport Group is typically either calcium-sulfate or calcium-bicarbonate water, very hard, and highly mineralized with calcium, bicarbonate, magnesium, sulfate and chloride present in significant concentrations (Johnson, 1964; La Sala, 1968). Due to this poor water quality and the nearby presence of the Niagara River, an important source of municipal drinking water throughout Western New York, bedrock water is not extensively utilized as a source of domestic water in the Lockport area. The municipal drinking water source for the town of Lockport is the Niagara River.

Most recharge to the Lockport Group results from infiltration of rainfall, snowmelt, and surface water through the overburden deposits; subsurface flow of groundwater from areas of higher elevation (e.g., the Niagara Escarpment) also recharges the bedrock aquifer (Johnson, 1964; La Sala, 1968; Miller and Kappel, 1987; Yager and Kappel, 1987). The blocky structure, i.e., cracks that have formed as a result of swelling and shrinking of clay minerals, of the native glacial deposits in the southwestern Lockport area

likely permits recharge of the shallow bedrock aquifer by infiltration. Recharge of deeper bedrock aquifers by infiltration through the floor of the nearby quarry and Erie Canal is also expected to occur.

Groundwater within the Lockport Group occurs primarily in the secondary porosity features such as weathered surface fractures, bedding planes, vertical joints, and small cavities and vugs. The principle control on groundwater flow, however, is the vertical joints and horizontal bedding plane fractures. The latter are the primary groundwater flow pathways in the Lockport Group and are areally extensive over several miles (Johnson, 1964; Yager and Kappel, 1987). Johnson (1964) identified seven such zones in the Niagara Falls area. Similar zones are likely to be found in the Lockport area but have not been extensively studied, or correlated with those in Niagara Falls. Some horizontal groundwater flow also occurs through small cavities and vugs (Woodward-Clyde and Conestoga-Rovers and Associates, 1992). Vertical movement of groundwater also occurs, especially in the upper 10 to 25 ft of rock where vertical fractures, created by stress relief from tectonic events, glacial rebound (Gross and Englelder, 1991), and quarrying operations have been enlarged by post-glacial fluvial exposure and fracture/joint dissolution. Prominent regional jointing trends in the Lockport Group were reported as N65°E and N30°W (Johnson, 1964). Vertical movement of groundwater within the Lockport Group is quite prevalent, with both upward and downward gradients observed (Woodward-Clyde and Conestoga-Rovers & Associates, 1992). Where horizontal and vertical fractures intersect, the water bearing capacity of the bedrock is substantially increased. Although such areas have been identified in the Niagara Falls area, little investigation has been conducted to identify such features in the immediate Lockport area.

2.2.4.2 Site Specific Hydrogeology

2.2.4.2.1 Overburden Hydrogeology

A total of six overburden monitoring wells were previously installed at the Guterl Site, of which five remain. All of the pre-existing overburden wells are located around the perimeter of the landfill area. Only a limited set of historical water level measurements exists for these wells. Existing hydraulic conductivity data were not available for these wells.

At the landfill area, NYSDEC (2000b) reported water level fluctuations of up to three feet in landfill area overburden monitoring wells. During this RI, the landfill area overburden monitoring wells were observed to be dry (MW-13S) or in an unusable, deteriorated condition (MW-81-01, MW-81-02, MW-81-04, and MW-105) during groundwater level monitoring events conducted (August, September, and November 2007, and March 2008).

Based on a review of available information (NYSDEC, 2000b and current RI data), it appears that the overburden drains to the bedrock potentiometric elevations, which appear commonly below the overburden screened interval. There is evidence, however, that new monitoring well MW-600S reflects bedrock groundwater levels that stabilized above bedrock elevations (semi-confining), especially in between recharge events (e.g., March 2008 water elevations that likely show the effect of winter/spring recharge that raised the bedrock water elevation to within the overburden screened interval). Therefore, comparison of available bedrock and overburden groundwater elevation data appear to indicate that overburden water table fluctuations of several feet can be expected due to precipitation and evapotranspirative effects; i.e., in general, overburden water levels will be higher during wet-weather conditions (winter and spring) and lower during the relatively dry and higher evapotranspiration summer and fall months.

2.2.4.2.2 Bedrock Hydrogeology

Bedrock monitoring wells at the Guterl Site penetrate the upper 15 to 20 feet of rock; for this reason, this RI will consider the available information to represent “shallow bedrock” conditions at the Guterl Site. There are 35 shallow bedrock monitoring wells installed at the Guterl Site.

- Five bedrock monitoring wells were installed by NYSDEC in the Excised Area in 1997 (MW-1 through MW-5) (NYSDEC, 2000b).

- NYSDEC installed another 20 bedrock wells under a separate investigation in 2006 (MW-06 through MW-26).

- Earth Tech installed nine bedrock wells (MW-600D through MW-607D) during the current RI.[7]

Observations of shallow bedrock core made during RI monitoring well installations confirm the presence of secondary porosity features described under Regional Geology. Secondary porosity features such as horizontal and vertical fractures will have an influence on the direction and magnitude of groundwater flow. Fracturing was noted to be most predominant in the upper 5 to 10 feet of bedrock. Hydraulic conductivity testing conducted for shallow bedrock wells during this RI indicates a geometric mean hydraulic conductivity of 5×10^{-3} cm/sec.

Bedrock groundwater elevation was observed to stabilize at or above the bedrock surface in a number of Guterl Site monitoring wells indicating semi-confining conditions. This condition was observed in the majority of onsite shallow bedrock wells during the March 2008 groundwater elevation monitoring event, and in several monitoring wells for all rounds monitored. Table 2-4 presents a summary of bedrock groundwater elevation relative to bedrock surface elevation for July, September, and November 2007, and March 2008 hydraulic monitoring events. Figure 2-10 presents a bedrock groundwater elevation relative to bedrock surface elevation for November 2007 and March 2008 hydraulic monitoring events.

Shallow bedrock groundwater elevations are highest in the north-northwest portion of the Guterl Site and lowest in the south-southeast portion of the Guterl Site. Groundwater in the bedrock zone flows generally southward from a northwest-southeast trending groundwater divide originating in the area of the landfill. Groundwater west of this divide appears to flow south-southwest toward the dolostone quarry and groundwater east of this divide appears to flow south-southeast toward the Erie Canal. The southwestward component of flow is likely due to quarry dewatering operations, and the southeastern component of flow is likely due to the presence of the Erie Canal. The Erie Canal is reported to have an average surface water elevation of 565 ft which is approximately 25 feet below the groundwater elevation at the nearest shallow bedrock monitoring well onsite.

NYSDEC noted that groundwater elevation data collected from shallow bedrock monitoring wells in the summer (August 1997) were uniformly lower than groundwater elevation data collected from bedrock wells in the spring (April 1998) (see Appendix A [NYSDEC, 2000b] for a reproduction of groundwater contour figures). Data collected by Earth Tech and USACE during November 2007 and March 2008 exhibit the same seasonal fluctuation; see Table 2-5. Therefore, it is reasonable to conclude that in general, water levels are higher during the wet-weather winter and spring seasons and lower during the relatively dry summer and fall months when evapotranspiration lessens recharge potentials.

2.2.4.3 Surface Water

The Guterl Site is not located in a 100-year or 500-year floodplain and a review of New York State and federal references determined that no New York State or federal regulated wetlands are identified at the Guterl Site; see Figure 2-11 (adapted from www.gis1.erie.gov/website/niagarany/viewer.htm for this report). There are several small, low-lying areas within the boundaries of the Guterl Site that may be classified as unregulated, ephemeral wetlands; these features are described in more detail in Section 2.2.6.2.

[7] The tally of nine new wells excludes installation of MW-606D that was installed in the wrong location; MW-606DR is counted in its place.

The Guterl Site does not contain any surface water bodies such as ponds or streams, and has no visible natural connection to the Erie Canal located south-southeast of the Guterl Site. A seasonal, unregulated wetland exists off the Guterl Site immediately south and west of the landfill area. This seasonal wetland may be drained by unmapped tributaries to the west branch of Eighteen Mile Creek that flows northward to Lake Ontario (NYSDEC 1994).

Temporary surface water has been observed to occur at the Guterl Site as stormwater runoff and as standing or ponded water resulting from generally undeveloped stormwater drainage patterns. Stormwater runoff is observed to move as sheet flow from topographic highs to topographic lows. Areas of standing water are seasonally influenced and are subject to evaporation or infiltration.

Stormwater runoff in the undeveloped northern portion of the Guterl Site (IA03, IA04A, IA05A, and IA05B) is unmanaged; i.e., no stormwater swales or sewers are present. The landfill area is poorly graded, and has been observed to exhibit pockets of standing water (e.g., NYSDEC, 1991); such pockets were not observed during the 2007 RI field activities (August through November). Topographic lows are apparent at the northeastern corner of IA04A; west and south of the landfill; and within IA04C (west of the main parking lot). USACE also notes, “In general, this area of Lockport is found to have poor drainage. Due to low soil permeability, there is a high potential to collect water from precipitation and overland drainage.” (USACE, 2001; p 5).

Stormwater runoff in the area of the operating facility (IA04B) is directed to a limited network of combined storm and sanitary sewers via surface swales and catch basins. Figure 2-12 presents a summary of known stormwater catch basin and storm sewer locations as determined through interviews with plant personnel and RI inspections. Storm sewer catch basins that were located during this RI were inspected for presence of standing water or sediment. Storm sewers located immediately north and south of the Excised Area did not appear to be functioning; i.e., sediment within the catch basins was preventing the sewer from collecting and conveying storm water. Catch basins located on the north and west sides of Building 24 appeared to be functioning properly; i.e., were sediment-free. A shallow culvert was located discharging to an open swale on the west side of Building 9; the open swale then directs stormwater south through a culvert pipe that crosses in a southwesterly direction below the main gate driveway. The culvert discharges to another open swale west of the main gate which discharges to the wooded area west of the main gate. One manhole was located in the wooded area west of the main gate; the manhole provides access to a combined stormwater and sanitary sewer from the active portion of the facility.

The Erie Canal is located approximately 300 feet southeast of Ohio Street (Figure 1-2). The surface water elevation of the Erie Canal immediately south of the Guterl Site fluctuates by several feet due to seasonal control of the navigable water level (i.e., water elevation is lowered in winter and raised in summer), its location relative to the Lockport locks to the northeast, and its confluence with Tonawanda Creek to the southwest (Tonawanda Creek provides the headwaters for the Erie Canal). In the area of the Guterl Site, the Erie Canal flows from west to east (i.e., from the Niagara River toward Lockport). From April 20 through November 20; the average flow is two feet per second. From November 20 through April 20, the lower Erie Canal is dewatered (below the Lockport Locks between the bulkhead in Pendleton, NY and the Genesee River) and there is no measurable flow. As a result, the flow from the west (i.e., in the area of the Guterl Site) through the Lockport Locks is also negligible.

The ongoing operating facility at the Guterl Site currently obtains industrial process water from the municipal water supply system. However, an abandoned industrial process water intake formerly used at the facility is located on the northwestern bank of the Erie Canal. The pump house and intake reservoir for this system are located 350 feet northwest of the Erie Canal (150 feet southeast of Ohio Street).. Water obtained from the Erie Canal was lifted to the intake reservoir and then pumped to the manufacturing facility through underground mains. Waters were used as contact-cooling, non-contact cooling, and process waters. A sump and “oil water separator” system located between Buildings 2 and 3 collected these waters prior to recirculating them back to the pump house near the Erie Canal. Waters were initially returned to a “grease trap” reservoir prior to return to the intake reservoir or overflow back to the Erie Canal. From 1974 to 1986, discharges from this system to the Erie Canal were regulated through

a National/State Pollution Discharge Elimination System Permit (No. 0002674). The permit was terminated in 1986 upon confirmation that discharges to the Erie Canal had been eliminated (NYSDEC, 2000b). The former "grease trap" reservoir has been backfilled, covered with stone, and is no longer visible. The pump house and intake reservoir have not been razed and are visible and accessible. Process waters at the active manufacturing facility are now discharged through the local sanitary sewer system.

Drinking and irrigation water for the Town of Lockport is supplied through the Niagara County Water District, which obtains its water from the Niagara River west of Lockport. The City of Lockport is also supplied with drinking and irrigation water obtained from the Niagara River; however, this is channeled through the City of Lockport's water treatment plant. Emergency drinking water for the City of Lockport is supplied from the Summit Street intakes located in the Erie Canal immediately southeast of the Guterl Site (NYSDEC, 1994). According to Niagara County Health Department, the most recent use of the emergency water intakes occurred September 16 and 18, 1990, August 10, 1992, November 2, 1992, May 18, 1993, September 18, 1993, and July 1997 (specific date not available) (New York State Department of Health [NYSDOH], 2008).

2.2.4.4 Surface Water and Groundwater Relationship

As noted in Section 2.2.4.3, the Guterl Site is not located within a 100-year or 500-year floodplain. Regulated wetlands have not been identified and there are no permanent streams, rivers, ponds, or lakes within the boundaries of the Guterl Site. Surface water features observed onsite are limited to seasonal (ephemeral) wetlands identified at a few, limited locations and the Erie Canal which is located approximately 300 feet southeast of the main plant entrance.

The ephemeral wetlands are shown on Figure 2-13. The ephemeral wetlands may provide a source of surface water-to-groundwater recharge during wet seasons. However, the surface area of these wetlands is limited and the long-term influence is expected to be minimal especially considering the low permeability of native site soils. The occurrence of overburden groundwater is limited to sporadic observations during wet seasons.

A seasonal, unregulated wetland exists offsite south and west of the landfill area. According to NYSDEC (1994), this seasonal wetland is drained by unmapped tributaries to Eighteen Mile Creek that flow northward to Lake Ontario or by unnamed tributaries toward the Erie Canal. The thinness and somewhat blocky texture of site soils and fill generally indicate that precipitation can readily recharge groundwater, as evident in the seasonal groundwater elevation fluctuations, which are greatest in areas away from the buildings.

The Erie Canal is excavated into bedrock along the reach adjacent to the Guterl Site. The average surface water elevation in the Erie Canal is approximately 565 feet which is approximately 25 feet lower than the shallow bedrock groundwater elevation in MW-604D (590 ft). Therefore, the difference in groundwater elevation between the onsite shallow bedrock monitoring well and the downgradient Erie Canal appears to indicate that shallow bedrock groundwater may be discharging to the Erie Canal.

2.2.4.5 Site Conceptual Hydrogeological Model

Overburden lithology consists of man-made fill (gravel, crushed concrete, brick, etc.), industrial fill (slag, cinders, etc.), and native soil. Native soil lithology consists of thin, discontinuous layers of glaciolacustrine silts and clays, and glacial till. Recharge of the hydrogeologic system at the Guterl Site occurs in the form of precipitation and infiltration. Infiltration is greater through fill or disturbed materials than through native soil.

Overburden groundwater has been observed in landfill area overburden monitoring wells on a seasonal basis; although not during this RI. Overburden groundwater was not observed as a discrete zone in soil

borings performed east or southeast of the landfill. Prior investigators (NYSDEC, 2000b) postulated that the seasonal occurrence of groundwater observed in the overburden is directly connected to shallow bedrock groundwater, and that the two zones could be considered to act as one unit. Based on data gathered during this RI, shallow bedrock groundwater has been observed to occur under semi-confining conditions and to fluctuate several feet on a seasonal basis, supporting prior conclusions

Shallow bedrock at the Guterl Site consists of weathered to slightly weathered dolostone of the Goat Island Formation of the Lockport Group. Shallow bedrock groundwater will move primarily through secondary porosity features such as weathered surface fractures, bedding planes, vertical joints, and small cavities and vugs. The principle control on groundwater flow, however, is considered to be vertical joints and horizontal bedding plane fractures. Secondary porosity features such as horizontal and vertical fractures will have an influence on the direction and magnitude of groundwater flow. Observations of bedrock core made during monitoring well installations confirm the presence of secondary porosity features. Fracturing was noted to be most predominant in the upper 5 to 10 feet of bedrock. Hydraulic conductivity testing conducted for shallow bedrock wells during this RI indicates a geometric mean hydraulic conductivity of 5×10^{-3} cm/sec. Bedrock coring and monitoring well installations performed for this RI were limited to the upper 15 feet below top of competent bedrock.

Shallow bedrock groundwater flow direction determined during this RI was consistent with prior investigations (NYSDEC, 2000b). Shallow bedrock groundwater was observed to flow in a general northwest to southeast direction, with a component of southwesterly flow west of the main plant. It is presumed that the southwesterly component is a direct result of influence from quarry dewatering operations west of the Guterl Site.

2.2.5 Demography and Land Use

The United States Census Bureau estimated the 2007 population of Niagara County at 214,845, which is a decrease from both the 2000 estimate of 219,846 and the 1990 estimate of 220,756. The population estimate for Lockport was 22,279 in 2000 which is also a decrease from the 1990 estimate of 24,426. The number of housing units in 2000 was 10,341 (United States Census Bureau, 2008).

Land use near the Guterl Site is mixed, consisting of private residences, small farms, and light industrial (Figure 1-2). To the north of the Excised Area, along Simonds Street, land use includes light industrial/warehouse operations. To the west of the former railroad right-of-way is a New York State Department of Transportation maintenance yard (abuts northern half of parcel) and private residences (abut southern half of parcel), land use consists of light industry (concrete batch plant operations and warehousing); to the east of the former railroad right-of-way are private residences. To the west of the operating facility, west-southwest of Route 93 bypass, there is an active dolostone quarry. To the south-southeast the Erie Canal separates the Guterl Site from private farmlands.

2.2.6 Ecology

The Guterl Site consists of developed manufacturing facilities, disturbed and undeveloped fields of grasses and scrub brush, limited woodland, and isolated wetland habitats. The biological resources described in this section include the major communities of terrestrial and aquatic organisms that may be found in and around the Guterl Site. The major terrestrial and aquatic organisms include plants, birds, mammals and fish.

2.2.6.1 Habitats and Vegetation

Within the Guterl Site, there are young fields, old fields wooded habitats, and disturbed urban habitats (e.g., buildings, mowed lawns, etc.). In general, large vegetated areas occur in the northern (IA05B), western (IA03/IA04A), and southwestern (IA04C) areas of the Guterl Site. The west central (IA04B), east central (IA01), and southeastern (IA04D) areas of the Guterl Site are highly developed; although, small

habitats of unmanaged open areas occur randomly in the eastern portion around the abandoned buildings (IA02) and the railroad right-of-way (IA05A).

The northern third of the Guterl Site contains large swaths of old fields that occupy former building and landfill sites. These old fields are often strewn with anthropogenic construction debris (e.g., concrete, wood, etc.). The western portion of the Guterl Site contains young fields and emergent wetlands. In the southwest portion of the Guterl Site, there are young and old fields and wooded habitats.

Isolated wetlands are present within the Guterl Site and vary from small, ephemeral wet depressional areas to scrub/shrub and forested wetlands. Wetlands are discussed in specific detail in Section 2.2.6.2.

The observed dominant vegetation in young fields was primarily sumac (Rhus sp.), box elder (*Acer negundo*), cottonwood (*Populus deltoides*), mullen (*Verbascum thapsus*), dandelion (*Taraxacum officinale*), birdfoot trefoil (*Lotus corniculatus*), milkweed (*Asclepias* sp.), ragweed (*Ambrosia* sp.), red clover (*Trifolium pretense*), thistle (*Cirsium* sp.), wild carrot (*Daucus carota*) and grasses (Gramineae Family).

The observed dominant vegetation within old fields was primarily maple (*Acer* sp.), sumac, black cherry (*Prunus serotina*), cottonwood, honeysuckle (*Lonicera* sp.), and wild grape (*Vitis* sp.).

Woodland habitats were often small isolated stands. Observed species within wooded areas included box elder, red maple, cottonwoods, hawthorn (*Crataegus* sp.) and various shrubs (e.g., buckthorn, multifloral rose, etc.).

2.2.6.2 Wetlands

A formal wetland delineation was not performed on the Guterl Site during Earth Tech's site walkover. Potential wetland areas were observed in the landfill; operating facilities, along Rt. 93 Bypass (drainage swales), and in the former railroad right-of-way. A description of the potential wetlands within these locations includes:

- **Landfill -** the western and southern perimeter of the landfill area contain emergent wetlands dominated by common reed (*Phragmites australis*). It should be noted that these wetlands are contiguous to large tracts of wetlands that continue north and west of the Guterl Site boundary.

- **Operating facility(s) -** the central portion of the Guterl Site is comprised of industrial structures and access roads. Emergent wetlands were observed within drainage swales that are present in between several buildings. These potential wetlands are linear in shape and vegetated with cattails (*Typha* sp.) and horsetail (*Equisetum* sp.). Other potential wetlands within this area include isolated depressional areas near Ohio Street.

- **Rt. 93 Bypass –** Long linear drainage ditches are located parallel to the Route 93 Bypass. The ditches measure approximately 5-10 ft in width and occur on either side of the roadway. The ditch on the east side of the bypass, which is within the Guterl Site, contains common reed-dominated emergent wetlands. Field investigations determined that this ditch is hydrologically connected to the ditch west of the bypass by a culvert pipe.

  Northeast of the Rt. 93 Bypass, there is a wooded area south of Building 14. Within this area scrub/shrub and forested wetlands were observed as well as isolated wet depressional areas.

- **Former railroad right-of-way** – This parcel is a long, L-shaped piece of land that occupies the northern-most portion of the Guterl Site, now occupied by vacant fields. Within this area, small, wet depressional areas are present. These potential wetlands should be considered isolated and ephemeral.

USACE performed a wetland determination of the Guterl Site and concluded that wetland vegetation is present in most areas noted above as wetland or wet areas. Soils in the landfill area, however, are predominantly fill material (0.3 to 3.7 feet in depth) and do not consist of native soils. There were some indicators of wetland hydrology in a few locations (e.g., cracked soils and small drift lines of vegetation). Most of these wet area sites were in the lowest elevations forming depressions. They were located predominately within the center of the 3.5 acres and most were approximately 50 x 100 feet in size. Many areas would not be considered wetland as they did not meet all three wetland parameters. However, a few locations did meet all three parameters (over 50 percent dominant hydrophytic vegetation, hydric soils, and wetland hydrology), and these areas added up to about 0.5 - 1 acre in size.

The wetland regulations for the state of New York were also considered and under NYSDEC rules the Guterl Site does not contain any wetlands subject to the Freshwater Wetlands Act (Article 24 of the Environmental Conservation Law).

2.2.6.3 Wildlife

A site reconnaissance was performed by an Earth Tech senior field biologist on May 2, 2008, to provide information on the habitat types found on the Guterl Site; examine the presence of potential ecological receptors using visual sitings, tracks, and scat; and finalize the USEPA ERAGS checklist that was partially completed by USACE biologists.

The active buildings, maintained lawns, young fields (disturbed) and abandoned buildings on the Guterl Site would be utilized by species common to an urban environment (e.g., rock doves, small rodents, etc.). Wooded areas in the southwest portion of the Guterl Site and large wetland tracts in the northwest portion of the Guterl Site, would be utilized by larger species (e.g., raccoon (*Procyon lotor*), white-tailed deer (*Odocoileus virginianus*), etc.). Evidence of these larger species (i.e., tracks and scat) was observed during the site visit. Common terrestrial/urban species that may also be present include the coyote (*Canis latrans*), Norway rat (*Rattus norvegicus)*, white-footed mouse (*Peromyscus leucopus*), house mouse (*Mus musculus*), gray squirrel (*Sciurus carolinensis*), woodchuck (*Marmota monax*), Striped skunk (*Mephitis mephitis*), eastern cottontail (*Sylvilagus floridanus*), and red fox (*Vulpes vulpes*). In addition, species which may be found along the Erie Canal include mink (*Mustela vison*), river otter (*Lutra canadensis*), and muskrat (*Ondatra zibethicus*).

The recent Breeding Bird Atlas survey (2000 to 2004) has identified 67 species that may inhabit the Lockport, NY area, including two species of special concern[8]: the sharp-shinned hawk (*Accipiter striatus)* and the golden winged warbler *(Vermivora pinus)*. It is possible that these species may utilize the Guterl Site if preferable habitat is available; although, this probability is low due to the level of anthropogenic disturbance.

Much of the Guterl Site is actively disturbed or occupied by buildings and paved areas. These disturbed sites would likely support the avifauna species that are common to urban environments (e.g., American crow, European starlings, etc.). Species adapted to more undeveloped habitats would likely be found in the wooded and emergent wetland habitats in the southwest and northwest portions of the Guterl Site, and undeveloped areas are present along the banks of the Erie Canal.

2.2.6.4 Fish

While no fish surveys were performed it is anticipated that the Erie Canal will support a diverse assemblage of fish including but not limited to: pumpkinseed (*Lepomis gibbosus*), bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), carp (*Cyprinus*

[8] As defined by NYSDEC's Natural Heritage Program website, “special concern” is defined as any native species for which a welfare concern or risk of endangerment has been documented in New York State.

carpio), crappie (*Pomoxis sp*.), sea lamprey (*Petromyzon marinus*), and brown bullhead (*Ictalurus nebulosus*).

2.3 Summary of Previous Investigations

2.3.1 Chronology and Scope of Previous Investigations

Existing data were generated under a number of previous investigations performed at the Guterl Site, dating back to 1978. USACE personnel compiled the data and conducted a preliminary evaluation of the existing data from seven of these investigations, focusing on usability for risk assessment (which is a use that typically has the most stringent data quality requirements). Earth Tech added summary information for one additional report, ORNL (1978), in the same format as the USACE summary.

Previous investigations that are summarized below include:

- *ORNL 1978 - Radiological Survey of the Former Simonds Saw and Steel Company, Lockport, New York, Final Report*, September 1978. Prepared by ORNL for United States Department of Energy. (ORNL, 1978).

- *FBDU 1981 - Preliminary Engineering and Environmental Evaluation of the Remedial Action Alternatives for the Former Simonds Saw and Steel Company Site, Lockport, New York*, November 1981. Prepared by Ford, Bacon & Davis Utah, Inc. (FBDU) for Bechtel National, Inc., for DOE. (FBDU, 1981)

- *NYSDEC 1988 - Engineering Investigations at Inactive Hazardous Waste Sites - Phase I Investigation, Guterl Specialty Steel, City of Lockport, Niagara County*, January 1988. Prepared by Engineering-Science and Dames & Moore for NYSDEC. (NYSDEC, 1988)

- *NYSDEC 1991 - Engineering Investigations at Inactive Hazardous Waste Sites - Preliminary Site Assessment, Task 1 Records Search, Guterl Specialty Steel Corporation, City of Lockport, Niagara County*, January 1991. Prepared by E.C. Jordan for NYSDEC. (NYSDEC, 1991)

- *NYSDEC 1994 - Engineering Investigations at Inactive Hazardous Waste Sites- Preliminary Site Assessment Evaluation Report of Initial Data, Guterl Specialty Steel, City of Lockport, Niagara County, Volumes I and II,* April 1994. Prepared by ABB Environmental Services (ABB-ES) for NYSDEC. (NYSDEC, 1994)

- *USEPA 1998 - Final Report, Guterl Steel Site, Lockport, New York, USEPA Work Assignment No. 2-194,* April 1998. Prepared by Roy F. Weston, Inc. for USEPA/Environmental Response Team Center (ERTC). (USEPA, 1998)

- *ORISE 1999 - Radiological Survey of the Guterl Specialty Steel Corporation*, Lockport, New York, December 1999. Prepared under a contract with DOE by Oak Ridge Institute for Science and Education (ORISE) for United States Bankruptcy Court for the Western District of Pennsylvania. (ORISE, 1999)

- *NYSDEC 2000 - Immediate Investigative Work Assignment (IIWA) Report for the Unlisted Guterl Excised Area*, City of Lockport, Niagara County, October 2000. Prepared by NYSDEC. (NYSDEC, 2000b)

A summary of the data contained in each of these reports, as well as the preliminary conclusions regarding the usability of the data, taken from the USACE summary report (USACE, 2005b), is presented below. A summary of the analyses performed and referenced in these reports, with more details on the sample quantities and analyses of each sample type is presented in Table 2-6. The USACE summary

report did not include a review of the ORNL (1978) report or data; the assessment and data compilation for that report was prepared by Earth Tech.

The following documents include historical data which formed the basis of the FSP (USACE 2007a) and subsequent onsite investigations, as well as data collected during this RI. The RI data were collected using approved quality assurance (QA) procedures as presented in the QAPP (USACE 2007b), and have been entered into a relational database. Data collected in the investigations prior to the RI (i.e., the historical data) are used qualitatively to confirm the reasonableness of the current RI data only because data quality records for the historical data were not available at the time of this report.

2.3.1.1 ORNL 1978

Radiological Survey of the Former Simonds Saw and Steel Company, Final Report, September 1978. Prepared by ORNL for DOE

This investigation report, performed under FUSRAP, included the results of a radiological survey of the Former Simonds Saw and Steel Company, Lockport, NY. The survey was conducted "to characterize the existing radiological status of the property", primarily in what is now referred to as the Excised Area. Investigations conducted in October 1976 included measurement of residual alpha and beta-gamma radiation levels in the rolling mill building and forging shop; external gamma radiation in the same area; uranium, radium, and thorium in soil samples taken from beneath removable floor plates in the rolling mill area and from other parts of the Guterl Site; radon and radon daughter concentrations in air samples in the rolling mill building; and contamination in drainage paths leading from the buildings and grounds. A few samples were also analyzed for individual uranium isotopes (^{234}U, ^{235}U, and ^{238}U) by mass spectrometry.

The data are useful for supporting the assessment of nature and extent of non-radiological contamination, focusing subsequent non-radiological investigations, and may assist in determining disposal options.

Selected figures presented in the ORNL (1978) report are reproduced in Appendix A of this report.

2.3.1.2 FBDU 1981

Preliminary Engineering and Environmental Evaluation of the Remedial Action Alternatives for the Former Simonds Saw and Steel Company Site, Lockport, New York, Former Utilized MED/AEC Sites Remedial Action Program, Final Report. Prepared by FBDU for Bechtel National, Inc. under FUSRAP, for DOE

The purpose of this report was to present the results of a preliminary engineering evaluation and the environmental assessment leading to the selection of appropriate remedial action options for the Guterl Site (formally Simonds). The investigation included analysis of cinder samples from the Guterl Excised Area (Excised Area), primarily within the 16-inch rolling mill area. FBDU also collected external gamma radiation measurements in "Building A" (equivalent to Building 8 in this RI Report and the ORISE, 1999 report) near the 16-inch rolling mill, and in "Building B" (equivalent to Building 3 in this RI Report and the ORISE, 1999 report). Test parameters included radium, thorium, and uranium. The report included analytical results with units, and sample location and depth.

The data are useful for supporting the assessment of nature and extent of non-radiological contamination, focusing subsequent non-radiological investigations, and may assist in determining disposal options.

Selected tables and figures presented in the FBDU (1981) report are reproduced in Appendix A of this report.

2.3.1.3 NYSDEC 1988

Engineering Investigations at Inactive Hazardous Waste Sites - Phase I Investigation, Guterl Specialty Steel, City of Lockport, Niagara County. Prepared by Engineering-Science and Dames & Moore for NYSDEC, January 1988

The purpose of this report was to assess the environmental hazards caused by the then-present condition of the Guterl Landfill Area (Landfill Area). Materials reportedly disposed in the onsite landfill, operated from 1962 until 1981, included slag, pelletized baghouse dust, foundry sand, wood, and miscellaneous plant rubbish. The Phase I Investigation report included results of five rounds of prior groundwater analyses, collected between 1980 and 1982 by Secure Landfill Contractors, Inc. (SLC), from the Landfill Area. Test parameters reported included oil & grease, phenols, total organic carbon (TOC), total halogenated organics, and metals. However, as discussed below, the reported analytical suite of this document did not include all of the analyses performed. The report included sample location figures, boring logs, and monitoring well construction logs.

Although the results are unlikely to be representative of current conditions due to the age of the data, they were useful for supporting the assessment of nature and extent of non-radiological contamination, focusing subsequent non-radiological investigations, and may assist in determining disposal options.

2.3.1.4 NYSDEC 1991

Engineering Investigations at Inactive Hazardous Waste Sites - Preliminary Site Assessment, Task 1 Records Search, Guterl Specialty Steel Corporation, City of Lockport, Site No. 932032, Niagara County. Prepared by E.C. Jordan for NYSDEC, January 1991

This report was prepared solely to determine the proper classification of the Guterl Site in accordance with NYSDEC regulations (i.e., to determine if hazardous waste is present at the Guterl Site [6 New York Codes, Rules and Regulations (NYCRR) Part 371] and if the waste at the Guterl Site poses a 'significant threat'). This investigation included a summary of previous groundwater analyses for samples collected by SLC from the Landfill Area from 1980 to 1982. Test parameters summarized in the report included oil & grease, TOC, total halogenated organics (as lindane), metals (chromium, copper, iron, lead, magnesium, and nickel), and phenols; however, no analyses were conducted as part of this Phase 1 Preliminary Site Assessment (PSA) (Task 1). Data from the December 1980 through April 1982 samples presented in this report are a re-statement of the same set of samples presented in the NYSDEC, January 1988 Phase I Report; however, a more complete summary is provided in the appendix to this 1991 PSA report than was presented in the 1988 Phase I report.

USACE (2005b) concluded that the data may not be usable in the risk assessment as only maximum concentrations are provided at each location; however, Earth Tech notes that a more complete summary is provided in Appendix D of the report (NYSDEC, 1991), which includes all the parameters and all the events, including reporting limits for non-detects. (Appendix D indicates that analyses were performed, including lindane, oil and grease, and other metals.)

In addition, Earth Tech notes that the data presented in the report were from samples collected between 1980 and 1982 (more than 25 years ago); as such, the data are unlikely to be representative of current conditions. The data are useful for supporting the assessment of nature and extent of non-radiological contamination, focusing subsequent non-radiological investigations, and may assist in determining disposal options.

2.3.1.5 NYSDEC 1994

Engineering Investigations at Inactive Hazardous Waste Sites- Preliminary Site Assessment Evaluation Report of Initial Data, Guterl Specialty Steel, City of Lockport, Niagara County, Volumes I and II. Prepared by ABB-ES for NYSDEC, April 1994

The purpose of this report was to establish the presence of hazardous waste at the Guterl Site and to determine if the Guterl Site posed a significant threat to public health or the environment. Specifically, the investigation was performed to develop data to reclassify the Guterl Site from a Class 2a to a Class 2 hazardous waste site.

This investigation included analysis of surface and subsurface soil, surface water, sediment, groundwater, and waste from the Landfill Area. Analytical parameters included volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and toxicity characteristic leaching procedure (TCLP). Groundwater and surface water samples were also analyzed for gross alpha and gross beta activity. A survey for gamma radiation was conducted over the Landfill Area (228 grid points on a 33.33-ft spacing). In addition, split-spoon samples were scanned for alpha, beta, and gamma radiation using a survey meter. The report included chain-of-custody (COC) forms, analytical results with units, detection limits, data qualifiers, analytical methods, equipment calibration records, and sample location and depth.

USACE (2005b) concluded that these data may be usable in a risk assessment; however, this RI addresses only radiological constituents. Data for chemical analyses (i.e., non-radiological) were validated by the contractor (ABB-ES); however, the laboratory data for gross alpha and gross beta radioactivity for groundwater and surface water samples were not validated. As a result, the radiological data are not considered useful for current or future data needs. The chemical data may be useful for supporting the assessment of nature and extent of non-radiological contamination, focusing subsequent non-radiological investigations, and may assist in determining disposal options.

2.3.1.6 USEPA 1998

Final Report, Guterl Steel Site, Lockport, New York, USEPA Work Assignment No. 2-194. Prepared by Roy F. Weston, Inc. for USEPA/ERTC, April 1998

The purpose of this investigation was to conduct *in situ* surficial, and *ex situ* subsurface soil analyses for target metals using x-ray fluorescence (XRF). The samples were collected within the Excised Area, inside and outside Buildings 1, 2, 3, and 4/9.[9] The samples were analyzed to evaluate the horizontal and vertical distribution of cadmium and lead (identified by the authors as primary indicators), and arsenic, nickel, and zinc (identified as secondary indicators). Additionally, shallow subsurface soil samples analyzed *ex situ* by XRF were submitted for TCLP metals analysis. Samples were also collected for PCB analysis from oil-stained areas and in the vicinity of an electric transformer.

Surficial lead and cadmium concentrations were detected in excess of the “screening level” of 400 parts per million (ppm) for lead and 200 ppm for cadmium over variable areas in each of the buildings and in the building exterior “vicinity.” TCLP analyses showed limited areas of lead exceedances per regulatory guidance (5 ppm). PCBs (Aroclor 1260) were detected in samples collected near the transformer area, but were not detected in samples collected within oil-stained areas of Building 3.

The report included COCs, analytical results with units, equipment calibration records, detection limits, data qualifiers, analytical methods, and several figures depicting sample locations (without a fixed grid system) and contaminant isopleths. Data for sample depth are present, but must be derived from COCs

[9] Building 4 and Building 9 are conjoined and are considered as one building (Building 4/9) throughout this report.

and analytical data reports. USACE (2005b) concluded that the data may be usable in a risk assessment; however, this RI addresses only radiological constituents.

2.3.1.7 ORISE 1999

Radiological Survey of the Guterl Specialty Steel Corporation, Lockport, New York. Prepared under a contract with DOE by ORISE for US Bankruptcy Court for the Western District of Pennsylvania, December 1999

The purpose of the ORISE investigation was to (1) adequately characterize the radiological status of the land and buildings areas located at the properties at the Guterl Site including the Allegheny property, and (2) to be comprehensive enough to provide both a volume and cost estimate for remedial design (RD). This work was conducted in response to a request of the US Bankruptcy Court for the Western District of Pennsylvania and with the approval of the DOE.

This investigation included analysis of surface and subsurface soil and sediment samples from the Excised Area, the landfill area, and the operating Allegheny Ludlum area (i.e., IA01, IA02, IA03, IA04A, and IA04B). The investigation also included a radiological survey of the buildings in the Excised Area. Test parameters included radium, thorium, and uranium. The report included analytical results with units, uncertainty, data qualifiers, analytical methods, and sample location and depth. Sample locations are often generalized to an item rather than a specific coordinate.

The data are useful for supporting the assessment of nature and extent of non-radiological contamination, focusing subsequent non-radiological investigations, and may assist in determining disposal options.

Selected tables and figures presented in the ORISE (1999) report are reproduced in Appendix A of this report.

2.3.1.8 NYSDEC 2000

Immediate Investigative Work Assignment Report for the Unlisted Guterl Excised Area, City of Lockport, Niagara County. NYSDEC, October 2000 NYSDEC 2000 - Immediate Investigative Work Assignment (IIWA) Report for the Unlisted Guterl Excised Area, October 2000. Prepared by NYSDEC

The purpose of this report was to determine the presence and extent of hazardous wastes at the Guterl Site. Specifically, the purpose was to determine if consequential amounts of hazardous wastes were disposed of in the Excised Area that would require the Excised Area be listed in the New York State Registry of Inactive Hazardous Waste Sites. In addition, this report evaluated the effects of the Erie Canal and the Frontier Stone Products quarry on the groundwater flow pattern in the vicinity of the Guterl Site by studying the strata underlying the Guterl Site.

This investigation included analysis of surface and subsurface soil, groundwater, surface water, and sediment samples collected from the Excised Area. Analytical parameters included VOCs, SVOCs, pesticides, PCBs, metals, and TCLP. The report included analytical results with units, data qualifiers, analytical methods, and sample location and depth. Sample COCs, equipment calibration records, and detection limits were not included in the report.

The data are useful for supporting the assessment of nature and extent of non-radiological contamination, focusing subsequent non-radiological investigations, and may assist in determining disposal options.

Selected tables and figures presented in the NYSDEC (2000b) report are reproduced in Appendix A of this report.

2.3.2 Use of Investigative Areas for Data Management

As noted in Section 1.2, the concept of developing IAs to better manage the assessment of existing data and future data needs was introduced. The list of IAs was used during the data gap analysis phase to provide manageable units for data organization and summary; that is, each matrix was evaluated for data gaps in each IA. The list of IAs was refined during the preparation of project plans to provide better investigative flexibility.[10] The organizational benefit of developing IAs is demonstrated by developing a correlation between the Conceptual Site Model (CSM) and data gap analysis. These IAs were also useful for developing exposure units (EU) for risk assessment purposes.

Figure 1-3 depicts the Guterl Site IAs.

2.3.3 Summary of Historical Data by Matrix

The DGAR provided a summary and assessment of existing data for usability in the RI/FS. Refer to the DGAR for summary tables and figures of data collected during previous investigations.

The following subsections summarize the conclusions of the DGAR by matrix. The discussion presents data collected during previous investigations, the resultant data gaps identified, and additional data acquisition recommended for further consideration during development of the RI field sampling plans. That is, the information summarized below, and reported in the DGAR, represents pre-RI information that was considered during design of the FUSRAP RI sampling plans.

2.3.3.1 Summary of Historical Building Data

The “building surfaces” medium surveyed by prior investigators included exterior and interior building surfaces (including walls, floors, and structural surfaces), and manufacturing components (e.g., forges, baths, etc., that remain in the buildings). Two of the current IAs include buildings and building surfaces. These IAs include buildings within the Excised Area (IA01) and buildings in the Allegheny Ludlum operations area (IA04B/IA04D). The summary of available data and data gaps for building surfaces in each of these areas are discussed separately below.

2.3.3.1.1 Contamination and Data Gaps Indicated by Prior Investigations

IA01 – Excised Area (Including Building 24). Prior investigators (FBDU, ORNL, and ORISE) reported radiological contamination (^{238}U, ^{235}U, ^{234}U, or ^{232}Th) in most of the buildings in IA01. No contamination was reported in Building 35; and contamination in Building 1 and Building 2 was generally limited to small, isolated areas. The northern part of Building 24 was also relatively free of radiological contamination. However, as summarized below and discussed in greater detail in the DGAR, the adequacy and completeness of the characterization of the extent or absence of contamination varies by building (and by areas and media within individual buildings).

During previous investigations, sampling in most of IA01 was not based on a formal site-wide grid and did not provide sufficient density of coverage in all areas to meet the current project objectives. In addition, the ^{232}Th screening level used by ORISE was higher than that considered for this RI. Reporting limits for isotopic analyses were generally adequate (i.e., were sensitive enough to meet the provisional proposed screening levels of this RI). The ORISE data indicated that radioactivity was not 'removable' and therefore decontamination of structures was not likely to be feasible. Building 1 was not surveyed adequately due to safety considerations and the flooded condition of the basement. The survey of Building 5 was described as 'minimum' due to structural concerns and accumulated debris. No residual contamination (based on screening) was reported by ORISE in Buildings 5 and 35; however, no isotopic samples were

[10] IA01 through IA08 were developed during the TPP/data gap analysis phase. Addition of IA09 and IA10, and breakout of IA05 and IA04 into subunits, was done during FSP development.

collected in these buildings. Buildings 2, 3, 6, and 8 (initially Class 3) were re-surveyed as Class 1; coverage appears adequate but only Buildings 6 and 8 were surveyed on a site-specific grid. Not all the floor plates were removed during the survey in Building 6; therefore contamination under the plates required further assessment in many areas. Information on the extent of the survey in the northern part of Building 24 (24N) that is currently used for storage by Allegheny was lacking.

IA04B and IA04D – Area of Active Allegheny Ludlum Operations. There were no historical data with regard to contamination of buildings in IA04B and IA04D; these buildings were apparently assumed to be uncontaminated. The interior of Buildings 14 and 37 (in the Class 3 area) were not surveyed in the ORISE investigation; history and exterior screening suggest presence of MED/AEC-related constituents was unlikely. No screening or sampling data were located for the current office building (Building 17, part of which was formerly used as a metallurgical laboratory).

2.3.3.1.2 DGAR Recommended FUSRAP RI Data Collection

IA01. The following list provides a summary of DGAR-recommended data collection for the FUSRAP RI for the Excised Area buildings:

- Building 1 - resolve safe access issues; resurvey Work Room at south end as Class 1; conduct initial survey of flooded basement as Class 3.
- Building 6 - survey under floor plates.
- Building 8 - additional survey optional; existing data may be sufficient to delineate impacted areas to within ±5 meters (m).
- Building 5 - resurvey as Class 3 area.
- Building 24 (North) - resurvey as Class 3 area.
- Buildings 2, 3, and 4/9 – existing data appear adequate, subject to general confirmation.
- General - existing data for equipment and structures above 2 m are inadequate; a more comprehensive survey is needed. In addition to the building-specific recommendations, confirmation re-sampling at 5 to 10 percent of ORISE frequency is recommended. Document gamma exposure measurement locations and add measurements and samples to evaluate current screening values.

IA04B and IA04D – Area of Active Allegheny Ludlum Operations. Screen current office building (use Class 3 criteria to establish program).

2.3.3.2 Summary of Historical Surface and Subsurface Soil Data

Surface and subsurface soils evaluated by prior investigators included Excised Area interior soils (IA01), Excised Area exterior soils (IA02), Landfill Area soils (IA03), Allegheny Ludlum operations area soils (IA04A and IA04B), and a portion of the railroad right-of-way north of the Guterl Site (IA05A). Prior investigations did not include areas this RI has identified as IA04C, IA04D, the northern portion of IA05A, IA05B, and IA10; therefore, the absence of surface soil and subsurface soil data for these areas represents a data gap by definition.

2.3.3.2.1 Contamination and Data Gaps Indicated by Prior Investigations

IA01 – Excised Area (Including Building 24). Not all the floor plates were removed during the ORISE survey in Building 6; therefore, contamination under the plates was not assessed in many areas. Additionally, subfloor samples were not collected from Building 24.

IA02 - Excised Area (Building Exterior Areas). ORISE reported radiological contamination in soils at various locations within the Excised Area. Areas identified as contaminated included areas directly west of Buildings 24 and 6/8, the area between Buildings 2 and 3, a portion of the small courtyard east of Building 5, and areas west of Building 2 and north of Building 1 in the general area below the former railroad tracks.

The exterior portion of the Excised Area was radiologically surveyed by ORISE using a site-specific grid, but the grid used was not tied to the New York State Plane Coordinate System. The extent of MED/AEC-related constituents (horizontal and vertical) was roughly established, although the sample density may not be sufficient for full delineation of impacted (contaminated) areas. Some contamination found was associated with firebrick and pieces of radioactive metal.

IA03 – Landfill Area. The presence of radiological contamination in subsurface soils in IA03 was not confirmed, with the exception of a limited area at the northeast corner of the Landfill Area. This area is a NYSDEC inactive hazardous waste site (NYSDEC, 2003), and as such NYSDEC has conducted several studies of this area. The chemical (non-radiological) sampling and analytical data are adequate for non-radiological data uses (e.g., planning for investigative derived waste management).

Surficial radiological data included isotopic analyses of soils which were determined to be adequate except in the northeast corner of the landfill. Subsurface data in the Landfill Area are inadequate, as MED/AEC-related constituents may have been moved (and buried) as a result of later activities (landfilling, mining, and covering). NYSDEC excavated test pits and conducted borings in areas outside of the northeast corner, but samples were only field screened for radiological contaminants (i.e., not sent for laboratory analysis). Subsurface radiological data are inadequate, as ORISE subsurface data (boreholes) were obtained only from locations with evidence of surficial contamination.

Samples in the southern part of the landfill, from the marshy area, were also collected and analyzed by NYSDEC for chemical parameters; these samples were reported as ‘surface water’ and ‘sediment’ samples.

IA04A, IA04B, IA04C, IA04D – Allegheny Ludlum operations area, not including Excised Area, Landfill Area, or Building 24. Radiological contamination was reported by ORISE at several areas within IA04A. These areas included a moderate-sized area northwest of Building 38 (east of the landfill), several smaller areas north of Building 37 (east of Building 38), and a larger area north of the Excised Area.

Surficial radiological data coverage is insufficient in some parts of the Allegheny Ludlum operations area (e.g., IA04C and IA04D). Subsurface data are inadequate, as subsurface data (boreholes) were obtained only from locations with evidence of surficial contamination in IA04A and IA04B. No subsurface data were found for buildings within IA04B (IA04D buildings pre-date MED/AEC support performance period).

IA05A, IA05B – Railroad Right-of-way North of Site Proper. NYSDEC performed an Ultrasonic Ranging and Data Screening system (USRADS) survey in the southern end of the former railroad right-of-way (NYSDEC, 1999) (see Appendix A). The survey identified areas of elevated radiological activity in the southern end of IA05A contiguous with IA03 and IA04A. The report indicates that elevated levels of thorium were detected in this area. Therefore, it is suspected that there are, as a minimum, discrete areas of contamination in IA05A.

There are no specific data indicating contamination in IA05B soils. Historical aerial photo review also did not show land disturbance in this area.

IA10 – Lot 7.1. No surface or subsurface data were located for this parcel.

Other Data Gaps - Background. Only limited background data for naturally-occurring radiological material were located for this report. As radiological criteria are normally based on exceedances of naturally-occurring background for a given site or area, accurate delineation of impacted areas cannot be performed without adequate data to establish local naturally-occurring background radiation levels.

2.3.3.2.2 DGAR Recommended FUSRAP RI Data Collection

IA01 – Excised Area (Including Building 24). The following list provides a summary of DGAR-recommended additional data collection for soil within the buildings for the FUSRAP RI:

- All buildings – Confirm prior investigators existing data by repeating a percentage of previously completed locations; collect surface soil data where prior coverage is inadequate for FUSRAP RI goals; and, collect subsurface data where only surface data exists.

- Building 24 (North) - Conduct limited subsurface sampling (coring) to evaluate possible sub-floor contamination.

IA02 - Excised Area (Building Exterior Areas). Correlate previous local sample grid coordinates to the New York State Plane Coordinate System. Conduct limited re-sampling of surface and subsurface locations to confirm ORISE data. Collect gamma readings at 1 m above sample grid nodes.

IA03 – Landfill Area. Evaluate potential subsurface contamination in area used for fill (excludes the marshy area) using DPT sampling and onsite screening. Additional intrusive investigation (test pits) may be useful in the northeast corner (where MED/AEC-related constituents, specifically thorium, have been identified). Additional surficial soil samples should be collected from the western and southern perimeter of the Landfill Area for radiological parameters to account for the possible overland migration of MED/AEC-related constituents during times the landfill was active or mined. Wetland delineation may be needed if MED/AEC-related constituents are found in the western or southern part of the Landfill Area.

IA04A, IA04B, IA04C, IA04D – Allegheny Ludlum operations area, not including Excised Area, Landfill Area, or Building 24. Conduct DPT sampling and onsite screening for surface and subsurface soil throughout Class 1 and Class 2 Areas (may need to add limited sampling in Class 3 areas), on systematic surveyed grid.

IA05A, IA05B – Railroad Right-of-way North of Site Proper. Based on evaluation of NYSDEC (1999) USRADS screening data, design and conduct a screening investigation, focused on, but not limited to, areas with evidence of historical disturbance. Private owner (Lombardi) disturbance of soils at boundary is a complicating factor.

IA10 – Lot 7.1. Include Lot 7.1 in subsurface soil sampling program. Assess berms along east and south sides of property generated during Lombardi property site development/activities.

Other Data Gaps - Background. It is recommended that a sufficient number of background samples be collected from appropriate locations and analyzed for COPCs as part of any future investigations.

2.3.3.3 Summary of Historical Surface Water/Sediment Data

For the purposes of the FUSRAP RI, surface water and sediment occurring within the Landfill Area (IA03) and the Erie Canal (IA09) are considered "native" surface water and sediment. There were no radiological data for native surface water or sediment available from prior investigations data

The data gap analysis also considered the availability of radiological data for non-native surface water and non-native sediment located within site utilities (i.e., IA08 including samples collected within the boundaries of IA01, IA02, and IA04). The IA08 media are considered to be aqueous phase and non-aqueous phase samples; i.e., they are not considered native surface water and sediment samples.

2.3.3.3.1 Contamination and Data Gaps Identified by Prior Investigators

IA03 – Landfill Area. No radiological contamination has been indicated to date in surface water or sediment; however, data for these media are very limited. As noted in Section 2.3.1.5 and Section 2.3.1.8, samples from the marshy area in the southern part of the landfill were also collected and analyzed by NYSDEC for chemical parameters.

IA08 - Site Utilities (Sewers and Drains). Radiological contamination exceeding the ORISE screening levels and FSP-proposed screening levels was reported in some of the samples analyzed by ORISE, including equipment or trenches in Buildings 3 and 8. The DGAR noted that these data suggest that the residual materials in the production area floor trenches are a concern.

Five trenches (in Buildings 3 and 8) and an oil-water separator between Buildings 2 and 3 were sampled by ORISE (1999) for radiological contaminants. NYSDEC (2000b) states that a surface water sample was collected from a sewer line in Building 3 (within the Excised Area), and the sample was submitted for radiological analysis, but the results were not included in the investigation report. Otherwise, very limited data exists relative to the sewers, drains, and trenches. Plant-wide utility drawings were made available during FSP development; however, the drawings only showed water lines.

IA09 – Erie Canal. No data were located for surface water or sediment samples associated with the Erie Canal. Historical data states that an oil/water separator with an overflow to the Erie Canal existed near the Erie Canal; it is possible that MED/AEC-related constituents were present in water that may have been discharged to the Erie Canal via an overflow outfall.

2.3.3.3.2 DGAR Recommended FUSRAP RI Data Collection

IA03 – Landfill Area. Additional surface water/sediment samples should be collected from the western and southern perimeter of the Landfill Area to account for the possible overland migration of MED/AEC-related constituents during times the landfill was active or mined.

IA08 - Site Utilities (Sewers and Drains). Continue to locate, acquire, and evaluate utility drawings. Evaluate various techniques (geophysical and others) to locate sewer lines, drains, and trenches. Sample residuals (water and solids remaining in lines, basins, lift stations, separators, etc.) and materials of which sewers/drains are constructed.

IA09 – Erie Canal. Locate the former oil/water separator and industrial water intake southeast of Ohio Street near Erie Canal, and collect surface water/sediment samples. Collect surface water/sediment samples from within Erie Canal upgradient, downgradient from the Guterl Site.

2.3.3.4 Summary of Historical Groundwater Data

Side-wide groundwater is treated as a separate investigative area (IA07). IA07 consists of groundwater present within the unconsolidated overburden and the uppermost bedrock zone at the Guterl Site.

2.3.3.4.1 Contamination and Data Gaps Indicated by Prior Investigators

IA07 - **Site-wide Groundwater**. No sampling for radiological contamination has been conducted other than a screening analysis by NYSDEC at the landfill; alpha radioactivity was reported to exceed NYSDEC groundwater standards at one location.

As noted above, only limited data are available from monitoring wells and there are no current ongoing sampling programs. Prior to this RI, there were five overburden monitoring wells present and only at the perimeter of the Landfill Area (IA03); and 25 bedrock monitoring wells existed at reasonably well distributed in locations in IA03, IA04A and IA04B. The pre-FUSRAP RI network of wells presents data gaps north of IA04A and south of the operating facility. The existing monitoring well network is not adequate to delineate groundwater occurrence or flow direction in the overburden, but may be adequate for the same purposes in the shallow bedrock.

In addition, as many as three of the five overburden wells at the landfill may need to be replaced due to inadequacies in their initial construction (i.e., installed prior to current standards).

2.3.3.4.2 DGAR Recommended FUSRAP RI Data Collection

IA07 - **Site-wide Groundwater.** Evaluate the condition of the existing monitoring wells. Replace as needed (may include three of the five landfill wells) and install additional overburden and bedrock wells to obtain an adequate network for hydraulic and chemical monitoring. Conduct two rounds of sampling (focused on radiological contaminants).

2.4 Conceptual Site Model

A physical-setting CSM has been developed to organize the data evaluation process, and to evaluate the impacts of MED/AEC support operations at the Guterl Site on the distribution, and potential fate and transport mechanisms of MED/AEC-related constituents. Figure 2-14 represents the physical-setting CSM for the Guterl Site.

The physical-setting CSM helps identify and visually organize factors associated with physical setting on potential exposure pathways and receptors. The basic elements of the physical-setting CSM are:

- Contamination Mechanism (Rolling Mill Operations, Disposal Practices, Spills)
- Source Media (Building Surfaces and Surface Soil)
- Transportation Mechanisms (Wind, Surface Water Runoff/Sewers and Drains, Leaching, and Land Disposal/Disturbance)
- Physical Features of the Study Area (Land Development, hydrology, surface water, geology, hydrogeology, groundwater)
- Matrices of Interest (Building Surfaces, Soil (Surface and Subsurface), Surface Water/Sediment, and Groundwater)
- Exposure Routes (Ingestion, Dermal Contact, Inhalation (Fugitive Dust), External Radiation, and Ingestion of Produce)
- Current and Future Human Receptors (Trespasser, Future Onsite Worker, Future Construction Worker, and Future Resident)

Additional discussion regarding the above bulleted items may be found in Section 5, which describes the various fate and transport mechanisms, and Section 6.3, which details the routes of exposure and the current and future human receptors.

2.5 Project Goals (DQOs)

The goal of the Guterl Site RI was to generate data of known and sufficient quality and quantity, with quantitation levels low enough to meet pertinent standards, ARARs, and remediation goals, with the long-term objective being the selection of a protective remedy under CERCLA. To achieve this, it was necessary to obtain data that are sufficient to determine nature and extent, fate and transport, and risk of contaminants in a RI, conducted utilizing CERCLA guidance (USEPA, 1988b). A secondary objective of this data collection was to produce data sufficient to develop an adequate volume estimate of contaminated media, as well as to assist in the development of project cost estimates, to support the feasibility study. The data will also be used to identify appropriate disposal facilities for wastes generated during site investigation activities and during remedial action (RA).

A preliminary identification of DQOs and ARARs is presented in the report *Preliminary Identification of Data Quality Objectives and Applicable, Relevant, and Appropriate Requirements, Former Guterl Specialty Steel Corporation FUSRAP Site* (USACE, 2005c).

As part of the planning phase for the Guterl Site RI, a TPP Meeting was conducted August 9 and 10, 2005 as discussed in Section 1.2.1. The purpose of the TPP Meeting was to gather the project stakeholders for informational discussions, and to begin development of site-specific project DQOs for the RI. A total of 21 project DQOs were developed for the RI during the TPP Meeting, and are summarized in the *Data Gap Analysis Report* (USACE, 2006a).

Several of the project DQOs were accomplished prior to development of the FSP and QAPP, or were not directly applicable to the RI field data collection and management program. The project DQOs that were determined to be directly applicable to the RI data acquisition phase are listed below and discussed in more detail in Table 2-7. The project DQOs applicable to this RI include (numbering as presented in the FSP [USACE, 2007a]):

Overarching Objectives:

1. Determine the nature and extent of MED/AEC-related constituents present at the Guterl Site (i.e., uranium, thorium, and radium[11] and the media and locations in which they are present).
2. Acquire information to define the fate and transport of contaminants from the Guterl Site.
4. Provide sufficient characterization data to allow completion of subsequent FS, RD, and RA.

Operations:

6. Identify the underground utility system within the Guterl Site, including if possible, utilities in place at the time of AEC contracted efforts and utilities installed after the AEC contracted efforts. Includes both between building and within building utilities.

Nature and Extent:

9. Define nature and extent of isotopic uranium, thorium, and radium in surface soils, subsurface soils, and buildings to support risk assessment (using Nuclear Regulatory Commission (NRC)

[11] Radium was not included in the constituent list developed during the TPP Meeting, but was added to the list of COPCs during development of the FSP in response to further technical evaluation of the Site. This note applies to each of the project DQOs where radium is listed.

screening levels for human health and DOE guidance for ecological [DOE, 2002]) and development and evaluation of FS alternatives (volume determination).[12]

10. Determine whether groundwater has been impacted by isotopic uranium, thorium, and radium above screening levels; and if so, determine nature and extent to support risk assessment, and development and evaluation of FS alternatives.
11. Determine whether surface water and sediments have been impacted by isotopic uranium, thorium, and radium above screening levels.
13. Determine if isotopic uranium, thorium, and radium has contaminated underground utilities.

Risk Assessment/Feasibility Study:

14. Determine the magnitude of any comingled chemical contamination to support establishing transportation and disposal requirements (e.g., waste classification) and associated costs to be included in various FS alternatives.
15. Conduct an inventory of building content/structures to support FS alternatives and evaluations.
19. Gather sufficient data to complete a Baseline HHRA for human health and a SLERA.

2.6 Identification of Analytical Methods and Procedures to Achieve DQOs

The analytical methods selected for the Guterl RI are shown on Table 2-8. Details on how many of which analyses were planned for the various media are provided in the FSP (USACE, 2007a); assessment of project completeness goal is discussed in Appendix B. This section briefly discusses the rationale for selecting the methods during development of the site-specific QAPP (USACE, 2007b).

The DGAR (USACE, 2006a) identified a lack of isotope-specific radiological data as one of the principal data gaps for the Guterl Site. Guterl Site. COPCs were initially identified as isotopic thorium (^{232}Th, ^{230}Th, and ^{228}Th) and isotopic uranium (^{238}U, ^{235}U, and ^{234}U). Because ^{228}Ra (radium) is an important daughter product of ^{232}Th decay, ^{228}Ra data were needed for risk assessment as well as for investigation derived waste (IDW) characterization; therefore, analyses for isotopic radium were added to the project plans. A limited number of analyses for uranium isotopes by inductively coupled plasma – mass spectrometry (ICP-MS) were also conducted to evaluate the possible presence of enriched or recycled uranium.

To maximize efficiency while generating sufficient defensible data, a tiered analytical approach was planned for soil samples. The FSP required that all recovered soil samples would be initially screened in the onsite core scanner with up to three selected samples analyzed by gamma spectroscopy in the onsite laboratory. A subset of these onsite gamma spectroscopy samples would then be submitted to the offsite laboratory for gamma spectroscopy and/or alpha spectroscopy, and ICP-MS. Samples of other media (e.g., groundwater, surface water, sediment, and building materials) were not amenable to onsite screening and would only be analyzed at the offsite laboratory.

2.6.1 Radiological Methods (Onsite Laboratory)

As noted in Section 2.6, the first planned step for assessment of soil samples included onsite screening using an automated core scanner. The core scan data were then reviewed to identify which soil samples (intervals) from any individual core were to be analyzed for COPCs by the onsite gamma spectroscopy laboratory; generally, three six-inch intervals from each core were planned for onsite gamma spectroscopy analysis. A flow chart showing the onsite gamma spectroscopy decision tree is provided as Figure 2-15. Details associated with the onsite radiological analyses are provided in Section 3.2 of this report.

[12] Since these elements are naturally occurring, a background concentration was established for each radioisotope. The background concentration for each was added to the appropriate NRC-provided screening level to derive an effective (working) screening level for RI purposes.

In addition to screening soil samples onsite, the FSP also allowed for analysis of swipe samples associated with the radiological survey of Excised Area buildings in the onsite laboratory (see Section 3.3.2.2 for additional swipe counting method detail). Analysis of the swipe samples in the onsite laboratory allowed for real-time data assessment with respect to planning subsequent steps of the radiological building surveys.

2.6.2 Radiological Methods (Offsite Laboratory)

In addition to onsite screening of soil samples, offsite analyses of soil, surface water, sediment, groundwater, and building material samples were also designated by the FSP/QAPP. The broad categories of radiological analyses performed by the offsite laboratory include (not every method was planned for every sample):

- Isotopic uranium, thorium, and radium COPCs by gamma spectroscopy (soil and IA08 sediment samples)
- Isotopic uranium and thorium by alpha spectroscopy (aqueous and non-aqueous samples)
- ^{226}Ra and ^{228}Ra by modified USEPA methods 903.0/904 (aqueous and non-aqueous samples)
- Gross alpha and beta radiation (groundwater and select soil samples)
- Isotopic uranium by SW-846 method 6020 (ICP-MS) (select soil samples)

Total uranium (non-isotopic) concentrations for risk assessment purposes (to assess the chemical toxicity of uranium) and also to assess compliance with the groundwater criteria for total uranium will be derived (calculated) from the alpha spectroscopy results for isotopic uranium.

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3.0 REMEDIAL INVESTIGATION ACTIVITIES

The purpose of this section is to provide a description of the RI activities completed by Earth Tech on behalf of USACE between June 2007 and December 2007. In general, remedial investigation field activities were performed in accordance with the FSP, QAPP, RPP, SSHP, and GWSP. On occasion, field conditions were different than anticipated and modifications to the project plans were necessary. Prior to making any modifications to the approved plans, USACE technical personnel were consulted for approval. A summary of deviations from the approved FSP is presented in Table 3-1.

3.1 Site Management and Control

Earth Tech completed a Daily Quality Control Summary Report (DQCSR) for each work day to document personnel and subcontractors present, equipment used, work performed including samples collected, quality control activities, health and safety activities and any other noteworthy occurrence. DQCSRs are provided in Appendix B.

Workers and visitors to the Guterl Site were required to sign the register at the Allegheny Ludlum main gate upon entering and exiting the Guterl Site. Prior to initiating work each day, a tailgate health and safety meeting was conducted to discuss the scope of work for the various crews and potential safety issues, suggestions, or requirements to minimize risk to workers or visitors to the Guterl Site. Attendees of the daily health and safety meeting were required to sign the Daily Safety Meeting Log, which was prepared by the health and safety officer and summarized scope of work, SSHP and Task Hazard Analysis (THA) review, SOP review, personal protective equipment (PPE) requirements, and incident review and safety alerts.

During the course of the RI, photographs of various activities being performed at the Guterl Site were collected. A log of the photos and an electronic version of the record photos are presented in Appendix C.

3.2 Mobilization Activities

3.2.1 Civil Survey

The following list summarizes the major activities associated with establishing site survey control during the RI field work:

- Civil surveys were performed by URS Corporation (Buffalo, New York). Site civil survey was performed by a NY State licensed surveyor whose surveyor's license was current and active throughout the term of performance of the project.
- Site civil survey locations were tied to New York State Plane Coordinate System (West Zone).
- Property boundaries were determined using available public information and were established during the Guterl Site mobilization activities; i.e., prior to characterization activities to ensure RI work was conducted within the areas with rights of entry.
- Two permanent benchmarks referenced to the New York State Plane Coordinate System (West Zone) were established on the Guterl Site. The control points were located in the area of the Allegheny Ludlum main gate – one outside the gate and south of the security building, and one inside the gate and north of the security building. The local site grid for RI investigations was tied to the reference benchmarks to ensure locations could be re-established in the future, if necessary.
- A site-wide reference coordinate system was established and was tied to the New York State Plane Coordinate System (West Zone).

  - The outdoor site-wide reference coordinate system had the origin located at the southwest corner of Building 4/9.

  - The outdoor reference coordinate system was established as 20-meter grid squares oriented and designed similarly to the local site grid used by ORISE (1999), including use of the same origin (southwest corner of Building 4/9) to optimize re-use of the ORISE data set.

  - Indoor reference grid systems were established in accordance with Earth Tech San Antonio Radiation Safety Group SOP 007, *Grid Systems and Surveys.* The basic grid system for building interiors was 1 meter.

- Location surveys were conducted for each new groundwater monitoring well, soil boring, and other sample location installed as part of this RI. In addition, pre-existing monitoring well locations were surveyed to establish a single reference system for all wells. Horizontal locations were referenced to North American Datum (NAD) 83 and vertical elevations were referenced to National Geodetic Vertical Datum (NGVD) 88.

  - Groundwater monitoring wells were surveyed at the top of the well riser (notched point), top of the protective casing, and the ground surface (north side ground surface, not the pad surface). All elements were surveyed to an accuracy of 0.01 feet.

- A topographic survey using a 1 ft contour interval was completed for the Guterl Site (Figure 3-1). Scale drawings of the survey areas were developed that indicate facility features, monitoring well locations, soil boring locations, and other pertinent data (e.g., catch basins, etc.).

During the performance of the GWS, the use of a portable Global Positioning System (GPS) unit was utilized in outdoor areas to establish the location of the GWS instrument during the performance of the survey. The GPS unit was accurate to within approximately one meter.

3.2.2 Utility Clearance for the Guterl Site Investigations

Utility clearance surveys were conducted prior to performing intrusive activities at the Guterl Site. In accordance with the FSP, Dig Safely New York (1-800-962-7962) was contacted to clear public utilities in rights-of-way and adjacent areas. Geomatrix (Amherst, NY) performed geophysical surveys at boring locations within IA04B (Allegheny Ludlum Property - Area of Active Allegheny Ludlum Operations) and IA04D (Allegheny Ludlum Property - Area South of IA02). Existing Allegheny Ludlum engineering drawings and plant personnel were also referenced or contacted, where and when available, to provide additional information with respect to the location of utilities.

Geomatrix mobilized to the Guterl Site during August 2007 for geophysical surveys at FSP-planned boring locations and during October 2007 for geophysical surveys at delineation soil boring locations. Geomatrix utilized ground penetrating radar and electromagnetic geophysical methods to locate site utilities near boring locations in IA04B and IA04D. Appendix D contains the geophysical survey reports produced by Geomatrix.

3.2.3 Vegetative Clearing for Guterl Site Investigations

Prior to conducting RI field activities, grasses, scrub brush, and trees of less than 3-inch diameter in outdoor areas were mowed and/or cleared to facilitate performance of the gamma walkover survey and to provide access to RI boring locations. Clearing was performed with hand-held tools in difficult access areas (e.g., in alleyways between buildings, close to fences, etc.), a mower mounted on a skid-steer loader in limited areas (e.g., around buildings in IA02), and using a “Hydro-Axe” power mower mounted on a rubber-tire front loader in IA03, IA04A, IA04C, IA05A, and IA05B. Due to limited availability of the

Hydro-Axe equipment, clearing performed with this piece of equipment was carried out during several mobilizations between July and September 2007.

Clearing debris generated using hand tools was hand-carried out of the work area and stacked in a secure location within the Excised Area. Clearing debris generated using mechanical equipment was shredded by the mechanical equipment and therefore required no further handling. In IA04A, IA04C, IA05A and IA05B clearing was directed around stands of trees greater than 3-inches in diameter, and around miscellaneous hard fill. In IA05A, clearing was also directed around areas of encroachment by neighboring land owners (equipment staging, debris piles, junk automobiles, etc.).

3.2.4 Excised Area Buildings Assessments

Earth Tech conducted a structural survey of the Excised Area buildings (IA01/IA02) in February 2006 for the purpose of assessing whether the buildings were sufficiently stable for Earth Tech personnel to conduct RI-related investigations without undue risk associated with the condition of the buildings. Earth Tech determined that the structural condition of the buildings was sufficient for RI-related investigations to proceed without undue risk associated with the structural integrity of the buildings. Information associated with this survey was incorporated into the SSHP (USACE, 2007c).

In accordance with the SSHP, a walk-through of the Excised Area buildings was performed during mobilization to mark out physical hazards such as open pits or trenches, weak flooring, or low-hanging utilities (e.g., steam lines) in the buildings. Areas of concern were flagged with yellow caution tape and/or physical barricades, and routes of foot traffic and equipment mobilization were established away from these areas to the extent practical.

A survey for potential asbestos-containing materials (ACM) was also conducted during RI mobilization activities. The presence of potential ACM in the Excised Area buildings was identified and an asbestos air monitoring program was implemented to determine the appropriate health and safety requirements for RI-related investigations in the Excised Area buildings. All of the air sample results came back below the Occupational Safety and Health Administration (OSHA) permissible exposure limit and the clearance levels established by the USEPA (i.e., based on the air sample results, the workers performing RI-related investigations would not be exposed to asbestos concentrations in excess of permissible OSHA or USEPA levels). Earth Tech's internal communications and associated air monitoring data are presented in Appendix E.

The intent of the activities within the building was to identify radiological contamination and not to disturb ACM within the buildings; therefore, RI-related activities were not considered appropriate to characterize the RI as an asbestos project. However, RI field investigation personnel were required to complete a two-hour asbestos awareness course as they would be working around asbestos. The asbestos awareness training was provided by Niagara County Community College (Lockport, NY) to any RI field investigation personnel that would be required to perform work inside the Excised Area buildings.

In support of DQO 15 (Section 2.5), an inventory and volume estimate of building contents was performed to support FS alternatives and evaluations. Inventories were performed both inside and outside of Buildings 1, 2, 3, 4/9, 5, and 35. A detailed survey was not conducted in Building 6 or 8 due to elevated radiological exposure measurements; however, a sketch depicting the machinery in Buildings 6 and 8 is included in Appendix A (ORISE, 1999). A summary of the building contents survey is presented in Appendix E-2. The summary includes a table describing and quantifying inventoried features paired with associated photographic documentation and sketches. Typical materials inventoried included, but are not limited to, miscellaneous metal, wood, electrical, and paper debris, machinery, overhead cranes, and miscellaneous materials (e.g. steel rolls, wood, fire brick, and asbestos).

3.3 Radiological, Chemical, and Geotechnical Screening and Analyses

3.3.1 Decision Logic for Onsite and Offsite Radiological Analyses

Table 3-2 lists the types of radiological analyses (including ICP-MS for uranium isotopes) performed during this project along with their respective analytes. The samples analyzed by these techniques included soil, detritus, surface water, sediment, groundwater, building material, and swipe samples. A more complete description of the rationale, purpose and use of these radiological analytical techniques is provided in the following sections. In summary, data uses by method were as follows (not all COPCs were detected by each method; refer to Table 3-2 for COPCs detected by method):

- Gamma walkover survey data were used to support evaluation of COPC nature and extent.
- Ex-situ core scanning data were used to support evaluation of COPC nature and extent.
- Onsite gamma spectroscopy data were used to support evaluation of COPC nature and extent.
- Offsite gamma spectroscopy data were used to support evaluation of COPC nature and extent (except ^{238}U data as discussed in Section 3.3.3.1).
- Alpha spectroscopy data were used to support evaluation of COPC nature and extent as well as baseline risk assessment.
- Gas flow proportional counter data were used to support evaluation of COPC nature and extent as well as baseline risk assessment.
- ICP-MS data were used to support evaluation of COPC nature and extent as well as baseline risk assessment.

The GWS and core scanning are screening techniques useful for pinpointing locations or samples worthy of additional study with other techniques and, conversely, for identifying locations and samples that likely contain little or no radioactive contamination.

The onsite gamma spectroscopic analyses and offsite gamma spectroscopic analyses differed primarily in the turnaround times allowed for analyses. The onsite laboratory's purpose was rapid turnaround times to help guide field activities; little or no time was available to allow buildup of progeny (primarily radon and its progeny) that would allow the laboratory to accurately quantify radium concentrations. The offsite laboratory had time available to hold the samples for progeny buildup and so was able to report radium, in addition to thorium and uranium, concentrations.

For radioanalytical data introduced in Section 3.3.2 and Section 3.3.3, below, and further evaluated in Section 4, weighted averages were used for combining blind (field) duplicate and laboratory duplicate results for a single sample where they were available, resulting in a single value for that sample location with reduced uncertainty. For example, counting the same sample twice the same way (laboratory duplicate sample analysis) and so producing two results is equivalent to counting that sample once for twice as long if weighted averaging is used to combine the results. This takes full advantage of all laboratory results.

Weighted averages were not used to combine laboratory results for more than one analysis technique. For example, alpha spectroscopy and gamma spectroscopy results were not combined into a single value using weighted averaging.

For a set of related results x_i with uncertainties σ_i, the weighted average x and weighted average uncertainty σ for that set are given by:

$$\overline{x} = \frac{\sum_{i=1}^{n} \frac{x_i}{\sigma_i^2}}{\sum_{i=1}^{n} \frac{1}{\sigma_i^2}}$$

and

$$\sigma_{\overline{x}} = \frac{1}{\sqrt{\sum_{i=1}^{n} \frac{1}{\sigma_i^2}}}$$

3.3.1.1 Soil Sampling Locations

3.3.1.1.1 ORISE (1999) Locations

Data from prior investigations were used to provide preliminary guidance for the RI soil sampling program. The most reliable historical data were located in the ORISE report (ORISE, 1999). The ORISE sample data and location figures are presented in Appendix A. ORISE Tables 12 through 16 present surface and subsurface soil sample results. ORISE Figures 27 through 36 present the ORISE grid system and sample locations listed in the tables.

3.3.1.1.2 FUSRAP RI (2007) Locations

The initial surface/subsurface soil sample locations were based on IA-specific data evaluations to minimize duplication of sampling at the historical ORISE locations. The ORISE sample location figures are presented in Appendix A. The initial plans for RI boring locations are shown on Figure 3-2 (outdoor areas) and Figure 3-3 (indoor areas).

The FSP also was designed to incorporate, to the extent possible, prior investigation data into the real-time decision making process during the execution of the current RI. The first step in this process was to compare the preliminary GWS data and building scan data against the currently designed soil sampling locations. If the GWS or preliminary scan data identified previously unknown areas of concern, adjustments to surface and subsurface soil sample locations were made to investigate the newly identified areas.

The second step in the process was to evaluate onsite gamma spectroscopy and offsite gamma and alpha spectroscopy COPC[13] analytical data to determine whether the nature and extent of contamination had been adequately bounded. To that end, a decision-logic diagram (Figure 3-4) was developed to guide the technical team in determining appropriate locations for additional sampling.

The tolerable uncertainty for bounding contamination was set at 5 meters. For example, following the chart in Figure 3-4 and using assumed location point *G* (for greater than screening levels) and assumed location point *L* (for lower than screening levels) located more than 10 m apart, a new boring location (i.e., point *P*) would be required halfway between point *G* and point *L* to reduce the uncertainty for the limits of contamination above screening levels to less than half the distance between the two points. This process is repeated until all points *G* that are adjacent to a point *L* are less than 10 m away from that point *L* (and *vice versa*), with assumed boundaries halfway between them. The result is that boundaries between

[13] The radiological COPCs are uranium (^{234}U, ^{235}U, and ^{238}U), thorium (^{232}Th, ^{230}Th, and ^{228}Th), and radium (^{226}Ra and ^{228}Ra).

"below screening levels" regions and "above screening levels" regions are within 5-m tolerance. That is, true boundaries, wherever they are, are less than the tolerable distance (5 m) from the determined boundary, which is the intended goal of the biased sampling.

The decision logic was applied in all horizontal directions (including diagonals across a square grid). Historical radiological data (e.g., ORISE, 1999) as well as ongoing RI-generated GWS and radiological data were used together to determine whether horizontal bounding of identified contamination had been adequately determined. As the data were generated in the field they were entered into the RI sample database and were reviewed against the decision logic presented in Figure 3-4 to determine if contamination had been adequately bounded. If the contamination above FSP screening levels had not been bounded based on application of the decision logic, then new biased sampling locations were identified. The selection of sample intervals was biased by the desire to bound the specific interval(s) in question.

The number of initial planned soil-sample boring locations was 544 and the number of anticipated bounding soil-sample boring locations was 109. The actual number of initial soil borings performed was 547 and the number of bounding soil borings was 117. Actual completed soil boring locations are shown on Figure 3-5 (outdoor areas) and Figure 3-6 (indoor areas).

3.3.2 Onsite Radiological Analyses

Calibration data for each instrument used to generate onsite radiological data included in this report were obtained, reviewed, and maintained on file in accordance with the FSP/QAPP.

3.3.2.1 Onsite Core Scanner

Soil samples were collected using DPT soil sampling or conventional sampling techniques (i.e., hollow-stem auger (HSA) and split-spoon sampler driven with a 140-pound hammer). Soil samples were advanced in 0.6 m (2 foot) intervals to refusal (i.e., very hard till or bedrock).

Recovered soil cores were transported to a central location for scanning using an automated core scanner (see Appendix C for photograph). The core scanner contained two diametrically opposed 2-inch × 2-inch sodium iodide (NaI) (Tl) gamma scintillator detectors mounted in a unit with a calibrated track that advanced the core through the scanner in four-inch intervals.

Data that the automated core scanner generated were used to select intervals of a soil core for onsite gamma spectroscopy analysis for COPCs. Figure 2-15 presents the decision tree by which this was done. A complete set of core scan forms used during this evaluation is provided as Appendix F to this report.

The default soil sampling assumption was that three soil samples would be collected at each designated soil boring location including one surface soil and two subsurface soil samples; or, if no surface soil sample was able to be obtained due to the presence of non-soil materials such as concrete/brick/metal flooring or crushed stone fill, then three subsurface soil samples were collected. Specific considerations when reviewing the core scan data included:

- The same procedure was applied to both indoor and outdoor sample/boring locations.
- Soil samples segregated for onsite gamma spectroscopy analysis were derived from the section of core between about 5 cm above and 5 cm below the target 10-cm interval as follows. The core interval analyzed had a length "l" equal to 5 cm + 10 cm + 5 cm = 20 cm. The diameter of the sample core used was 6.4 cm, so the volume of this sample from the core was about $V = ¼\ \pi d^2 l = ¼ \times 3.14159 \times (6.4\ \text{cm})^2 \times 20\ \text{cm} = 640\ \text{cm}^3$. This was sufficient after vegetation and rocks were removed to provide a 500-cm^3 (500-milliliter [mL]) soil sample. The depth range was recorded for each sample.

- The FSP decision tree for selection of surface soil samples for onsite gamma spectroscopy prescribed a frequency of not less than 50 percent of soil sample locations for each respective IA distributed to account for high and low scan readings, as well as spatial coverage of the IA. However, during the initial days of the field work the project team revised the procedure to include every boring location where surface soil was present; i.e., the resulting frequency was close to 100 percent.

- The subsurface sample with the highest scan result was analyzed for COPCs at the onsite gamma spectroscopy laboratory.

- The subsurface sample, 20 cm long, from a depth greater than that of the previous sample, that the core scanner indicated to be approaching background count-rate levels (the "bounding" sample), was analyzed for COPCs at the onsite gamma spectroscopy laboratory.

- If the core scan did not indicate elevated activity, then the same vertical interval as that in the nearest sample with elevated activity was analyzed. For example, if a surface soil interval 20 m north of the subject core was above screening levels, then the surface soil interval in the subject core was analyzed.

In order to determine a reference background level core scanner count rate relative to onsite gamma spectroscopy data, 100 percent of the recovered soil samples from several of the first boring locations performed was subjected to onsite gamma spectroscopy analysis. The first borings were intentionally drilled in areas of suspected activity (i.e., GWS data and ORISE data indicating area of concern). This allowed for comparison of full-profile core scan data against full-profile gamma spectroscopy data for these several borings. As a result of this evaluation, a threshold screening level count rate of approximately 2500 counts per minute (cpm) was determined to indicate above background activity; i.e., the 2500 cpm threshold was used to guide sample selection relative to selecting the vertical bounding sample at depth.

Table 3-3 lists the number of borings and core scan intervals by IA along with the number selected for and analyzed by gamma spectroscopy.

3.3.2.2 Onsite Swipe Counting

Table 3-4 lists the building surface screening levels used for this RI.

Previous sampling by ORISE in most of IA01 was not based on a formal site-wide grid and did not provide sufficient density of coverage in all areas to meet the current survey objectives. Additionally, ORISE results indicated that radioactivity was not "removable" but was below screening levels everywhere in the buildings. Swipe tests for removable contamination were performed for verification purposes and to increase survey density.

Swipes for removable alpha and beta activity were analyzed for gross alpha and beta activity using a Ludlum Model 2929 coupled with a Ludlum Model 43-10-1 detector (before the onsite laboratory was set up) and a Tennelec LB5100 Low Background Alpha/Beta gas-flow proportional counter with automatic sample changer.

3.3.2.3 Onsite Gamma Spectroscopy Laboratory

Onsite gamma spectroscopy analyses were performed by American Radiation Services [ARS] (Baton Rouge, LA). The onsite gamma spectroscopy laboratory was used to analyze selected surface soil and subsurface soil samples for radiological COPCs. The primary purpose and benefit of the onsite gamma spectroscopy laboratory was to provide reliable near-real-time results to permit the survey team to locate and take additional samples where contamination was identified in order to ensure that the contamination

was bounded to within an appropriate distance as described in Section 3.3.2.1. The soil samples were subject to a limited amount of processing (drying and removal of rocks and large pebbles) prior to analysis in the onsite laboratory, although this processing was not as rigorous as the sample preparation techniques utilized by the offsite laboratory.

Onsite gamma spectroscopy operating procedures were provided in ARS' Laboratory Quality Assurance Manual (LQAM) and standard operating procedures (SOP). The LQAM and SOPs were submitted for USACE review and approval prior to initiation of any onsite analysis. In addition and prior to full-scale operation of the onsite gamma spectroscopy laboratory, a technical specialist based in USACE Environmental and Munitions Center of Expertise, Omaha, NE, performed an inspection and audit of the onsite laboratory. The specialist identified areas for improved sample preparation handling and analytical record keeping in ARS' field procedures and SOPs. ARS incorporated the suggested modifications to the site-specific SOPs prior to full-scale implementation of the onsite gamma spectroscopy laboratory. Formal USACE review and approval of the revisions occurred as the field program was underway.

The most appropriate data generated from the onsite gamma spectroscopy laboratory for further consideration was for the COPCs ^{238}U and ^{232}Th for the following reasons:

- ^{226}Ra and ^{235}U: The onsite laboratory gamma spectroscopy results for these COPCs are questionable because of interference between near-identical gamma-ray energies (186 kiloelectron volt (keV) and 185 keV, respectively) in their decay spectra. Holding the samples in a sealed container for several weeks to allow buildup of ^{222}Rn progeny (^{214}Pb and ^{214}Bi) that would permit determination of ^{226}Ra concentrations would have defeated the purpose of the onsite laboratory.

- ^{228}Ra: The onsite laboratory assumed that ^{228}Ra was in secular equilibrium with ^{232}Th and reported identical concentrations for both.

- ^{234}U: The onsite laboratory assumed that ^{234}U was in secular equilibrium with ^{238}U and reported identical concentrations for both.

A total of 1785 soil samples were analyzed at the onsite laboratory by gamma spectroscopy. For convenience, Table 3-5 lists all of the onsite laboratory-reported gamma spectroscopy results for ^{232}Th and ^{238}U concentrations; detailed data assessment is provided in Section 4 on an IA-by-IA basis. It is emphasized that the onsite gamma spectroscopy results do not agree with results of offsite radiological analyses for ^{238}U. The correlation of the onsite and offsite radiological analyses with respect to ^{238}U is discussed in Section 3.3.3.1 below.

3.3.3 Offsite Radiological Analyses

3.3.3.1 Gamma Spectroscopy

The FSP required that 5 percent of the onsite gamma spectroscopy soil samples (or a minimum of 100 samples, whichever was greater) should be analyzed at the offsite laboratory (Severn Trent Laboratories, Inc., [STL], St. Louis, MO[14]) by gamma spectroscopy. The purpose of the offsite gamma spectroscopy analyses was to assess comparability with the onsite laboratory. The STL-St. Louis gamma spectroscopy method is based on DOE-GA-01-R Mod; and the STL SOPs (RC-0025 for sample preparation and RD-0101 for instrumental analysis) are included in Attachment B of the QAPP (USACE, 2007b).

[14] At the time the RI Project Plans were prepared (2006/2007) and during the early phases of RI field data acquisition (summer 2007), the St. Louis, MO facility was owned and operated by STL. In September 2007, STL was purchased by TestAmerica Laboratories, Inc. As of the purchase date, the St. Louis, MO facility began operating under the TestAmerica Laboratories name. For this RI Report, the STL name will be used to minimize confusion with respect to FSP and QAPP naming conventions and supporting materials (e.g., laboratory SOPs).

A total of 138 of the 1785 soil samples analyzed in the field screening laboratory (7.7 percent) were sent to the fixed analytical laboratory for gamma spectroscopic analysis for COPCs. For convenience, Table 3-6 lists all the gamma spectroscopy results provided by the fixed analytical laboratory for the COPCs; detailed data assessment is provided in Section 4 on an IA-by-IA basis.

The soil samples that were selected for fixed laboratory gamma spectroscopy analyses were selected as a representative variety of high and low onsite laboratory gamma spectroscopy values and for vertical and horizontal distributions. The purpose of these second measurements was to obtain results from an accredited laboratory that can be used to corroborate and/or to correlate (provide a correction factor for) the field screening laboratory results.

Preliminary data review indicated poor correlation for offsite gamma spectroscopy data for ^{238}U as compared to onsite gamma spectroscopy data for ^{238}U, and a poor correlation for offsite gamma spectroscopy data for ^{238}U as compared to other offsite analytical data for ^{238}U by alternate methods (e.g., alpha spectroscopy). As a result, it was determined that the ^{238}U concentrations reported by the offsite laboratory using gamma spectroscopy were unusable. Some reasons for this determination follow.

- Onsite radiological laboratory gamma spectroscopy results for ^{238}U concentrations correlate better with QA split gamma spectroscopy results (from a USACE-selected independent radiological laboratory) than with offsite radiological laboratory gamma spectroscopy results.

- Onsite radiological laboratory gamma spectroscopy results for ^{238}U concentrations correlate better with ICP-MS results than do offsite radiological laboratory gamma spectroscopy results, especially if the single anomalous high onsite radiological laboratory gamma spectroscopy result in sample B03SL-037-01 is treated as an outlier.

- Onsite radiological laboratory gamma spectroscopy results for ^{238}U concentrations correlate better with offsite radiological laboratory alpha spectroscopy results than do offsite radiological laboratory gamma spectroscopy results.

- Result uncertainties reported by the onsite radiological laboratory onsite gamma spectroscopy laboratory show significantly lower uncertainties than do the offsite radiological laboratory gamma spectroscopy results.

- USACE QA split samples appear to be better correlated with the offsite radiological laboratory alpha spectroscopy than with offsite radiological laboratory gamma spectroscopy data.

- Core scan count rates were correlated to ^{238}U concentrations determined from onsite gamma spectroscopy measurements. The correlation for ^{238}U was 0.94, showing a strong correlation between core scan data and onsite gamma spectroscopy data.

- Sampling at a different FUSRAP RI site (2003-2006) also produced inconsistent gamma spectroscopy results for ^{238}U concentrations from the same offsite laboratory when compared to duplicate gamma spectroscopy ^{238}U concentrations from another laboratory (as well as to offsite radiological laboratory-based alpha spectroscopy results). The USACE eventually dismissed the gamma spectroscopy results for ^{238}U concentrations from this same offsite laboratory for use in the RI decision making process for the other site.

Only the ^{238}U concentrations reported by the offsite radiological laboratory are considered unusable. Other results reported by the offsite radiological laboratory are used in this report.

In addition to the soil matrices, a total of 40 building material samples and 71 sediment samples were sent to the fixed analytical laboratory for gamma spectroscopic analysis for COPCs. One IA08 surface water sample that was characterized by the offsite laboratory as “oil” was analyzed by gamma

spectroscopy. Groundwater samples were not analyzed by gamma spectroscopy methods. Table 3-7 and Table 3-8 list the gamma spectroscopy results provided by the fixed analytical laboratory for the COPCs in sediment samples and building material samples, respectively.

3.3.3.2 Alpha Spectroscopy

Between 12 and 30 surface soil samples (top 0 to 6-inches of soil) and between 12 and 30 subsurface soil samples from each IA or sub-area (see FSP Tables 5-8, 5-9, 5-11, and 5-12 for requirements) were scheduled to be analyzed for uranium and thorium isotopes by alpha spectroscopy.[15] Alpha spectroscopy utilizes a small sample mass (typically on the order of one gram), making obtaining a representative sample more difficult, but providing more definitive identification of the isotopes present in the sample. The STL-St. Louis method (SOP-RD-0210), based on the DOE HASL-300 alpha spectroscopy (DOE A-01-R), was used for isotopic uranium and thorium COPCs; copies of these SOPs are also included in QAPP Attachment B. The radiological methods utilized had the necessary specificity and also are sensitive enough to achieve the preliminary radiological screening criteria identified in the DGAR (Section 2.6). In addition, low-concentration samples were analyzed with sufficient sensitivity (i.e., using STL-St. Louis' 'long count' method) to determine the presence or absence of radionuclides at background levels.

A total of 524 soil samples were sent for offsite alpha spectroscopy analysis for isotopic uranium and thorium COPCs. For convenience, Table 3-9 lists all the alpha spectroscopy[16] results provided by the fixed analytical laboratory for soil samples; detailed data assessment is provided in Section 4 on an IA-by-IA basis.

The selection of samples for offsite alpha spectroscopy analysis was dependent upon several factors, including:

- The current arrangement of IAs was anticipated to approximate exposure units that will be evaluated during the feasibility study/risk assessment. An approximate total of 12 to 30 samples per IA and per medium (i.e., surface soil; subsurface soil), depending on the nature and size of the IA, were collected to accommodate risk assessment.

- For the purposes of identifying surface soil samples for use in this risk assessment, surface soil samples were defined as 0 to 6-inch depth.

- Since alpha spectroscopy has generally lower uncertainty than gamma spectroscopy, alpha spectroscopy data were preferred over gamma spectroscopy data for use in determining exposure point concentrations.

- Samples for offsite alpha spectroscopy analysis were selected to ensure that each exposure unit/point was characterized at the surface and to full depth. Sample selections at depth were determined using a decision tree based on onsite gamma spectroscopy laboratory data.

- Samples for offsite alpha spectroscopy analysis were selected from those with the highest onsite gamma spectroscopy values.

- A secondary purpose of these analyses was to obtain results from an accredited laboratory that can be used to corroborate and/or to correlate (provide a correction factor for) the onsite laboratory results.

[15] The samples submitted for alpha spectroscopy analysis are independent of the samples submitted for gamma spectroscopy analysis. As a result, some of the analyses may overlap on any given sample; see Section 3.3.1 for additional discussion.

[16] "Long count" and "short count" in Table 3-9 through Table 3-13 refer to alpha spectroscopy measurements." The laboratory varied count times to meet sensitivity requirements. "Short counts" lasted on the order of 3 hours; "long counts" took about 7 hours to 10 hours.

In addition to the soil matrices, a total of 40 building material samples, 59 field-filtered and 59 unfiltered groundwater samples (i.e., 118 total samples over two rounds), 46 surface water samples, and 71 sediment samples were submitted for offsite alpha spectroscopy analysis for isotopic uranium and thorium COPCs. For convenience, Table 3-10, Table 3-11, Table 3-12, and Table 3-13 list the alpha spectroscopy results provided by the fixed analytical laboratory for building materials, surface water, groundwater, and sediments, respectively; detailed data assessment is provided in Section 4 on an IA-by-IA basis.

The offsite laboratory reported 5,390 results of alpha spectroscopic analyses for thorium and uranium isotopes in 859 samples (including 75 duplicates) using the standard (short) count time. Additionally, the offsite laboratory reported 237 results of alpha spectroscopic analyses for thorium and uranium isotopes in 40 samples (including four duplicates) using a long count time. The latter set of results was for the 36 samples also analyzed by ICP-MS and gross alpha/gross beta (see FSP Table 5-9 footnotes 4, 9, and 12).

3.3.3.3 Gas Flow Proportional Counting

The FSP required that approximately 50 percent of the samples submitted to STL-St. Louis for isotopic uranium and thorium COPCs by alpha spectroscopy were to also be analyzed for ^{226}Ra and ^{228}Ra by gas flow proportional counting (GFPC) methods. Analysis for radium isotopes was performed utilizing STL-St. Louis SOPs RC-0040 and RC-0041, based on USEPA methods 903.0 (for ^{226}Ra) and 904 (^{228}Ra), respectively; copies of these SOPs are included in QAPP Attachment B. A period of 14 to 21 days is needed to allow for ingrowth (i.e., for the buildup of short-lived daughter products), so rapid turnaround time was not possible for isotopic radium analyses. Soil samples were prepared for isotopic radium analysis by STL SOP RC-0004.

The FSP required that approximately one-half of the alpha spectroscopy soil samples were to be analyzed for radium COPCs using GFPC methods. Two hundred seventy seven soil samples (approximately 53 percent of alpha spectroscopy analyses) were selected for radium COPC analyses using GFPC methods. The 277 soil samples for radium analyses were chosen from the top-half of the alpha spectroscopy SOR rankings (generated using onsite gamma spectroscopy data), taking into consideration vertical and horizontal coverage (i.e., if several samples fell in one boring, one sample was selected from that boring and the other samples were “moved” to the next lower SOR ranked sample).

In addition to the soil matrices, a total of 40 building material samples, 59 field-filtered and 59 unfiltered groundwater samples (i.e., 118 total samples over two rounds), 47 surface water samples, and 61 sediment samples were sent to the fixed analytical laboratory for analysis for ^{226}Ra and ^{228}Ra.

For convenience, Table 3-14, Table 3-15, Table 3-16, Table 3-17, and Table 3-18, lists the offsite laboratory results for radium using GFPC methods for soil, sediment, building materials, surface water, and groundwater, respectively; detailed data assessment is provided in Section 4 on an IA-by-IA basis.

3.3.3.4 Isotopic U as a Metal by ICP-MS

Additional data were collected to evaluate the presence of enriched, depleted, and recycled uranium. Presence of ^{236}U indicates recycled uranium; enhanced abundances of ^{234}U and ^{235}U indicate enriched uranium, and the enhanced abundance of ^{238}U indicates depleted uranium. Twelve soil samples that displayed significantly elevated uranium concentrations as determined by onsite laboratory gamma spectroscopy analysis were selected for isotopic uranium by ICP-MS analysis at the offsite fixed laboratory.[17] STL-St. Louis performed isotopic uranium analysis by their SOP MT-0001, which is based

[17] The selection of samples was based on ranking of sum of ratio scores as determined from onsite gamma spectroscopy data. Where multiple samples were identified in a single boring, only one sample from that boring was selected. Alternate samples were then selected from the next highest ranking sum of ratios score to improve the distribution of samples selected.

on SW-846 Method 6020 (metals by ICP-MS); soil samples were prepared for analysis by STL SOP IP-0002 (SW-846 3050B).

These 12 elevated activity samples were chosen because they had the best chance to produce statistically valid indications of whether the uranium they contained was enriched or recycled. The ICP-MS analysis determined the isotopic mass concentrations of ^{233}U, ^{234}U, ^{235}U, ^{236}U, and ^{238}U to evaluate the presence of recycled, depleted, or enriched uranium (see Section 3.4.1).

For convenience, Table 3-19 lists the laboratory results for uranium isotopes analyzed by ICP-MS; detailed data assessment is provided in Section 4 on an IA-by-IA basis. Laboratory mass concentration reporting limits were between 0.005 microgram uranium per gram (µg U/g soil) and 0.013 µg U/g soil. They are the bracketed values shown in the table.

In addition to the 12 elevated activity soil sample locations, 24 background reference area soil samples were submitted for ICP-MS analysis. The laboratory data for background samples were not sufficient to determine the relative mass abundances of the uranium isotopes in them (i.e., generally only ^{238}U mass concentrations were reported above the ICP-MS sensitivity limits). However, the mass abundance ratio for ^{238}U:^{235}U was indicative of natural uranium, where calculable.

Table 3-19 also lists the relative mass abundances for the non-background samples calculated from the mass concentrations. The table also provides typical relative mass abundances for natural uranium, commercial-feed enriched uranium, and depleted uranium for comparisons with the calculation results. Sample A02SL-028-01 shows ^{235}U and ^{238}U relative mass abundances indicative of depleted uranium. The remaining samples appear to be natural uranium but the possibility of blends of natural, depleted, and enriched uranium cannot be ruled out. Three of the samples show traces of ^{236}U, which is present only in recycled uranium.

3.3.3.5 Gross Alpha and Gross Beta Analysis

In addition to isotope-specific analyses, groundwater samples, background reference area soil samples, and a select subset of 12 elevated activity soil sample locations were analyzed for gross alpha and beta radioactivity using STL SOP RC-0020, which is based on USEPA method 900.0 and SW-846 method 9310. These analyses were conducted to provide general information on the presence or absence of radionuclides in the respective groundwater or soil samples, and also to confirm previous data from landfill monitoring wells indicating the presence of radionuclides at levels exceeding New York water quality standards. The STL-St. Louis method had the specificity to report the analytes as noted in the water quality criteria and was also sufficiently sensitive to measure the analytes at concentrations below the standard.

For convenience, Table 3-20 and Table 3-21 show all results for gross alpha and gross beta analyses in soil and in groundwater samples, respectively; detailed data assessment is provided in Section 4 on an IA-by-IA basis.

Gross alpha and gross beta radiation analyses were compared with results from other analytical techniques to verify consistency of results. The gross alpha and gross beta results were found to be consistent with the COPC alpha and beta results. That is, the sum of all COPC concentrations for a sample was typically slightly less than the gross alpha (taking into account uncertainties). The same was true for gross beta with natural potassium-40 (^{40}K) making the relative difference larger than for gross alpha.

3.3.4 Chemical (Non-radiological) Parameters Analyses

Only a limited amount (in terms of parameters and sample quantities) of chemical (non-radiological) parameters analyses were planned and performed during the FUSRAP RI. (The only MED/AEC-related constituents identified at the Guterl Site are the radionuclide COPCs.)

Chemical (non-radiological) parameters were collected for disposal planning and acceptance of FUSRAP RI IDW; see Section 3-12 for additional discussion.

Ten (10) sediment samples from IA03 and IA09 and 13 soil samples from other locations across the Guterl Site were analyzed for TOC to assist in evaluating contaminant fate and transport. TOC data are presented in Section 3.7.7.

Unfiltered groundwater samples were analyzed for total suspended solids (TSS) to assess the likelihood that inorganic contaminants detected are bound to the sediment entrained in the sample, as opposed to being in the dissolved phase. TSS data are presented in Table 3-22.

3.3.5 Geotechnical Analyses

Analysis or estimation of various geotechnical parameters is necessary for site characterization (including contaminant transport) and input to the human health model. Geotechnical analyses were performed on 17 soil samples by SJB Services, Inc. (SJB) (Hamburg, NY). Relevant parameters include:

- American Society for Testing and Materials (ASTM) D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soils (Atterberg limits) (17 samples)
- ASTM D-422: Particle Size Analysis of Soils (17 samples)
- ASTM D-5084: Measurement of Hydraulic Conductivity of Saturated Porous Material Using a Flexible Wall Permeameter (2 samples)
- Moisture Content (reported with ASTM D-5084) (2 samples)
- Bulk Density (calculated from data presented with ASTM D-5084) determined from soil core volume and weight) (2 samples)

In addition, the onsite laboratory collected wet weight, dry weight, and volumetric data from which moisture content and bulk density could be calculated for each sample analyzed.

Other parameters (e.g., porosity) needed for input to the RESRAD model were estimated from literature values which were confirmed through site-specific data derived from recovered soil cores.

3.4 Background Reference Sampling

Background reference samples were collected for surface soil, subsurface soil, sediment, surface water, groundwater, and building material matrices. A total of 12 surface soil and 12 subsurface soil samples were collected from the background reference area located in IA05B; three collocated surface water and sediment samples were collected from the Erie Canal (IA09) upgradient of the Guterl Site; one bedrock groundwater sample was collected (for each round of sampling) from the background reference area located in IA05B, and nine building material samples (from six types of materials) were collected from Class 3 areas within the Excised Area.

The planned overburden groundwater sample was not collected because there was insufficient groundwater available for sampling during each of the two groundwater sampling rounds.

3.4.1 Background Surface and Subsurface Soil Sampling

Collection and analysis of background surface and subsurface soils was performed to evaluate background levels of COPC radionuclides for the Guterl Site. MARSSIM defines a background reference area as a geographical area in which representative reference measurements are performed for comparison with measurements performed in specific survey units. The background reference area for this RI had similar physical, chemical, radiological, and biological characteristics as the areas being investigated and based on review of available historical data was not expected to be contaminated by the Guterl Site activities (that is, it is non-impacted).

Figure 3-7 shows the FSP-proposed location of the background reference area, Outwater Memorial Park, relative to the Guterl Site. During performance of the GWS within IA04A, it was noted that the apparent background readings at the Guterl Site were lower than the GWS readings previously collected at Outwater Memorial Park. As a result, alternate locations for a more appropriate background reference area were evaluated, and a 30-m^2 area in IA05B near background well cluster MW-600 was selected (see Figure 3-8).[18]

The background reference area was 30 m^2 for the following reasons:

- The present survey is a characterization survey, not a final status survey.
- Background reference areas are required when the COPCs occur in nature. One of the COPCs is refined uranium and some of the instruments that were used are able to differentiate refined uranium from naturally occurring uranium. Therefore, a background reference area is not required for refined uranium.[19]
- One of the COPCs, ^{232}Th, occurs in nature. Differentiating refined thorium from naturally occurring thorium at the concentrations the refined thorium likely will be encountered will be difficult with the instruments that will be used in the survey. However, ^{232}Th concentrations that exceed screening levels are expected to be found over relatively small areas, so a small background reference area will suffice.
- Radium occurs in nature as a progeny radionuclide in the natural uranium and thorium decay chains. It is expected that its concentration will not vary much in the surface soil of the reference area, so that results of sampling over a larger reference area would not differ significantly from the results of sampling over 30 m^2.

The background reference area for background soil samples and background radiation measurements was surveyed as if it were a Class 1 area. A total of twelve surface and twelve subsurface soil samples in the reference area were collected to establish background soil concentrations for COPCs. Sampling points were placed at locations equidistant between the center and each corner of a 10-m grid square (that is, one sample location centered within each quadrant of a 10-m grid square; thus generating four equidistant points within each 10-m grid).

On August 1, 2007, SJB mobilized a Simco-2400 DPT rig and operator to advance soil borings for background soil sample collection at the background reference area shown on Figure 3-8. Background soil borings were identified as BKGSL-001 through BKGSL-012. An Earth Tech geologist and radiation

[18] Soil borings at four of the twelve planned Outwater Memorial Park background reference area locations were completed prior to discovering the higher gamma walkover survey readings on site. Earth Tech retained the soil cores for later reference, but they were not analyzed.

[19] "Refined uranium" means the natural uranium metal that MED/AEC brought to the site, which contained impurities (such as progeny) at negligible levels at the time it arrived at the site and which contains the uranium isotopes ^{234}U, ^{235}U, and ^{238}U at their natural abundances. It does not include enriched, depleted, or recycled uranium.

technician provided direction to the Simco operator, completed field screening of soils retrieved during drilling, logged the soil samples, and prepared the soil samples for radiological analyses.

Table 3-23 summarizes the surface and subsurface soil sample identifications and samples selected for onsite and offsite analyses. A total of 24 soil samples were collected for offsite radiological analyses from the 12 background reference area borings; i.e., one surface and one subsurface soil sample were collected from each boring. Table 3-24 summarizes the offsite analyses for the background reference area samples. The background reference area sample data are summarized in the following tables:

- Table 3-25**,** Onsite gamma spectroscopy (data extracted from Table 3-5).
- Table 3-26**,** Offsite gamma spectroscopy (data extracted from Table 3-6).
- Table 3-27**,** Offsite alpha spectroscopy (data extracted from Table 3-3).
- Table 3-28**,** Offsite GFPC by USEPA methods 903.0 and 904 (data extracted from Table 3-14).
- Table 3-29**,** Offsite ICP-MS for isotopic U (derived from ^{238}U data extracted from Table 3-19).[20]
- Table 3-30 presents the isotopic parameters for ^{234}U, ^{235}U, and ^{238}U that were used to convert the mass concentrations for ^{238}U into activity concentrations for the three uranium isotopes presented on Table 3-29.
- Table 3-31**,** Offsite gross alpha and gross beta data.
- Table 3-32 presents all of the average concentrations of the background samples shown in the previous tables in one place for reference purposes. The table also presents the minimum and maximum results for each analytical method for each COPC.

3.4.2 Background Surface Water and Sediment Sampling (IA09)

Collocated sediment and surface water samples were collected from three locations along a single transect, upgradient from the Guterl Site, spanning the Erie Canal on September 12, 2007. Prior to collecting the background surface water/sediment samples, the flow direction of the Erie Canal was field verified to be towards the northeast (i.e., away from Tonawanda Creek and toward the Lockport Locks). The background transect was located 600 feet upstream of the industrial water intake; Figure 3-8 shows the surface water/sediment background sample locations.

Surface water samples were collected at the midpoint of the water column using a Wildco® Alpha™ brand horizontal water bottle sampler prior to sediment sampling to minimize turbidity. Water samples were transferred from the sampler directly to the appropriate sample bottles. The surface water samples were analyzed at the offsite laboratory by alpha spectroscopy (uranium and thorium COPCs) and USEPA method 903.0/904 (^{226}Ra and ^{228}Ra).

Consistent with the FSP, sediment samples were collected using a Ponar dredge sampler. Sediment collected with the Ponar dredge sampler was placed into a disposable aluminum foil tray and logged. This process was repeated until sufficient sample volume was obtained. The collected sediment was then homogenized with a stainless steel trowel and transferred to the required sample container(s). The sediment samples were analyzed at the offsite laboratory by gamma spectroscopy (uranium, thorium, and

[20] The analyses of the background samples by ICP-MS were not sensitive enough to detect ^{234}U or consistently detect ^{235}U. Table 3-19, therefore, lists ICP-MS results for ^{238}U only and then, assuming natural abundances for ^{234}U and ^{235}U, lists their concentrations derived from the ICP-MS mass concentrations for ^{238}U.

radium COPCs), alpha spectroscopy short-count (uranium and thorium COPCs), USEPA method 903.0/904 (^{226}Ra and ^{228}Ra), and TOC (sediment only).

Table 3-33 shows surface water background inferred from samples taken in IA09 (Erie Canal). Table 3-34 shows sediment background inferred from samples taken in IA09.

3.4.3 Background Groundwater Sampling

An upgradient groundwater sample was collected from new bedrock monitoring well MW-600D on August 17, 2007 (round 1) and November 13, 2007 (round 2). The overburden upgradient monitoring well, MW-600S, was dry on both occasions; therefore, no upgradient overburden groundwater sample was collected. The upgradient monitoring well pair is located in an area not expected to be impacted by the Guterl Site activities (see northeast quadrant of IA05 on Figure 3-8.) Table 3-35 shows the results of background groundwater sampling. Data are discussed in Section 4.10.5 (IA05B Groundwater).

A field-filtered and unfiltered groundwater sample pair was collected from the background monitoring well during each round of sampling. Purging and sampling of the monitoring well was accomplished using a Geotech 12 VDC variable speed peristaltic pump with dedicated Teflon tubing (i.e., down-hole Teflon line, flexible pump roller tube, and Teflon outflow tube). Samples were collected as further described in Section 3.8.3. Water quality parameters were measured using a flow-through cell designed specifically for micro-purge sampling (YSI 556 Mutli Parameter meter equipped with a 5080 YSI flow-through cell).

Filtered and unfiltered groundwater samples were analyzed at the offsite laboratory by alpha spectroscopy short-count (uranium and thorium COPCs), USEPA method 903.0/904 (^{226}Ra and ^{228}Ra), gross alpha, and gross beta; the unfiltered sample was also analyzed for TSS.

3.4.4 Background Volumetric Building Material Sampling

A background reference sample was collected for each type of building material surveyed during the RI, with the exception of concrete. To avoid damaging buildings in use outside the controlled area, background reference samples were collected within Excised Area buildings from locations with low background exposure rates (FSP Section 5.2.2.4). Table 3-36 lists the results of the building material background volumetric sample analyses for radium, thorium, and uranium isotopes, respectively.

3.5 Gamma Walkover Survey

A GWS was performed in accordance with the Gamma Walkover Survey Plan (USACE, 2006b) in order to aid the selection of soil sampling locations. Preparatory tasks for the GWS included clearing vegetation for survey access and establishing civil survey benchmarks and survey grids. In general, the GWS process involved slowly scanning the soil surface with an appropriate gamma-sensitive radiation detector while walking slowly down adjacent lanes to accomplish the specified survey coverage.

A Ludlum model 44-151 plastic scintillator (1.5 inches $\times$ 4 inches $\times$ 28-inches) with a Ludlum model 2221, Scaler/Ratemeter Single Channel Analyzer, was used for the GWS. The gamma detector was interfaced with a GPS unit and a data logger that automatically recorded the location and the gamma count rate at a prescribed frequency. The GWS preferred data logging rate was once per second while the surveyor walks at a speed of 0.5 meters per second (m s^{-1}).

For consistency with the scanning survey concepts used in the FSP, the baseline GWS coverage was 100 percent for Class 1 areas, 25 percent for Class 2 areas, and between 5 percent and 10 percent for

Class 3 areas. The survey areas designated as Class 1 and 2 in the pre-GWS stage are shown on GWSP Figure 2-1. No Class 3 areas were designated in the pre-GWS stage.[21]

MARSSIM specifies 100 percent scanning surveys for Class 1 areas and allows some flexibility in the selection of the survey coverage for Class 2 and Class 3 areas. The 25 percent scanning survey coverage for Class 2 areas was deemed sufficient to identify anomalies of elevated gamma levels with areas in excess of 2 m^2. The value between 5 and 10 percent for the Class 3 area is planned to assure sufficient data over a 400 m^2 area to support a decision that an area is either potentially impacted or not impacted based on the mean of survey data, with a confidence level of at least 95 percent. It is also generally consistent with the scanning survey protocol in the FSP for Class 3 areas, which is specified at 6.3 percent.

The results were imaged as overlays on aerial photographs for delivery to the USACE. Figure 3-9 provides an example of this method. Under ideal conditions where GPS can provide sufficient location accuracy, each of the instrument survey count rates were automatically collected in a data logger with (*x*, *y*) coordinates that were referenced to the New York State Plane Coordinate System.

3.6 Building Radiological Surveys

The integrated survey design combined scanning surveys with direct measurements and field sampling. The level of survey effort was determined by the potential for contamination as indicated by the survey unit classification as presented on Figures 5-7 through 5-10 of the FSP.

- Class 1 survey areas received scanning over 100 percent of the survey area combined with direct measurements and sampling based on evaluation of current data in conjunction with prior data (e.g., placing sampling locations on a systematic grid to fill general data gaps and/or selecting biased locations to further investigate and bound prior survey data).

- Class 2 survey areas received scanning over a portion of the survey area based on the potential for contamination combined with direct measurements and sampling based on a systematic grid to a lesser degree than performed in a Class 1 area (approximately 25 percent of the Class 1 total).

- Class 3 survey units received judgmental scanning/randomly located direct measurements and sampling based on a systematic grid to a lesser degree than performed in Class 2 areas (approximately 25 percent of the Class 2 total).

The primary objective of the building characterization effort was to provide data sufficient to plan future actions such as decontamination, demolition, radioactive waste disposal, or final status surveys. The survey design was not necessarily intended to conclusively demonstrate compliance with regulatory standards, although data may ultimately be used to support that purpose.

3.6.1 Building Interior Surfaces

For the purposes of this survey, building interior surfaces included floors, walls (above and below 2 m), ceilings, structural surfaces, sub-floor surfaces, trench side-walls and surfaces, manufacturing components (for example, forges, baths, etc., that remain in the buildings), and other overhead surfaces. This effort was performed because the Guterl Site operating history and previous surveys indicated contamination in all of these areas.

[21] For the purposes of this RI and based on site operating history and previous radiation surveys: *Class 1 areas* are assumed to have a potential for radioactive contamination or known contamination above the screening levels. *Class 2 areas* are assumed to have a potential for radioactive contamination or known contamination, but are not expected to exceed the screening level. *Class 3 areas* are not expected to contain any residual radioactivity or are expected to contain levels of residual radioactivity at a small fraction of the screening levels.

3.6.1.1 Class 1 Surfaces

Floors were 100-percent surveyed with a floor monitor. Commensurate with safety considerations, other surfaces were 100-percent scanned with an appropriate instrument. A swipe test and static measurement were taken at the location of the highest concentration detected by scanning in each 1-m grid square or other surface. If no contamination was detected, a swipe test and static measurement were taken at the center of the grid square.

Exposure rate measurements at 1 m from the floor and other surfaces was performed at a frequency of 1 systematic measurement per every 4 m^2.

3.6.1.2 Class 2 Surfaces

A minimum of 30 measurement locations each, on vertical and horizontal surfaces where radioactive material would likely accumulate, (air exhaust vents and horizontal surfaces where dust would settle) were surveyed. To assure a reasonable coverage of these surfaces, an average of at least 1 measurement location per 20 m^2 of surface area was selected. A scan of the surface was performed to identify the presence of any elevated activity levels, followed by the measurement.

Scanning covered at least 25 percent of the surface. If scans or measurements indicated residual activity exceeding 25 percent of the screening level, the surface was considered potentially contaminated and the surface exhibiting such levels was surveyed in the same manner as Class 1 surfaces to determine whether reclassification is necessary.

Exposure rate measurements at 1 m from floor and other surfaces were performed at a frequency of 1 systematic measurement per every 16 m^2.

3.6.1.3 Class 3 Surfaces

MARSSIM notes, “Class 3 survey units receive judgmental scanning and randomly located measurements.” Therefore, Class 3 surfaces were surveyed similar to Class 2 surfaces but to a lesser extent based on the professional judgments of the Project Health Physicist. For example, if they are contaminated, upper walls and ceilings are likely to be contaminated uniformly from dust deposition, so one or two measurements may suffice to adequately characterize these Class 3 areas.

As a general guideline for the beginning of the survey, the survey coverage of Class 3 areas was approximately 5 percent to 10 percent of the area and the number of samples per unit area will be approximately one-fourth of the number for Class 2 areas (i.e., one measurement location per 80 m^2).

3.7 Surface and Subsurface Soil Sampling and Analyses

Surface and subsurface soil sample collection was completed by SJB under the direct supervision of an Earth Tech geologist and radiological technician. Surface and subsurface soil samples were collected using a Simco-2400 truck-mounted DPT rig, Central Mine Equipment (CME)-75 drill rig, Geoprobe© 66DT track-mounted DPT rig, or hand auger. Surface and subsurface soil sample collection and handling was performed in general accordance with the FSP; any deviations from the approved FSP were discussed with USACE personnel for concurrence prior to implementation and are listed in Table 3-1.

In general, the Simco-2400 DPT rig was used for easily accessible outside areas and in the landfill. The Geoprobe 66DT track rig was used in limited access areas such as inside buildings and narrow areas between buildings (IA02, IA04A, and IA04B). The CME-75 drill rig was used in the landfill and other outside areas where the Simco-2400 truck rig encountered shallow refusal within the overburden (i.e., shallower than top of bedrock surface). Hand auguring was performed when there was no access for any of the rig styles (this was limited to a few areas in and around the buildings).

Surface and subsurface soil samples were collected during the performance of full-profile subsurface soil borings. Soil samples were collected using DPT soil sampling techniques or conventional split-spoon sampling methods. The soil sampling device consisted of a field-decontaminated 3-inch OD split-spoon fitted with a dedicated acetate sleeve liner (2 ½" OD x 2 7/16" ID x 24" length x 1/32" wall thickness). The soil sampling device was advanced two feet into the soil using the hydraulic hammer on the DPT rig or by a 140-pound hammer on the HSA rig. Where surface soil was present, the uppermost six inches of the initial core was designated the surface soil segment.

The general procedure for surface and subsurface soil sampling included:

- The drill crew removed the acetate sleeve from the soil sampling device and handed the acetate sleeve to the radiological technician.

- The radiological technician screened the sleeve for radiological activity using a Ludlum meter 2221 coupled with a Ludlum model 44-10 NaI detector probe. Per Section 5.4.3.1.2 of the FSP, automated core scanning was allowed to record the cpm data. The onsite core scanner data are presented in Appendix F.

- The radiological technician wiped down the outside of the sleeve with a large area wipe and the wipe was screened for radiological activity. The soil core was released to the geologist only after the radiological technician confirmed that surface activity on the outside of the sleeve was at background levels.

- The geologist screened the open ends of the sleeve for VOCs using a photoionization detector (PID).

- The geologist logged the soil core through the sleeve and recorded the information on the boring log. (The soil core was retained in the sleeve so that the intact core could be run through the onsite core scanner.) Soil boring logs are presented as Appendix G and document conditions such as soil type, grain size, color, density, moisture and other overburden soil characteristics.

- The acetate sleeve was capped, labeled, and placed in a container for transport to the onsite core scanner.

- The geologist delivered the surface soil samples to the onsite core scanner at the completion of each boring location. Refer to Section 3.3.2.1 for discussion of core scanner operation.

Where drill rig/DPT rig access was not possible, the bucket hand auger method was used for collection of surface/subsurface soil samples. The bucket hand auger was a stainless steel bucket auger head attached to an extension rod and T-shaped bar. The hand auger was advanced into the soil to the required depth designated for the sampling location. Material collected in the bucket from each interval was removed using a stainless steel spoon and transferred into a stainless steel bowl for placement into the acetate sleeve.

Soil sampling equipment was decontaminated between sample intervals and boring locations as described in Attachment 1 of the FSP.

3.7.1 Surface Soil Sampling

Surface soil sampling was completed between July 24, 2007 and November 8, 2007. The purpose of collecting these samples was to define nature and extent of isotopic uranium, thorium, and radium in surface soils and to provide data for human health and ecological risk assessments.

For the purpose of defining COPC nature and extent, surface soil was defined as the uppermost six inches of soil; therefore, a surface soil sample was not collected at boring locations where gravel fill, asphalt pavement, brick floor, or concrete was present at the surface.[22] Table 3-37 presents a summary of boring locations and soil type where surface soil was present and Table 3-38 presents a summary of boring locations and surface material where surface soil was not present.

The FSP required that a minimum of 50 percent of the surface soil samples be analyzed at the onsite laboratory for COPCs by gamma spectroscopy. During the early stages of the RI, field personnel determined that it would be more representative to analyze each surface soil sample at the onsite laboratory; i.e., increase frequency for onsite gamma spectroscopy analysis from minimum 50 percent of sample locations to 100 percent. As a result, a greater number of surface soil samples were analyzed at the onsite laboratory by gamma spectroscopy than were planned in the FSP. These data will be used to supplement the determination of COPC nature and extent.

A total of 497 surface soil samples were collected from the soil boring locations shown on Figures 3-10 and 3-11. Sample quantities for radiological analyses are summarized in Section 3.7.5.

3.7.2 Subsurface Soil Sampling

Subsurface soil sampling was completed between July 24, 2007 and November 8, 2007. The purpose of collecting subsurface soil samples was to define nature and extent of isotopic uranium, thorium, and radium in subsurface soils.

Numerous shallow refusals were encountered during performance of subsurface soil borings in outdoor areas using the Simco-2400 DPT rig. The shallow refusals were caused by dense fill or hard till that the Simco-2400 DPT rig could not penetrate. In response to this unexpected development, the depths and locations of the shallow refusals were plotted and compared against available geologic information such as new and existing monitoring wells installed using HSA rigs. Based on this analysis, shallow refusal boring locations were re-visited with the heavier and more powerful CME-75 HSA rig. These second visits were labeled “200-series” borings to differentiate them from the initial (i.e., primary) visit. For instance, a soil sample collected from the 6 to 12-inch interval at primary boring location 37 in IA03 would be labeled A03SL-037-02 and the secondary boring at the same location and interval would be labeled A03SL-237-02. The 200-series borings were located as close as possible to the primary location.

Procedures associated with soil logging, onsite core scanning, and onsite gamma spectroscopy sample selection were repeated for the 200-series samples in the same manner as if they were primary borings. As a result, there are instances in the database where a shallow sample from an initial boring was repeated at the 200-series boring.

Table 3-39 presents a summary of primary and secondary boring locations completed during the RI. Table 3-40 presents a summary of the number of FSP-planned and RI-completed boring locations. Completed primary and delineation subsurface soil boring locations are shown on Figures 3-5 and 3-6. Sample quantities for radiological analyses are summarized in Section 3.7.5.

3.7.3 Detritus Identification and Sampling

During layout of the IA01 soil borings, a layer of soil-like material was identified on top of the floor surface in numerous locations. This layer of material consisted of varying amounts of dirt, anthropogenic materials, bird dander, etc., and was characterized as dry and less consolidated than a normal soil or fill matrix. Occurrence and thickness of this loose material was discontinuous and sporadic. This material

[22] For the baseline risk assessments, the presence of pavement or flooring was ignored and the uppermost soil sample at each boring location was treated as a surface soil sample for risk assessment purposes. Additional explanation is provided in Section 6.

was classified as 'detritus' and samples were collected for onsite radiological analysis when this material was identified at soil boring locations. This material was not anticipated by the FSP; as a result, detritus sampling is listed on Table 3-1 as deviation from the FSP. The detritus data represent supplemental information available for later use in nature and extent, HHRA, SLERA, and/or feasibility study decisions, as appropriate.

Detritus samples were given a 700-series sample identification number in the soil matrix series; e.g., B02SL-701-01 is a detritus sample from Building 2, boring location 001. Table 3-41 lists detritus sample locations and analyses performed. Detritus samples were collected from the loose material on top of the floor surface using a field-decontaminated stainless steel trowel. In areas where detritus was observed on top of dirt floor, the detritus was sampled and then the area was cleared to the top of the dirt floor surface for the collection of a surface soil sample. Figure 3-12 presents detritus sample locations.

The detritus samples were not included in the data set evaluated for offsite analyses discussed in Section 3.3.3 (with the exception of Building 2, where two detritus samples were selected for offsite alpha spectroscopy to supplement the surface soil data set; see Section 4.2.2.2 for additional detail). The rationale for differentiating detritus from the floor materials was to determine if the detritus and floor materials exhibited different levels of COPCs. For example, if the detritus was found to be contaminated and removable, while the underlying floor was not, then only the detritus would be removed during remediation, if deemed necessary. This would present cost savings over having included the detritus in the soil matrix and characterizing the upper six inches as contaminated.

3.7.4 Contingency (Delineation) Borings

One of the objectives of the RI soil boring program was to delineate COPC nature and extent in the Guterl Site surface and subsurface soils. The FSP accounted for 109 contingency (delineation) borings to be performed to delineate COPCs in surface and subsurface soils. Delineation borings were labeled as 300-series borings beginning at -301 within each IA (i.e., the first delineation boring in IA03 would be labeled A03SL-301 regardless of the primary boring it was associated with).

The first step in determining whether a delineation boring was required was to determine whether an FSP-planned surface or subsurface soil sample was above or below FSP screening levels. To determine this, the onsite gamma spectroscopy results for COPCs were converted to a sum of ratios (SOR) score. Determination of SORs is explained in detail in Section 4.1. An SOR greater than 1 indicated the sample interval was above screening levels as presented in the FSP.

After the onsite gamma spectroscopy data were converted to SOR scores, the decision logic for selecting bounding soil boring locations as presented in Section 3.3.1.1.2 was applied. A total of 117 delineation borings were performed. Delineation boring locations are shown on Figures 3-5 and 3-6. Delineation boring drilling and soil sampling procedures were performed in the same manner as described in Section 3.7.1 and Section 3.7.2.

The onsite gamma spectroscopy data were used to generate SOR scores for each FSP-planned boring location. According to the FSP, for boring locations where SOR scores exceeded unity (SOR > 1), a delineation boring was to be performed. A total of 109 delineation borings were planned (budgeted). The number of soil boring locations that required delineation borings was greater than anticipated. A total of 117 delineation borings were performed prior to budget constraints resulted in stoppage of the delineation boring program. As a result, not all boring locations where SOR > 1 occurred were delineated to the FSP tolerance for FSP screening levels. Completion of the 117 delineation borings provided sufficient data to determine that MED/AEC-related constituents exceeding FSP screening levels were confined to the Guterl Site (refer to Section 4 for evaluation), and it is likely that sufficient data were produced to allow for delineation of nature and extent at alternate screening levels (to be developed during HHRA and evaluated during FS) to acceptable tolerances.

3.7.5 Radiological Analyses

Surface and subsurface soil samples were analyzed at both onsite and offsite radiological facilities by a variety of radiological methods. Table 3-2 presents a summary of radiological analysis methods used during this RI, COPCs detected via each respective method, and COPC data use for each method applied.

Onsite analyses included *ex situ* soil core scanning and gamma spectroscopy. Each recovered soil core was analyzed *ex situ* using the onsite core scanner as described in Section 3.3.2.1. Selected soil samples were subsequently analyzed onsite by gamma spectroscopy according to the decision criteria described in Section 3.3.2.3. A total of 127 detritus samples, 497 surface soil samples (including 200- and 300-series samples), and 1160 subsurface soil samples were analyzed at the onsite laboratory by gamma spectroscopy. Based on the onsite gamma spectroscopy data and the decision criteria for offsite analyses discussed in Section 3.3.3, selected soil samples were subsequently analyzed at the fixed laboratory for one or more of the following methods (depending on matrix, location, and intended data use): gamma spectroscopy; alpha spectroscopy; GFPC; ICP-MS; and gross alpha and gross beta.

Table 3-42 provides a summary list of surface soil sample IDs submitted for onsite gamma spectroscopy analyses. Table 3-43 provides a summary list of surface soil sample IDs and requested analyses at the offsite fixed laboratory. Table 3-44 provides a summary list of subsurface soil sample IDs submitted for onsite gamma spectroscopy analyses. Table 3-45 provides a summary list of subsurface soil sample IDs and requested analyses at the offsite fixed laboratory.

3.7.6 Geotechnical Sampling and Analyses

According to the FSP, five representative samples of each soil type anticipated (fill, glaciolacustrine silt and clay, glacial till) would be obtained for geotechnical analyses from non-impacted areas of the Guterl Site. The analyses required included:

- Hydraulic conductivity (ASTM D 5084)
- Grain size distribution (ASTM D 422)
- Atterberg limits (ASTM D 4318)
- Moisture Content
- Bulk Density

Moisture content and bulk density were determined at the onsite radiological laboratory for each soil sample analyzed; representative data are presented in Table 3-46.

Hydraulic conductivity, grain size distribution, and Atterberg limits were performed at an offsite geotechnical laboratory (SJB Services, Inc., Hamburg, NY). Samples selected for offsite analyses were pre-screened for radiological activity to ensure samples were not above background levels.

Soil samples for grain size and Atterberg limits testing were selected from post-radiological testing archival samples.

Undisturbed soil samples for hydraulic conductivity testing were collected using a Shelby tube sampler at MW-600S. The samples were collected from native soil at 3 to 5 feet bgs and 5 to 7 feet bgs.

A summary of geotechnical analyses is presented in Table 3-47 and Table 3-48.

A copy of the geotechnical laboratory report is presented in Appendix H-1. A technical analysis of the available geotechnical data was performed and a technical memorandum was prepared to support future use of the data. A copy of the technical memorandum is presented in Appendix H-2.

3.7.7 Total Organic Carbon Sampling

Table 5-9 of the FSP stated that approximately 1 percent of the anticipated total of 1620 soil samples would be submitted for TOC analyses. The purpose for these analyses was to support COPC fate and transport analyses.

A total of 16 soil samples were collected for TOC analysis from various soil types across the Guterl Site. TOC samples were collected using a field-decontaminated stainless steel hand auger bucket. Soil was transferred to a field decontaminated stainless steel bowl for homogenization prior to placement in laboratory supplied sample containers. Table 3-49 lists TOC sample locations, sample depths, and soil descriptions.

3.7.8 Distribution Coefficient Sampling and Determination

Near-surface soil samples were obtained for distribution coefficient (K_d) analysis to ensure requirements are met for K_d analysis under ASTM D 4646-03, *Standard Test Method for 24-h Batch-Type Measurement of Contaminant Sorption by Soils and Sediments*. This soil procedure is applicable to the needs of the transport analysis for the Guterl Site.

Five soil samples were collected and sent for K_d analysis by the USACE to represent the following conditions:

- Background soil near well MS600S/D, 1 sample taken from 1 to 2 feet bgs
- Contaminated fill samples from three locations in IA04A taken from 0.5 to 1 foot bgs
- A composite sample of bedrock core composed of material from wells MW603D (5.5 to 6.0 feet bgs) and MW605D (5.5-6.0, 9.0-9.5, and 9.5-10.0 feet bgs).

Sample descriptions are provided in Appendix U3, Table U-8. K_d values were used in SESOIL modeling (Section 5.5.2) to predict transport of uranium in the vadose and saturated zones.

3.8 Groundwater Monitoring and Sampling

3.8.1 Monitoring Well Drilling, Installation, and Development

One new overburden monitoring well (MW-600S) and nine new shallow bedrock monitoring wells (MW-600D through MW-607D and MW-606DR) were installed and developed as part of this RI. The new monitoring wells were installed to improve the overall distribution of groundwater monitoring points used to assess water quality and flow direction in the overburden and shallow bedrock units. The locations of the new monitoring wells are shown on Figure 3-13. Table 3-50 presents a construction summary for monitoring wells installed during 1997, 2006, and 2007 (wells installed prior to 1997 are not considered reliable due to age and construction methods). No existing monitoring wells were abandoned or replaced during this RI.

Monitoring well drilling, installation, and development was performed from July 10, 2007 to October 11, 2007. Monitoring well MW-606DR was installed as a replacement for MW-606D, which was inadvertently installed at an incorrect location; MW-606D was not abandoned due to its proximity and similar monitoring interval as existing well MW-14. The incorrect placement and subsequent replacement of MW-606D was a deviation from the FSP.

Reconnaissance of each proposed monitoring well location was performed prior to mobilization of the drill rig. The reconnaissance included an assessment of as-staked monitoring well location, access to and

from the area, and presence of overhead and buried utilities. Utility clearance was conducted as summarized in Section 3.2.2.

An equipment staging area for drilling equipment and monitoring well construction materials was set up in the north end of Building 24. A decontamination pad was assembled on firm, level, truck-accessible ground east of Building 24 in IA04A.

Potable water for drilling and decontamination was obtained from the City of Lockport municipal water supply system, which draws water from the Niagara River. Prior to approval of this source, water quality data from the City of Lockport was requested to verify absence of COPCs; a copy of the water quality data provided by the City of Lockport is presented in Appendix I.

Solid and liquid IDW generated from drilling, well development, sample purging, and decontamination were managed in accordance with the procedures defined in the FSP. Management of IDW is further discussed in Section 3.12.

Monitoring well drilling and well installation procedures were completed in accordance with the FSP and Engineer Manual (EM) 1110-1-4000 *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites* (USACE, 1998). Monitoring well drilling activities were completed by SJB under the direction of an Earth Tech geologist and radiological technician. Monitoring well drilling was performed using a truck-mounted CME-75 drill rig. Soil sampling equipment was decontaminated between sample intervals and between sample locations as described Attachment 1 of the FSP.

3.8.1.1 Monitoring Well Drilling

Monitoring well boring logs are presented in Appendix J and include drilling metadata (driller, geologist, weather, problems encountered, etc.) and soil and bedrock descriptions and lithologic boundaries.

3.8.1.1.1 Overburden Drilling

Conventional HSA drilling techniques were used to advance the monitoring well boreholes through the overburden using 4-1/4-inch (for overburden well) inside-diameter (ID) or 6 ¼ inch (for bedrock wells) ID HSAs. Overburden soil samples were collected using 1-5/8 inch x 24-inch long split-spoon samplers driven with a 140 pound hammer. The split-spoon sampler was advanced in 0.6 m (2 ft) intervals to refusal (i.e., top of bedrock).

The retrieved soil sample was screened by the radiological technician for radiological activity using a Ludlum 2221 meter coupled with a Ludlum model 44-10 NaI detector probe; screening data were recorded on the boring log for each interval sampled. The outside of the sampler was wiped down with a large area wipe and the wipe was screened for radiological activity by the radiological technician. The soil core was handed over to the geologist after the radiological technician confirmed that surface activity was at background levels. The geologist opened the split-spoon sampler and logged the soil sample in accordance with FSP procedures.

For the overburden monitoring well, drilling stopped at split-spoon refusal.

3.8.1.1.2 Bedrock Drilling

Bedrock drilling was accomplished using the same drill rig as overburden drilling. Overburden soil samples were not collected; overburden soil information for MW-600S was deemed representative given the proximity of the paired well location. For the bedrock monitoring wells, the HSAs were advanced through the relatively thin, weathered top of bedrock zone to auger refusal to create a socket for placement of a permanent 4-inch ID steel casing. Refusal of the HSAs was considered to indicate top of

competent bedrock. In general, the weathered zone (from first bedrock observation in split spoon to auger refusal) ranged from 0.5 (MW-600D) to 4.2 ft (MW-601D) thick. Although no samples of the weathered top of bedrock zone were collected, the weathered zone likely consists of severely weathered, gravel-sized fragments of angular dolostone.

Upon confirmation of HSA refusal, a 4-inch ID steel casing was set to the bottom of the bedrock socket and was grouted in place using a cement-bentonite grout. The cement-bentonite grout was allowed to cure for 24-hours before bedrock drilling was started. The 4-inch ID steel casing served as the protective casing for above-grade, bedrock well completions.

Bedrock boreholes were advanced 15 feet into the shallow bedrock as measured from the bottom of the 4-inch casing. The bedrock borehole was advanced using HX-wireline, double-barrel coring system, producing a nominal 3-15/16 inch bedrock borehole.

The retrieved bedrock core was screened by the radiological technician for radiological activity using a Ludlum 2221 meter coupled with a Ludlum model 44-10 NaI detector probe; screening data were recorded on the boring log for each interval screened. The Earth Tech geologist logged the bedrock core in accordance with FSP procedures. The bedrock runs, intervals, RQD, bedrock descriptions and field instrument measurements were recorded on the HTW drilling logs.

Bedrock cores were stored in standard wooden core boxes marked with monitoring well number, run numbers and intervals, recovery, RQD, and date generated. Bedrock cores were wrapped in tin foil to ensure sample competence. The cores were staged in a secure, long-term storage container located in Building 35.

The bedrock borehole was flushed with recirculated water to remove larger particles from the borehole prior to monitoring well construction.

3.8.1.2 Monitoring Well Installation

Monitoring well materials consisted of new, pre-cleaned polyvinyl chloride (PVC) screen, riser, and fittings, and commercially available construction supplies such as sand filter pack, bentonite chips, and cement. Bottom caps, screens, and casing sections were flush threaded. i.e., thermal or solvent welded couplings were not used. Potable water obtained from the City of Lockport municipal water supply system was used to prepare cement-bentonite grout.

Monitoring well construction diagrams were developed in accordance with the FSP and are presented in Appendix K.

3.8.1.2.1 Overburden Monitoring Well

One new overburden monitoring well (MW-600S) was installed during this RI; this overburden well also served as the background monitoring well for this RI. As noted in the FSP, it was anticipated that the relatively thin overburden present at the Guterl Site may require that slight modifications be made to standard well material dimensions. The dimensions of material placed at MW-600S below represent modifications necessary to complete the well installation with an adequate sand pack and grout seal. USACE field representatives were consulted for approval of dimensions prior to constructing the overburden well.

The overburden monitoring well was constructed with a 2-foot length of 2-inch ID, Schedule 40, 0.010 inch machine-slotted PVC monitoring well screen. The screen was placed through the HSAs on a six-inch bed of filter pack sand previously placed at the bottom of the borehole. Two-inch ID PVC monitoring well casing was used to extend the well from the top of the screen to approximately 2.9 ft above grade (“stick up” completion).

Morie size 0 granular (sand) filter pack was placed from the bottom of the screen to one foot above the screen. A 6 inch layer of Morie size 00 filter pack (sand choke) was placed on top of the Morie size 0 filter pack. The filter pack materials were installed through the HSAs with careful measurements made as the HSAs were withdrawn to ensure that the filter pack remained inside the HSAs at all times.

A one foot thick layer of compressed powdered bentonite chips were placed above the filter pack to act as an annular seal. The bentonite seal was added slowly to prevent bridging. The bentonite seal was hydrated with potable water and was allowed to sit a minimum of ½ hour prior to cement-bentonite grout placement.

The cement-bentonite grout consisted of Type I Portland cement mixed with approximately 5 percent powdered bentonite per 94-pound sack of dry cement, and approximately eight to nine gallons of water per sack of cement. The cement-bentonite grout was tremie grouted in place from the top of the bentonite seal to grade.

The surface completion for the new overburden monitoring well was a standard above-grade completion. A locking 5 ft long by 4-inch ID protective steel casing was installed over the PVC casing to approximately 2 ft below grade. A layer of filter pack sand was placed within the 4-inch steel/2-inch PVC annular space to within 4-inches of the top of the PVC riser to help prevent loss of tools or equipment that may fall in the annulus during sampling.

A sloping concrete pad measuring approximately 30-inches square was placed around the exterior of the protective casing. The thickness of the concrete pad was uniform and no less than four inches. Following placement and curing of the concrete pad, a drainage port measuring approximately 0.25 inches in diameter was drilled into the protective casing at approximately 0.1 ft above the top of the internal mortar collar to allow drainage of water from the steel/PVC annular space.

3.8.1.2.2 Bedrock Monitoring Wells

Nine new shallow bedrock monitoring wells were installed during this RI. There were no deviations from the FSP associated with bedrock well construction.

The bedrock monitoring wells were constructed with 10-foot lengths of 2-inch ID, Schedule 40, 0.010 inch machine-slotted PVC monitoring well screen. The screens were placed through the overburden casing and into the open bedrock borehole on a pre-placed six-inch bed of filter pack sand. Two-inch ID PVC monitoring well casing was used to extend the well from the top of the screen to grade (flush mount completions) or approximately 2.5 ft above grade (“stick up” completions).

Morie size 0 granular (sand) filter pack was placed from the bottom of the screen to approximately two ft above the screen. A 6 inch layer of Morie size 00 filter pack (sand choke) was placed on top of the Morie size 0 filter pack. The filter pack materials were installed through the cased-off, open borehole with periodic, careful measurements being made to ensure that bridging of the sand pack did not occur.

A minimum 1.5-ft thick (varied by location) layer of compressed powdered bentonite chips were placed above the filter pack to act as an annular seal. The bentonite seal was added slowly to prevent bridging. The bentonite seal was hydrated with potable water and was allowed to sit a minimum of ½ hour prior to cement-bentonite grout placement.

The cement-bentonite grout consisted of Type I Portland cement mixed with approximately 5 percent powdered bentonite per 94-pound sack of dry cement, and approximately eight to nine gallons of water per sack of cement. The cement-bentonite grout was tremie grouted in place from the top of the bentonite seal to grade.

Seven of nine new bedrock wells were completed as "stick up" surface completions; two wells (MW-604D and MW-605D) were completed as flush-mounts because these wells were located in lawn areas of the active Allegheny Ludlum facility. Stick-up completions were completed in the same manner as described for the overburden well stick-up completion. For the flush-mount completions, the steel overburden casing was cut off at grade and the PVC well casing was cut-off approximately 0.2 ft below the top of the steel casing. A watertight, locking "road box" cover was placed over the well casings and a sloping concrete pad measuring approximately 30-inches square was placed around the exterior of the road box cover. The thickness of the concrete pad was uniform and no less than four inches.

3.8.1.3 Monitoring Well Development

Each newly installed monitoring well was developed to remove residual drilling water and particulates from the well and filter pack, and to improve the hydraulic connection between the formation and the filter pack. Procedures for monitoring well development were conducted in accordance with the FSP and EM 1110-1-4000 *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites (USACE, 1998).*

Appreciable groundwater was not observed at MW-600S during drilling or any of the subsequent water level monitoring rounds. As a result, this well was not developed during this RI.

Bedrock monitoring well development was conducted by surging and pumping each well using an electric submersible pump (Whale Model GP9215) connected to dedicated discharge tubing. At well locations MW-605D and MW-607D, a PVC surge block was also used. Field measurements for depth to water, pumping rate, temperature, dissolved oxygen, pH, oxidation reduction potential, specific conductivity, and turbidity were obtained until stabilization of parameters was achieved. Stabilization was defined as consecutive readings that varied by 10 percent or less. Data were recorded on the monitoring well development logs which are presented in Appendix L.

Well development purge water was containerized in 55-gallon drums for transport to the IDW staging area. The drums were labeled with the date generated and monitoring well location.

3.8.2 Aquifer (Slug) Testing

During RI field investigations, in-situ hydraulic conductivity (slug) testing was performed between September 11 and September 18, 2007 on 28 new and previously installed shallow bedrock monitoring wells. The slug testing was performed to provide aquifer properties (horizontal hydraulic conductivity) within the screened interval. The slug tests were conducted in accordance with the FSP.

Two methods of slug testing were conducted, and included solid slug and pneumatic testing. Wells where solid slug testing was used, both rising and falling head conductivity tests were performed. This method was used in wells where the water table was below the top of screen (and therefore below top of rock), (i.e., open fractures that would not allow proper pressurization using pneumatic device). At these wells, a 1.5-inch outside diameter (OD) x 4-ft long length stainless steel slug was used to raise and lower the water level in the well. In wells where pneumatic slug testing was used, air pressure was applied to lower the water level in the well; as a result, only rising head conductivity tests were performed.

Water level responses were measured utilizing a Mini-Troll data logger and Win-Situ software. The electronic data logger was set to collect water levels at the appropriate logarithmic intervals to provide adequate data to determine the hydraulic conductivity of the monitoring well.

Hydraulic conductivity was calculated using methods presented by Bouwer and Rice (1976) using the computer program AQTESOLV for Windows Version 4.0 (Duffield, 2008). In recent years, the test approach has been questioned particularly for those wells screened in low-permeability formations and fractured formations because of the model assumption of homogeneous and isotropic conditions (Bouwer

and Rice, 1976; Bouwer, 1989). However, further evaluation and testing has proven that the Bouwer and Rice model appears to continue to provide reasonable estimates for water table wells (Hyder and Butler, 1995). The Bouwer and Rice method worked well with the data collected during the RI, where the weathered and fractured upper Lockport Dolostone acts like a very coarse-grained porous deposit, as further discussed below.

Appendix M presents the AQTESOLV software curve-matching output pages. Careful consideration was given to normalization of the data before data processing coupled with applying the recommended head ranges which are represented by the two horizontal and parallel lines shown on each curve-matching page. Butler (1998) illustrates that matching the straight line within the recommended head ranges suits the robust model analysis for normalized data.

Hydraulic conductivities ranged from a minimum of 7.1×10^{-5} cm/sec at MW-15 to a maximum of 8.9×10^{-2} cm/sec at MW-3. The geometric mean hydraulic conductivity for the Guterl Site is 4×10^{-3} cm/sec. The bedrock hydraulic conductivities observed during the RI are similar to a coarse sand and/to gravel. Table 3-51 provides a summary of hydraulic conductivity testing data.

3.8.3 Groundwater Sampling

Groundwater samples were collected from 29 shallow bedrock groundwater monitoring wells from July 31, 2007 through August 20, 2007 (round 1) and from 30 shallow bedrock monitoring wells from November 12 through 16, 2007 (round 2). The number of wells sampled in the first round was one fewer than collected in the second round because MW-606DR was not yet installed; refer to Table 3-1 for an explanation of this deviation from the FSP.

Figure 3-13 presents the locations of new and existing groundwater monitoring wells on the Guterl Site. Table 3-52 provides a summary of well identification, sample date, and analyses completed for each round of groundwater sampling. The actual list of monitoring wells sampled differed from the FSP because existing overburden wells were found to be in poor condition and/or dry. As a result, the overburden wells were removed from the sampling program. With USACE concurrence, an equal number of existing shallow bedrock wells were substituted for the cancelled overburden wells in each round of sampling to improve the spatial coverage of the network of wells sampled.

Collection of groundwater samples from monitoring wells involved well purging, measurement and stabilization of field parameters during purging, and groundwater sample collection. Groundwater sampling activities followed the requirements of the FSP and *EM 200-1-3 C.2 Groundwater Sampling*.

For round 1, monitoring wells were sampled in the order of suspected least to most contaminated; this sequence was reviewed and adjusted for round 2 based on round 1 analytical data. For both rounds, purging and sampling of monitoring wells was accomplished using a peristaltic pump with dedicated Teflon® tubing (i.e., down-hole Teflon line, flexible pump roller tube, and Teflon outflow tube). Water quality parameters were measured using a flow-through cell designed specifically for micro-purge sampling. Groundwater parameter data were entered onto the groundwater sampling logs which are presented in Appendix N.

During purging the following steps were completed:

1. Placed plastic sheeting on the ground around the monitoring well.
2. Recorded all data on the Groundwater Sampling Logs.
3. Unlocked the well cover and measured depth to groundwater using an electronic water level indicator from the top of the inner well casing.
4. Measured and slowly lowered Teflon lined tubing down the well until the end of the tubing was set at the midpoint of the screened interval.

5. Connected Teflon lined tubing to silicon tubing for Geotech 12 VDC variable speed peristaltic head. Effluent end of the silicon tubing connected to Teflon lined tubing, which was connected to the YSI Groundwater Monitoring Multiprobe System flow-through cell (YSI 556 Mutli Parameter meter equipped with a 5080 YSI flow-through cell). Purged water was collected in 5-gallon buckets for later transfer to 55-gallon drums located at the IDW staging area in Building 35.
6. Groundwater was pumped at a rate that minimized drawdown. Flow rate was recorded on the Groundwater Sampling Logs.
7. Monitored and recorded field parameters every five minutes. Continued purging the well until stabilization criteria were met.
8. Disconnect tubing from flow through cell.
9. Remove water level probe from well.

A groundwater sample was collected when stabilization was achieved. During groundwater sampling the following steps were completed:

1. Collected groundwater sample immediately after the well was purged.
2. Collected groundwater samples directly from the discharge end of the tubing. Samples were collected into two 4 liter (L) poly bottles and one 250 milliliter (mL) poly bottle.
3. Caps were placed on the sample containers and the containers were placed in appropriately labeled and prepared coolers.
4. Removed the tubing from the peristaltic pump head and placed tubing back into well.
5. Replaced well cap and locked protective casing or j-plug. Cleaned up area.
6. Completed COC information, sample preparation and handling and shipped the samples to the offsite laboratory for analytical testing.

A field-filtered and an unfiltered sample were collected at each sample location. The field-filtered sample was passed through a dedicated, 0.45 micron (µm), disposable, in-line pore filter attached to the sample collection tubing prior to discharge in the sample containers.

Groundwater samples were shipped under COC to STL (St. Louis, MO) for analysis. Each groundwater sample was analyzed for alpha spectroscopy short count (uranium and thorium COPCs), USEPA method 903.0/904 (^{226}Ra and ^{228}Ra), and gross alpha and gross beta; the unfiltered sample was also analyzed for TSS. Refer to Table 3-52 for a summary of sample IDs and respective analytical parameters.

As specified in the FSP/QAPP, blind field duplicates were collected at a minimum five percent frequency, and rinse blanks were collected for each type of equipment for each decontamination event.

3.8.4 Hydraulic Monitoring

Groundwater level measurements were obtained on July 17, 2007 within existing monitoring wells; and on September 11, 2007 and November 13, 2007 within existing monitoring wells and newly installed monitoring wells. USACE personnel collected water levels on March 7, 2008. During the collection of the July 17, 2007 groundwater level measurements, a monitoring well inspection was completed and is summarized on Table 3-53. Groundwater levels were measured from the top of the well riser (inner casing) at the marked point on the north facing side of the well riser. Groundwater level measurement data are presented in Table 3-54. The groundwater level monitoring data from November 2007 and March 2008 were used to generate groundwater contours for the Guterl Site (see Figure 3-14 and Figure 3-15).

Static water level measurements were made using an electronic water level indicator in accordance with the FSP and EM 1110-1-4000 Chapter 8, *Water Levels* and recorded on the water level data summary form (Appendix O). The water level indicator probe was lowered into each monitoring well until the alarm sounded and/or the indicator light illuminated. The distance between the top of casing and the groundwater surface was recorded to within 0.01 ft. The static water level measurement procedure was

repeated to ensure that the water level measurements were consistent (± 0.01 ft). The water level indicator probe was decontaminated between wells using an Alconox/distilled water rinse followed by a distilled water rinse.

3.9 IA08 Site Utilities Sampling (IA01, IA02, IA04)

IA08 site utility surface water (i.e., aqueous phase) and sediment (i.e., non-aqueous phase) sampling was performed in IA01, IA02, and IA04. A visual survey documenting sewers, drains, and trenches within these investigative areas was completed as a preliminary activity. The visual survey identified more features than anticipated in the FSP. Therefore, based on the relative distribution of sample quantities proposed in the FSP and an assessment of features identified in the visual survey, a revised list of IA08 surface water and sediment sample locations was developed. The revised list was designed to collect representative samples from features (drains, trenches, sewers) with the highest potential of containing MED/AEC-related constituents. As a result, not all sewers, drains, or trenches identified in the visual survey were discretely sampled; i.e., features that could reasonably be expected to be of similar nature were logged but just one representative sample was collected. Table 3-55 presents a summary of planned versus actual IA08 surface water and sediment sample locations. Table 3-56 and Table 3-57 present the sample IDs and summary of analyses for IA08 surface water and sediment samples, respectively.

IA08 sample locations are shown on Figure 3-16. Table 3-58 presents IA08 feature descriptions, physical characteristics, and an estimate (when possible) of the volume of solid and aqueous wastes contained therein. A sketch of each IA08 sample location is presented in Appendix P. Figure 2-12 shows storm sewer, sanitary sewer, and former industrial water intake locations; representative features were sampled as part of the IA08 sampling program.

Procedures for surface water and sediment sampling were completed as outlined in the FSP and in accordance with EM 200-1-3 C.3, *Surface Water Sampling* and EM 200-1-3 C.5, *Sediment Sampling*.

At sample locations where surface water was present, surface water samples were collected by directly dipping and filling the appropriate sample bottles from the feature. At sample locations, where the surface water was below arms reach, the sample was collected by using a stainless steel cup connected to a 10-foot steel pole. At IA04D the surface water sample was collected by using a peristaltic pump and dedicated tubing. The surface water samples were analyzed at the offsite laboratory by alpha spectroscopy short count (uranium and thorium COPCs), and USEPA method 903.0/904 (^{226}Ra and ^{228}Ra).

At sample locations where sediment was present, sediment samples were collected using a stainless steel cup connected to a 10-foot steel pole, unless otherwise noted. At each sample location, the sediment was transferred into a stainless steel bowl, characterized, and homogenized with a stainless steel trowel prior to placement in the appropriate sample container(s). The sediment samples were analyzed at the offsite laboratory by gamma spectroscopy (uranium, thorium, and radium COPCs), alpha spectroscopy short count (uranium and thorium COPCs), and USEPA method 903.0/904 (^{226}Ra and ^{228}Ra).

Sample preparation and handling was conducted in accordance with Section 6 and Section 7 of the FSP. Surface water and sediment samples were analyzed at the offsite laboratory. Sampling equipment was decontaminated in accordance with the FSP and the required QA/quality control (QC) samples were collected accordance with the FSP/QAPP.

3.9.1 IA01 – Excised Area Buildings

Features identified in IA01 buildings consisted of covered and/or open utility, drainage, furnace trenches, pits, basins, sewers and drains, and a flooded basement. These features were located throughout seven buildings within the Excised Area, including Buildings 1, 2, 3, 4/9, 6, 8, and 24.

3.9.1.1 Building 1

A combined total of six surface water samples and seven sediment samples were collected from Building 1; samples were collected on September 11, 2007, October 24, 2007, and November 8, 2007. Four surface water/sediment sample pairs were initially collected from the flooded basement as planned in the FSP. The initial sample data were reviewed and were found to contain elevated COPCs. As a result, an additional two surface water/sediment sample pairs were collected. One "sediment" sample was collected from the ground surface in the alleyway between Building 1 and Building 2 below a drain pipe that originates in the workroom at the south end of Building 1 (sample ID A08-B1-SL-001); surface water was not present, therefore only a sediment sample was collected. The surface soil sample below the drain pipe was collected with a stainless steel trowel.

3.9.1.2 Building 2

Two surface water samples and three sediment samples were collected from Building 2 features on September 26, 2007. In two locations, a surface water/sediment sample pair was collected. At the remaining one location (open floor trench), surface water was not present so only a sediment sample was collected.

3.9.1.3 Building 3

NYSDEC (2000b) states that a surface water/sediment sample pair was collected from the Building 3 trench that connected with the oil/water separator between Building 3 and Building 2; however, these data were not included in the final version of the NYSDEC (2000b) investigation summary report. NYSDEC was contacted for a copy of the analytical data for this sample pair to help guide sample locations for this RI; however, NYSDEC replied that the sample data were not published and were therefore not available for distribution. As a result, only the surface water and sediment data collected during this RI are available for evaluation.

A combined total of 13 surface water and 14 sediment samples were collected from Building 3; samples were collected on September 26, 2007, October 1, 2007, and October 3, 2007. In 12 locations, a surface water/sediment sample pair was collected. At two of the remaining three locations, surface water was not present (furnace pit and north section of double basin); at the third location sediment was not present (south side of double basin).

3.9.1.4 Building 4/9

Five surface water/sediment sample pairs were collected from Building 4/9 on September 27, 2007.

3.9.1.5 Building 6 and Building 8

Two sediment samples were collected from Building 6 on October 4, 2007; no surface water was observed in Building 6.

Two surface water/sediment sample pairs were collected from Building 8 on October 4, 2007.

3.9.1.6 Building 24

Seven sediment samples were collected from covered utility trenches in Building 24 on September 25, 2007; no surface water was observed in the covered trenches. The sediment samples were collected using a stainless steel trowel.

3.9.2 IA02 – Building Exterior Areas

Features associated with IA02 included catch basins, down spouts, stormwater drainage swales, and an oil/water separator. A combined total of four surface water and ten sediment samples were collected from these features on September 28, 2007 and October 3, 2007. In four locations, a surface water/sediment sample pair was collected from each feature. At the remaining six locations, surface water was not present and only a sediment sample was collected. The sediment sample at the oil/water separator was collected using a Ponar dredge sampler.

3.9.3 IA04A, IA04B, IA04C and IA04D – Allegheny Ludlum Property

No IA08 features were identified in IA04A or IA04B; therefore, no IA08 samples were obtained. IA08 features identified within IA04C and IA04D included a storm sewer, a pump house sump, and a basin of undetermined use. Sampling activities in IA04C and IA04D are described in the following subsections.

3.9.3.1 IA04C – Area South of Allegheny Ludlum Operations

Two surface water/sediment sample pairs were collected from IA08 features within IA04C on September 28, 2007. The sediment samples were collected by using a stainless steel cup connected to a 10-foot steel pole.

3.9.3.2 IA04D – Area South of IA02

One surface water/sediment sample pair was collected from the former Erie Canal pump house reservoir east of Ohio Street on September 28, 2007. The sediment sample was collected using a Ponar dredge sampler. A second sediment sample was collected from this feature on October 11, 2008, because the laboratory indicated that the original sample had insufficient volume for analysis. The re-sample was collected using the same methodology as the first sample and was assigned the original sample ID, as no analysis had been performed on the initial sediment sample.

3.10 Surface Water/Sediment Sampling (IA03/IA09)

Procedures for surface water and sediment sampling at the toe of the landfill perimeter and in the Erie Canal were completed as outlined in the FSP and in accordance with EM 200-1-3 C.3, *Surface Water Sampling* and EM 200-1-3 C.5, *Sediment Sampling*.

Sample preparation and handling was conducted in accordance with Section 6 and Section 7 of the FSP. Surface water and sediment samples were analyzed at the offsite laboratory. Table 3-59 and Table 3-60 present sample IDs and summary of offsite radiological analyses for surface water and sediment samples, respectively. Figure 3-17 presents surface water and sediment sample locations.

Sampling equipment was decontaminated prior to use and between sample locations in accordance with the FSP. The required rinse blanks and field duplicate samples were collected in accordance with the QAPP.

3.10.1 IA03 – Landfill Area

Surface water was not present at the designated surface water/sediment sample locations in IA03 during the RI field data acquisition phase of work. As a result, only sediment samples were collected at the IA03 sample locations. A sixth sediment sample location was added to the five FSP-planned locations to improve lateral coverage of samples along the landfill perimeter.

On September 11, 2007, sediment samples were collected from six locations in the western and southern perimeter of the Landfill Area. Sediment samples were collected by digging into the surface material to a depth of 6 inches using a stainless steel trowel. Sampled material was then transferred to a stainless steel bowl and described (physical characteristics). This process was repeated until sufficient sample volume was obtained at each sample point. The collected sediment was then homogenized with a stainless steel trowel and transferred to the appropriate sample container(s).

The sediment samples were analyzed at the offsite laboratory by gamma spectroscopy (uranium, thorium, and radium COPCs), alpha spectroscopy short count (uranium and thorium COPCs), and USEPA method 903.0/904 (^{226}Ra and ^{228}Ra). Three of the six sediment samples were analyzed for TOC. All sediment samples were shipped under chain-of-custody to STL-St. Louis for analysis.

3.10.2 IA09 – Erie Canal

A Canal Work Permit was applied for through the New York State Canal Corporation prior to performance of surface water and sediment sampling activities. The approved work permit allowed for use of Erie Canal lands for sediment and water column sampling. A copy of Canal Work Permit #C4W070055 is presented in Appendix Q.

Collocated surface water and sediment samples were collected from 12 locations in the Erie Canal on September 12, 2007. The 12 sample locations were distributed across four transects spanning the width of the canal; three sample points were located on each transect. Figure 3-17 presents surface water and sediment sample locations. Transect numbers 1 and 2 were located downstream of the former Guterl industrial water intake pump house outfall. Transect number 3 was located at the former Guterl pump house outfall. Transect number 4 was located upstream of the former Guterl pump house outfall (background transect).

Surface water and sediment samples were collected from the most downstream location first and then subsequently to the next upstream location. Surface water samples were collected at each location prior to the collection of the sediment sample to minimize the potential influence of resuspended sediment being collected in the surface water sample.

Surface water samples were collocated with each of the sediment samples. Surface water samples were collected at the midpoint of the water column using a Wildco® Alpha™ brand horizontal water bottle sampler. Water samples were transferred from the sampler directly to the appropriate sample bottles. The surface water samples were analyzed at the offsite laboratory by alpha spectroscopy (isotopic uranium and thorium) and GFPC (^{226}Ra and ^{228}Ra).

Sediment samples were collected from the Erie Canal using a Ponar dredge sampler. Sediment collected with the Ponar dredge sampler was placed into a disposable foil tray and described (physical characteristics). This process was repeated until sufficient sample volume was obtained at each sample point. The collected sediment was then homogenized with a stainless steel trowel and transferred to the appropriate sample container(s). The sediment samples were analyzed at the offsite laboratory by gamma spectroscopy (U, Th, and Ra COPCs), alpha spectroscopy short count (uranium and thorium COPCs), and USEPA method 903.0/904 (^{226}Ra and ^{228}Ra). Six of the 12 sediment samples were analyzed for TOC.

The water column thickness was recorded at each sample location to determine an approximate profile of the canal floor, (i.e., to determine if significant thickness of sediment has been deposited along the edges of the canal). The water column thickness was measured at approximately 12 feet at each sample point. Depth to sediment data indicated that the canal had a relatively level mudline with no significantly greater deposits of sediment along the edges of the canal.

3.11 Air Monitoring

The Guterl Site radiation safety officer (SRSO) was responsible for assessing and implementing workplace and breathing zone air monitoring during field activities. Due to the anticipated levels of contamination, air monitoring was implemented only during circumstances that the SRSO deemed had potential to create detectable airborne radioactivity. The air monitoring program consisted of three elements: perimeter monitoring, workplace monitoring, and breathing zone monitoring.

3.11.1 Perimeter

No perimeter air samples were collected due to the minimal hazard that airborne radioactivity from site activities represented to members of the general public at the Guterl Site boundary in accordance with the SSHP.

3.11.2 Workplace

During contamination survey activities in Building 24, the roof trusses in the southwest portion of the building were found to be encrusted with a thick dust layer. Samples of the dust were analyzed at both the onsite and offsite laboratories. Sample results showed a maximum value of about 2,000 pCi/g for ^{238}U (sample results are discussed in Section 4.2.8.2). Breathing zone samples for the survey technicians were below detectable levels.

According to historical references, Building 24 was constructed as an addition to Building 8. The southwest portion of Building 24 was originally the loading dock area of Building 8. The original Building 8 structural steel is still in place and in use within that part of Building 24. The remaining portions of Building 24 were new material at the time of construction. Building 24 is currently in use as an active warehouse facility.

In order to assess airborne radioactivity with sufficient sensitivity to demonstrate compliance with general public exposure standards, an ambient air sample was collected to assess airborne radionuclide concentrations in the worker accessible area below the contaminated roof trusses. The sample was collected by means of a high volume stationary particulate sampler (F&J Specialty Products, Inc., model HV-1) with a collection time of approximately 74 hours.

The sample was analyzed offsite by ARS (Baton Rouge, LA) and was determined to have a gross alpha radiation activity of $(1.49 \pm 0.20) \times 10^{-13}$ microcuries per mL (µCi/mL) of air. This value was compared to the Derived Air Concentration (DAC) Values published in 10 CFR 20 and a worst-case Committed Effective Dose Equivalent was calculated. The calculated dose was (38 ± 5) millirem (mrem). The annual dose limit for a non-radiation worker or member of the general public is 100 mrem. Note that the radiation levels found in the air sample are of the same magnitude as naturally occurring (background) radiation levels. As these results were not corrected for background radiation, they likely represent levels that are not distinguishable from background. The dose calculations also assume 2000 hours of exposure per year which may not be realistic considering the current use of the building. The undisturbed material on the trusses does not present a danger to workers and any resulting exposures are well below regulatory limits and are likely indistinguishable from background.

3.11.3 Breathing Zone

Worker breathing zone monitoring was conducted during activities that had the potential to create airborne radioactivity. Specific activities monitored included brush clearing activities using the hydro-axe, boring activities in Buildings 6 and 8, and radiological survey work conducted on the roof trusses of Building 24. Air samples were collected using a Gilian Model GilAir-5 pump connected through plastic tubing to a 37-millimeter cassette assembly containing a glass fiber filter and placed in the worker's breathing zone. The pumps were set a flow rate of 2 liters per minute. At the end of the workday, relevant information as specified in the SSHP was collected and the filters were submitted to the onsite lab and analyzed for gross alpha and beta radiation. Flow rate was checked daily using a Bios DryCal, DC-Lite, air flow calibrator manufactured by Bios International Corporation.

Breathing zone sample results demonstrated that airborne contamination during site activities was minimal. The maximum value for the breathing zone samples equated to 0.2 DAC-hrs, with the majority below detection limits.

3.12 Investigation Derived Wastes

3.12.1 IDW Management

During the performance of the RI data acquisition phase of work, non-hazardous IDW (i.e., municipal refuse) and potentially hazardous liquid and solid IDW were generated. Non-hazardous IDW was placed in a rented dumpster for periodic removal and disposal (Modern Corporation, Model City, NY). Potentially hazardous liquid and solid IDW generated during this RI was collected, containerized, labeled, and inventoried in accordance with the procedures outlined in the FSP (USACE, 2007a); see Appendix R for a copy of the IDW Log.

Liquid IDW consisted of sampling equipment decontamination water, and drilling, development, and purge water from monitoring well installation and testing activities. Solid IDW consisted of decontamination solids, drill cuttings (soil), disposable sampling equipment, and PPE.

Potentially hazardous IDW was categorized as it was generated (liquid or solid), containerized, and segregated at the IDW staging area as it was generated. The secure IDW staging and containment area was located in Building 35. Liquid IDW was placed in Department of Transportation (DOT)-compliant, labeled, closed-top 55-gallon drums. Solid IDW was placed in DOT-compliant, labeled, open-top 55-gallon drums equipped with plastic drum liners.

3.12.2 IDW Disposal

Liquid and solid IDW generated during this RI was characterized to develop appropriate waste profiles and to identify the most efficient means of disposal.

Four 55-gallon drums of solid IDW were generated during the project. The solid IDW was profiled for radiological constituents by collecting a composite sample from the drums and analyzing it at the onsite radiological laboratory. The chemical constituents of the material were profiled based on review of prior investigative data. The solid IDW was transported to Impact Services (Oak Ridge, TN) where additional radiological and chemical profiling was performed in advance of waste acceptance for disposal under Tennessee's Bulk Survey for Release criteria. The material was subsequently disposed at Chestnut Ridge Landfill, Heiskell, TN as non-hazardous waste. The disposal certificate is presented in Appendix R.

Fifteen 55-gallon drums of liquid IDW were generated during the project. The radiological profile was based on groundwater sample data. The chemical constituents of the liquid IDW were profiled by collecting a composite sample for VOC, TCLP metals, and PCB analyses (Table 3-61). The analytical

results are shown in Appendix R. The liquid IDW was disposed at US Ecology TX, Robstown TX. The waste profile and disposal certificate are presented in Appendix R.

3.13 Data Quality Review / Data Verification

Data verification is a process of evaluating the completeness, correctness, consistency, and compliance of a data package. The onsite and offsite radiological laboratories provided sample data in hard copy and electronic data deliverable (EDD) format. The EDDs were verified for accuracy against the laboratory data packages. Radiological analytical data reports are presented in Appendix S.

The overall goal of the verification process was to verify that there was an acceptable analysis reported for each sample submitted for each analytical parameter required[23]. The specific items included in the verification of Guterl Site samples submitted to STL-St. Louis for radiological analyses are presented in Appendix B.

Blind duplicate samples were collected for each matrix in accordance with the frequencies listed in the FSP and QAPP. Table 3-62 presents a list of original sample identification (ID) alongside the blind duplicate sample ID. A summary of comparability is presented in Appendix B.

Data were generally found to be compliant with the measurement quality objectives (e.g., completeness, accuracy, duplicate precision) established in Section 3 of the QAPP (see detailed discussion in Appendix B). Further discussion of the internal comparability assessment and the generation of data sets for the various uses (fate and transport; risk assessment; etc.) is presented within Section 4 of this report.

[23] This is not the same as determining that the data are “valid” or “usable”; data validation is pending.

4.0 NATURE AND EXTENT OF CONTAMINATION

This section discusses the nature and extent of radiological parameters at the Guterl Site. The analytical database referenced in this discussion consists of radiological data generated during this RI, as well as historical data generated by prior investigators. The data generated during this RI have been used as the primary data set because these data meet project data quality requirements. Data from prior investigations have been used to corroborate nature and extent data generated during this RI.

The nature and extent discussion is organized by IA. Within each IA subsection, each COPC is evaluated within each matrix. The matrices evaluated include building materials, surface soil, subsurface soil, surface water, sediment, and groundwater. Where a matrix does not occur within an IA, a placeholder subsection has been used to maintain consistency of the outline within the section.

4.1 Background Concentrations

4.1.1 Use/Application of Background Concentrations

This subsection describes how RI-generated background concentrations were compared with RI-generated radiological data for the various matrices and COPCs, respectively. Comparison against background allows for determination of areas where COPC concentrations indicate that, with reasonable confidence, the respective media have been affected by MED/AEC-related constituents. COPC concentrations considered potentially significant with regards to risk are further evaluated in the baseline risk assessment. The development and use of risk-based preliminary remediation goals (PRG) is discussed in the baseline risk assessment.

All of the radiological COPCs also are present as a result of the natural composition of the soil. To identify contributions to activity caused by naturally occurring isotopes, background soil samples were collected from a small section in IA05B for reasons discussed in Section 3.4.1 and analyzed for the concentrations of the radiological COPCs.

The comparison of background concentrations to site-specific data allowed for an evaluation of impacts from previous site operations. Background radiological COPC concentrations must be representative of local settings and indicative of land use in the area of the Guterl Site (e.g., industrial, urban, rural). As such, the media sampled from IA05B displayed a range of constituents and contaminants as a result of anthropogenic pollution (i.e., the general impact of people on the environment).

4.1.1.1 Basis for Selection of Background Values

Section 3.4 describes the sample quantities, collection methods, and analytical methods for background samples for surface soil, subsurface soil, surface water, sediment, groundwater, and building materials. Table 3-32 presents average COPC background concentrations for surface soil and subsurface soil. Table 3-34 presents average COPC background concentrations for sediments. Table 3-36 presents COPC background concentrations for building materials. Table 4-1 presents average COPC background concentrations for surface water and groundwater samples shown in previous tables in one place for reference purposes.

In accordance with MARSSIM protocols, average (mean) background concentration was used for the assessment of nature and extent of COPCs in Guterl Site media.

Results of laboratory analyses of soil, surface water, sediment, groundwater, and building material samples for individual radiological COPC concentrations within this report are generally presented without subtracting background concentrations. However, the following subsections address special circumstances related to the use/application of background values for soil and sediment analyses.

4.1.1.2 Comparisons of COPC Concentrations in Soil and Sediment Samples to Screening Levels

Because this project involves eight radiological COPCs, average (mean) background concentrations are subtracted from the laboratory results for the purpose of applying the *unity rule*[24] for soil and sediment samples, as follows.

Single values for background concentrations were needed for sum-of-ratio (SOR) calculations. Weighted averaging was used to obtain those single values for each sample location with the inherent assumption that the concentration of each COPC did not vary significantly between points in the background reference area. Weighted averages were obtained by combining duplicate laboratory results for a single sample, resulting in a single value for that sample with reduced uncertainty. For example, counting the same sample twice the same way (duplicate sample analysis) and so producing two results is equivalent to counting that sample once for twice as long if weighted averaging is used to combine the results. This takes full advantage of all laboratory results. Weighted averages were not used to combine laboratory results for more than one analysis technique; i.e., alpha spectroscopy and gamma spectroscopy results were not combined into a single value using weighted averaging. For a set of related results x_i with uncertainties σ_i, the weighted average $\bar{x}$ and weighted average uncertainty $\sigma_{\bar{x}}$ for that set are given by

$$\bar{x} = \frac{\sum_{i=1}^{n} \frac{x_i}{\sigma_i^2}}{\sum_{i=1}^{n} \frac{1}{\sigma_i^2}} \text{ and } \sigma_{\bar{x}} = \frac{1}{\sqrt{\sum_{i=1}^{n} \frac{1}{\sigma_i^2}}}.$$

The significance of this choice is that this weighted average is the maximum likelihood estimator of the mean of the probability distributions under the assumption that they are independent and normally distributed with the same mean.

A background concentration B_i for each radiological COPC i is then calculated separately for each media type (for example, surface soil and subsurface soil) as the weighted average of the results for samples taken in the background reference area. If, for radiological COPC i, n_i is the number of analyzed background samples, b_{ij} is a laboratory-reported background sample result, and σ_{ij} is the laboratory-reported uncertainty for that sample,[25] then

$$B_i = \frac{\sum_{j=1}^{n_i} \frac{b_{ij}}{\sigma_{ij}^2}}{\sum_{j=1}^{n_i} \frac{1}{\sigma_{ij}^2}}.$$

[24] The unity rule (mixture rule) is a rule applied when more than one radionuclide is present at a concentration that is distinguishable from background and where a single concentration comparison does not apply. In this case, the mixture of radionuclides is compared against default concentrations by applying the unity rule. This is accomplished by determining: 1) the ratio between the concentration of each radionuclide in the mixture, and 2) the concentration for that radionuclide in an appropriate listing of default values. The sum of the ratios for all radionuclides in the mixture should not exceed one. (MARSSIM, page GL-23)

[25] Laboratory-supplied documentation on how uncertainties in reported results were determined are available in laboratory-specific operations plans. The onsite laboratory reported uncertainties as one standard deviation; the offsite laboratory reported uncertainties as two standard deviations. The uncertainty of each *numerical* result that appears in this report represents two standard deviations.

The uncertainty σ_{B_i} in B_i is

$$\sigma_{B_i} = \frac{1}{\sqrt{\sum_{j=1}^{n_i} \frac{1}{\sigma_{ij}^2}}}.$$

For radiological COPC *i*, if R_i is the laboratory-reported concentration for a sample, then the concentration above background C_i for that sample is simply

$C_i = R_i - B_i$.

If the uncertainty in each R_i is σ_{R_i}, then the uncertainty σ_i in C_i is given by

$$\sigma_i = \sqrt{\sigma_{R_i}^{\ 2} + \sigma_{B_i}^{\ 2}}.$$

If L_i is the screening level for radiological COPC *i*, application of the unity rule leads to the SOR *S* for that sample as

$$S = \sum_i \frac{C_i}{L_i}.$$

The uncertainty σ in *S* is given by

$$\sigma = \sqrt{\sum_i \left(\frac{\sigma_i}{L_i} \right)^2}.$$

If *S* is less than one, then the total radiological COPC concentration in the sample meets the cumulative screening levels. Table 4-2 presents soil screening levels developed during the data gap analysis and work plan preparation phase of this RI and used for the data evaluation phase of this RI.

The unity rule will be applied to a sample only using values of R_i and B_i and their uncertainties that were determined by the same analytical method. This is because sample preparation differs between the analytical techniques (alpha spectroscopy and gamma spectroscopy) and, so, the exact same sample for each technique is not being analyzed although the same sample ID may apply.

Additionally, results generally are not reported for all eight radiological COPCs for a given analytical method. In such cases, reported results will be used when possible as surrogates for other radiological COPCs using accepted values of natural abundances or assuming secular equilibrium. Specifically, when analytical results are not available for a radiological COPC, it will be assumed that ^{232}Th, ^{228}Th, and ^{228}Ra are in secular equilibrium, that ^{238}U and ^{234}U are in secular equilibrium, or that ^{234}U, ^{235}U, and ^{238}U occur at their natural abundances[26] in order to obtain derived values for R_i for that COPC for the purpose of

[26] The validity of these assumptions, made when not all COPCs are accounted for in a single sample by laboratory-reported results for a particular analytical technique, may be studied by comparing results for single samples analyzed by more than one technique. Some of the uranium detected in the samples likely was depleted or enriched in the ^{238}U isotope. This will have minor effects on the accuracy of SOR calculations using on-site gamma spectroscopy results.

calculating *S*. Since not enough time has passed for ^{226}Ra and ^{230}Th to be in secular equilibrium with their parent ^{238}U in any processed uranium that remains from MED/AEC support operations, they will be assumed to be at background concentrations when an analytical value is unavailable for the calculation of *S*. These assumptions are noted in Section 4.1.2 and taken into account for propagation-of-uncertainty calculations.

Finally, in Title 10, Code of Federal Regulations, Part 20, the Nuclear Regulatory Commission allows terms in the SOR that are less than 0.1 to be disregarded. This procedure is adopted to reduce uncertainty in the final result for *S*.

Note that a large relative uncertainty in a soil concentration often leads to a large relative uncertainty in the SOR. Therefore, the SOR should be viewed with this in mind. For example, because of large relative uncertainties in some of the soil concentrations, some of the calculated gamma spectroscopy SORs for samples collected from the background reference area are not clearly less than 1, whereas, by definition, the true SOR for a background sample must be less than 1.

4.1.2 Calculation of SOR Values for Soil and Sediment

4.1.2.1 SOR for Soil Concentrations Determined by Alpha Spectroscopy

The off-site laboratory reported alpha spectroscopy results for ^{228}Th, ^{230}Th, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U soil concentrations. As discussed in Section 4.1.1.2, the reported soil concentrations for ^{232}Th are used as surrogates for ^{228}Ra concentrations. This is necessary and sufficient because the laboratory did not report alpha spectroscopy results for ^{228}Ra (^{228}Ra does not emit alpha particles) and ^{232}Th likely is in secular equilibrium with ^{228}Ra. The soil concentrations of ^{226}Ra will be assumed to be at background levels.

Thus, $C_{Ra\text{-}228} = C_{Th\text{-}232}$ and $C_{Ra\text{-}226} = 0$ for SOR calculated from alpha spectroscopy results. The equation for the alpha spectroscopy SOR becomes

$$\begin{aligned} S_\alpha &= \frac{0}{L_{\text{Ra-226}}} + \frac{C_{\text{Th-232}}}{L_{\text{Ra-228}}} + \frac{C_{\text{Th-228}}}{L_{\text{Th-228}}} + \frac{C_{\text{Th-230}}}{L_{\text{Th-230}}} + \frac{C_{\text{Th-232}}}{L_{\text{Th-232}}} + \frac{C_{\text{U-234}}}{L_{\text{U-234}}} + \frac{C_{\text{U-235}}}{L_{\text{U-235}}} + \frac{C_{\text{U-238}}}{L_{\text{U-238}}} \\ &= \frac{L_{\text{Ra-228}} + L_{\text{Th-232}}}{L_{\text{Ra-228}} L_{\text{Th-232}}} C_{\text{Th-232}} + \frac{C_{\text{Th-228}}}{L_{\text{Th-228}}} + \frac{C_{\text{Th-230}}}{L_{\text{Th-230}}} + \frac{C_{\text{U-234}}}{L_{\text{U-234}}} + \frac{C_{\text{U-235}}}{L_{\text{U-235}}} + \frac{C_{\text{U-238}}}{L_{\text{U-238}}} \end{aligned} .$$

It follows that the uncertainty σ_α in S_α is given by

$$\sigma_\alpha = \sqrt{\left(\frac{L_{\text{Ra-228}} + L_{\text{Th-232}}}{L_{\text{Ra-228}} L_{\text{Th-232}}} \sigma_{\text{Th-232}}\right)^2 + \left(\frac{\sigma_{\text{Th-228}}}{L_{\text{Th-228}}}\right)^2 + \left(\frac{\sigma_{\text{Th-230}}}{L_{\text{Th-230}}}\right)^2 + \left(\frac{\sigma_{\text{U-234}}}{L_{\text{U-234}}}\right)^2 + \left(\frac{\sigma_{\text{U-235}}}{L_{\text{U-235}}}\right)^2 + \left(\frac{\sigma_{\text{U-238}}}{L_{\text{U-238}}}\right)^2} .$$

Applying the soil screening levels in Table 4-2, the equations become

$$S_\alpha = \frac{C_{\text{Th}-232}}{0.55\,\text{pCi/g}} + \frac{C_{\text{Th-228}}}{4.7\,\text{pCi/g}} + \frac{C_{\text{Th-230}}}{1.8\,\text{pCi/g}} + \frac{C_{\text{U-234}}}{13\,\text{pCi/g}} + \frac{C_{\text{U-235}}}{8\,\text{pCi/g}} + \frac{C_{\text{U-238}}}{14\,\text{pCi/g}}$$

and

$$\sigma_\alpha = \sqrt{\left(\frac{\sigma_{\text{Th-232}}}{0.55\,\text{pCi/g}}\right)^2 + \left(\frac{\sigma_{\text{Th-228}}}{4.7\,\text{pCi/g}}\right)^2 + \left(\frac{\sigma_{\text{Th-230}}}{1.8\,\text{pCi/g}}\right)^2 + \left(\frac{\sigma_{\text{U-234}}}{13\,\text{pCi/g}}\right)^2 + \left(\frac{\sigma_{\text{U-235}}}{8\,\text{pCi/g}}\right)^2 + \left(\frac{\sigma_{\text{U-238}}}{14\,\text{pCi/g}}\right)^2} .$$

Table 4-3 and Table 4-4 present the SOR calculation results for all concentrations determined by alpha spectroscopy for surface and subsurface soil, respectively. Data from these tables will be used in the discussions for each IA. Figure 4-1 (inside IA01 buildings) and Figure 4-2 (outdoor areas) graphically display these results.

As described above, the SOR utilizes individual screening levels in application. However, because of the contribution of multiple COPCs in the formula, it is entirely possible to have an SOR exceedance (result greater than unity) while not having a screening level exceedance for any single COPC. An example would be a sample containing 8 pCi/g ^{238}U and 8 pCi/g ^{234}U (and for the purpose of illustration, assume no contribution from the other 6 COPCs). These U values are clearly greater than background, and almost certainly attributable to MED/AEC-related constituents. While these COPCs are not above their respective screening levels, the resulting SOR for the sample would be greater than 1. As a result, the SOR is a good indicator for identifying areas where materials may be affected by MED/AEC-related constituents, but should be used with caution to define areas of individual COPC screening level exceedance because further examination of individual COPC concentrations would be required to make such a determination.

4.1.2.2 SOR for Soil Concentrations Determined by Offsite Gamma Spectroscopy

The offsite laboratory reported gamma spectroscopy results for ^{226}Ra, ^{232}Th, and ^{235}U soil concentrations. However, the results for only a few samples provide sufficient information to calculate meaningful sums of ratios. Absent concentrations for ^{234}U and ^{238}U, most of the ^{235}U concentrations were not useful as surrogates for the other uranium isotopes because of their large relative uncertainties, often exceeding 100 percent. This produces similarly large relative uncertainties in the concentrations for ^{234}U and ^{238}U, with resulting large relative uncertainties in the SOR that make the SOR essentially meaningless.

For the remaining samples, the ^{235}U concentrations alone indicate that the SOR are clearly greater than 1. However, as discussed below, SOR calculated from alpha spectroscopy results and from onsite gamma spectroscopy results also show that the SOR for these same samples are clearly greater than 1 and, so, no SOR information for these samples has been lost by not calculating the SOR from offsite gamma spectroscopy.

The offsite laboratory set the ^{228}Ra results equal to the ^{232}Th results, so they are not independent of each other. That is, the laboratory assumed, as is assumed elsewhere in this report when necessary, that ^{232}Th is a surrogate for ^{228}Ra and set the concentrations equal to each other. In such a case, the separate SOR terms for ^{228}Ra and ^{232}Th must be combined into a single term for the purpose of uncertainty propagation, as was done in Section 4.1.2.1.

The ^{238}U results are not usable because of concerns about their accuracy (see Section 3.3.3.1). The ^{235}U results are not sufficiently precise to use for estimating the ^{234}U and ^{238}U concentrations except for the eight samples with ^{235}U concentrations greater than about 4 pCi/g. For those eight samples the concentrations of ^{234}U and ^{238}U are each more than 20 times greater than the associated ^{235}U concentration. Since the screening levels for ^{234}U and ^{238}U are only 13 pCi/g and 14 pCi/g, respectively, and the ^{234}U and ^{238}U concentrations are greater than 80 pCi/g, the SOR clearly exceed 1 for these samples in agreement with SORs calculated from alpha spectroscopy and onsite gamma spectroscopy.

4.1.2.3 SOR for Soil Concentrations Determined by Onsite Gamma Spectroscopy

Gamma spectroscopy results were reported by the onsite laboratory for ^{232}Th and ^{238}U soil concentrations. The reported soil concentrations for ^{232}Th are used as surrogates for ^{228}Ra and ^{228}Th concentrations. The reported soil concentrations for ^{238}U are used as surrogates for ^{234}U and ^{235}U

concentrations.[27] The soil concentrations of ^{226}Ra and ^{230}Th are assumed to be at background levels. Thus, $C_{\text{Ra-228}} = C_{\text{Th-228}} = C_{\text{Th-232}}$, $C_{\text{U-234}} = C_{\text{U-238}}$, $C_{\text{U-235}} = 0.0450C_{\text{U-238}}$, and $C_{\text{Ra-226}} = C_{\text{Th-230}} = 0$ for SOR calculated from onsite gamma spectroscopy results. The equation for the onsite gamma spectroscopy SOR becomes

$$\begin{aligned} S_{\text{onsite }\gamma} &= \frac{0}{L_{\text{Ra-226}}} + \frac{C_{\text{Th-232}}}{L_{\text{Ra-228}}} + \frac{C_{\text{Th-232}}}{L_{\text{Th-228}}} + \frac{0}{L_{\text{Th-230}}} + \frac{C_{\text{Th-232}}}{L_{\text{Th-232}}} + \frac{C_{\text{U-238}}}{L_{\text{U-234}}} + \frac{0.0450C_{\text{U-238}}}{L_{\text{U-235}}} + \frac{C_{\text{U-238}}}{L_{\text{U-238}}} \\ &= \frac{L_{\text{Th-228}}L_{\text{Th-232}} + L_{\text{Ra-228}}L_{\text{Th-232}} + L_{\text{Ra-228}}L_{\text{Th-228}}}{L_{\text{Ra-228}}L_{\text{Th-228}}L_{\text{Th-232}}} C_{\text{Th-232}} \\ &\quad + \frac{L_{\text{U-235}}L_{\text{U-238}} + 0.0450L_{\text{U-234}}L_{\text{U-238}} + L_{\text{U-234}}L_{\text{U-235}}}{L_{\text{U-234}}L_{\text{U-235}}L_{\text{U-238}}} C_{\text{U-238}} \end{aligned}.$$

It follows that the uncertainty $\sigma_{\text{onsite }\gamma}$ in $S_{\text{onsite }\gamma}$ is given by

$$\sigma_{\text{onsite }\gamma} = \sqrt{\left(\frac{L_{\text{Th-228}}L_{\text{Th-232}} + L_{\text{Ra-228}}L_{\text{Th-232}} + L_{\text{Ra-228}}L_{\text{Th-228}}}{L_{\text{Ra-228}}L_{\text{Th-228}}L_{\text{Th-232}}} \sigma_{\text{Th-232}} \right)^2 + \left(\frac{L_{\text{U-235}}L_{\text{U-238}} + 0.0450L_{\text{U-234}}L_{\text{U-238}} + L_{\text{U-234}}L_{\text{U-235}}}{L_{\text{U-234}}L_{\text{U-235}}L_{\text{U-238}}} \sigma_{\text{U-238}} \right)^2}.$$

Applying the soil screening levels in Table 4-2, the equations become

$$S_{\text{onsite }\gamma} = \frac{C_{\text{Th-232}}}{0.89\ \text{pCi/g}} + \frac{C_{\text{U-238}}}{6.5\ \text{pCi/g}}$$

and

$$\sigma_{\text{onsite }\gamma} = \sqrt{\left(\frac{\sigma_{\text{Th-232}}}{0.89\ \text{pCi/g}} \right)^2 + \left(\frac{\sigma_{\text{U-238}}}{6.5\ \text{pCi/g}} \right)^2}.$$

Table 4-5 and Table 4-6 present the SOR calculation results for all concentrations determined by onsite gamma spectroscopy for surface and subsurface soil, respectively. Data from these tables will be used in the data discussions for each IA. Figure 4-3 (inside IA01 buildings) and Figure 4-4 (outdoor areas) graphically display these results.

4.1.2.4 Combined SOR Results

Each calculated SOR has an inherent uncertainty as shown in Section 4.1.1.2 by the equation for the SOR uncertainty; Table 4-3, Table 4-4, Table 4-5, Table 4-6, and the tables extracted from them are color-coded to graphically display the implications of SOR uncertainties as follows.

- Green backdrop: $(S + 2\sigma) < 1$, implying that the SOR is clearly less than 1 (confidence greater than 95 percent)

[27] As mentioned in an earlier footnote, it is noted that some of the uranium detected in the samples likely was depleted or enriched in the ^{238}U isotope. This will have minor effects on the accuracy of SOR calculations using on-site gamma spectroscopy results.

- Blue backdrop: $S < 1$ and $(S + 2\sigma) > 1$, implying that the SOR is less than 1, more likely than not (confidence greater than 50 percent but less than 95 percent)

- Yellow backdrop: $S > 1$ and $(S - 2\sigma) < 1$, implying that the SOR is greater than 1, more likely than not (confidence greater than 50 percent but less than 95 percent)

- Red backdrop: $(S - 2\sigma) > 1$, implying that the SOR is clearly greater than 1 (confidence greater than 95 percent)

The SOR tables show side-by-side a color for the sample ID cell in the table and for each of the analytical technique cells. Sometimes, the alpha spectroscopy and onsite gamma spectroscopy SOR do not assign the same cell color for the same sample ID. In such cases and as a convention, the SOR with the lesser uncertainty takes precedence for assigning backdrop color (combining the SOR) to the sample ID cell. Figure 4-5 (inside IA01 buildings) and Figure 4-6 (outdoor areas) display the SOR assigned to sample ID in this fashion (with green and blue backdrop assignments shown as green dots and yellow and red backdrop assignments shown as red dots).

4.1.3 Site-Wide Comparison of Soil Boring Results with Background Concentrations

RI-generated radionuclide concentrations in soil for Guterl COPCs relative to site background are plotted in Figures 4-7 through 4-28. The figures were developed using onsite gamma spectroscopy data (^{238}U and ^{232}Th), fixed laboratory alpha spectroscopy data (uranium and thorium COPCs), and GFPC data (radium COPCs). The onsite gamma spectroscopy data set contains the most data points; i.e., with only a few exceptions, at least one sample from every boring is represented. Selection of onsite gamma spectroscopy samples was based on the decision tree presented in Section 2.6.1, and the methods described in Section 3.3.2.1. As described in Section 3.3.2.1, the onsite gamma spectroscopy data set is unbiased with respect to surface soil samples, but is biased with respect to subsurface soil samples. As discussed in Section 3.3.2.2, the alpha spectroscopy and GFPC data sets were biased both in the number of samples per IA and to the highest ranking onsite gamma spectroscopy SOR. The GFPC samples were analyzed at the rate of 50 percent of the alpha spectroscopy samples.

Section 4.1.3.1 through Section 4.1.3.3, and Figures 4-7 through 4-28, present a summary of COPC concentrations relative to the respective analytical method and matrix background concentrations and use the convention of multiples of background concentration. Comparisons in the range of one to two times background should be used with caution as the statistical uncertainties in this range make definitive conclusions problematic.

Section 4.2 through Section 4.15 provide additional IA-specific discussion regarding the distribution of MED/AEC-related constituents at the Guterl Site on an IA-by-IA basis. Section 4.2 (IA01) is discussed on a building-by-building basis.

4.1.3.1 Uranium COPCs in Soil

Figure 4-7 and Figure 4-8 show the ^{238}U data based on the onsite laboratory gamma spectroscopy data for indoor areas (IA01) and outdoor areas (IA02 through IA10), respectively. Figures 4-9 through 4-16 show the site-wide distribution of ^{238}U, ^{235}U, ^{234}U, and total U, respectively, based on alpha spectroscopy data. Exceedance of U soil screening levels (Table 4-2) occurred within the primary production and associated areas (Building 2 [north end], Building 3, Building 4&9, Building 6, and Building 8), beneath the concrete floor of Building 24, in outdoor areas near production areas (IA02), and in presumed landfill/disposal areas (IA03, IA04A). The distribution of ^{238}U is consistent with previous studies (ORISE, 1999) and shows a broad area of contamination in the area of IA03 and IA04A and extending well into the subsurface. A second area of contamination is found in IA01 and IA02. ^{235}U and ^{234}U are found in similar locations. Approximately 55 percent of ^{238}U and ^{234}U and approximately 36 percent of ^{235}U samples

exceeded two times background. Section 4.2 provides additional detail regarding nature and extent of COPCs in each IA.

4.1.3.2 Thorium COPCs in Soil

Figure 4-17 and Figure 4-18 display the site-wide distribution of ^{232}Th based on the onsite laboratory gamma spectroscopy results for indoor areas (IA01) and outdoor areas (IA02 through IA10), respectively. Figures 4-19 through 4-24 display the Guterl Site wide distribution of ^{232}Th, ^{230}Th, and ^{228}Th, respectively, based on alpha spectroscopy data. Exceedance of Th soil screening levels (Table 4-2) occurred within the primary production and associated areas (Building 2, Building 3, Building 4&9, Building 6, and Building 8), beneath the concrete floor of Building 24 and Building 35, in outdoor areas near production areas (IA02), and in presumed landfill/disposal areas (IA03, IA04A). The distribution of ^{232}Th is consistent with previous studies (ORISE, 1999) and shows elevated values primarily in IA01 and IA02 and to a lesser extent in IA04 and IA05A. The small number of results exceeding two times background for ^{232}Th (12 percent), ^{230}Th (3 percent), and ^{228}Th (8 percent) is consistent with previous studies and the historical description of primarily uranium metal being handled at the Guterl Site. Section 4.2 provides additional detail regarding nature and extent of COPCs in each IA.

4.1.3.3 Radium COPCs in Soil

Figure 4-25 through Figure 4-28 display the site-wide distribution for ^{228}Ra and ^{226}Ra, respectively, for indoor areas (IA01) and outdoor areas (IA02 through IA10), based on GFPC data. Exceedance of Ra soil screening levels (Table 4-2) occurred within the primary production and associated areas (Building 2, Building 3, Building 4&9, Building 6, and Building 8), beneath the concrete floor of Building 24 and Building 35, in outdoor areas near production areas (IA02), and in presumed landfill/disposal areas (IA03, IA04A). The small number of results exceeding two times background for ^{228}Ra (8 percent) and ^{226}Ra (11 percent) is consistent with previous studies and the historical description of primarily uranium metal being handled at the Guterl Site. Section 4.2 provides additional detail regarding nature and extent of COPCs in each IA.

4.2 IA01

In the text and tables in this section, “-700” series sample IDs represent “detritus” samples. Detritus was loose “non-native” material (for example, dirt, concrete, and brick) that was on top of the floor. It was typically looser and drier than native soil or fills and was easily discernible. These detritus samples were evaluated and summarized similarly to surface soil samples. The location of a “-700” sample is the same as the soil sample taken with a sample number 700 less; for example, detritus sample “-709” was taken at the same location as was soil sample “-009.”

Table 4-7 is a summary of the surface contamination static measurement results representing average (fixed plus removable) surface contamination for the IA01 buildings. Table 4-8 is a summary of the swipe results representing removable surface contamination for the IA01 buildings. Brief discussions of these results in comparison with the building surface screening levels in Table 3-4 follows below within the appropriate building subsection.

4.2.1 Building 1

Building 1 was originally built in 1913 and has a floor area of approximately 816 square meters (87,800 square feet). The building is constructed of masonry exterior walls with metal interior frame system. The main floor is constructed of thin gauge steel over trusses; in some places plywood has been used to bridge weak areas of the floor. According to available records, Building 1 was originally used as a manufactured gas house to provide gas to run the furnaces located in the manufacturing buildings. Based on the abandoned equipment on the main floor of Building 1 observed during the current RI, the most recent use of Building 1 appears to have been for small-scale metallurgical operations and testing. The

main floor of Building 1 was in disrepair and limited areas of complete deterioration were noted; access to these areas was restricted as a health and safety precaution. The south end of the building houses a work room that has been built onto so that the work room extends across the alleyway between Building 1 and Building 2, to the west. Because of the elevation difference between the main floor of Building 1 and that of Building 2, the Building 1 workroom attaches to Building 2 at the second floor level.

Building 1 contains a lower level that has been referred to as a basement. The basement was flooded throughout this RI, including the Guterl Site reconnaissance visits performed in May 2005 and February 2006; this observation is consistent with prior investigation reports (ORISE, 1999 and USACE, 2001). The basement walls extend several feet above grade, thus creating an elevated main floor to the building as compared to the other buildings on the Guterl Site. There are vehicle access ramps to the basement located on the east side (southern third) and the north end of the building.

4.2.1.1 Building Materials

Data Evaluation

Three building material samples were collected from the main floor of Building 1.One sample each of concrete, metal, and wallboard were collected. Sample locations are shown in Appendix T. No radiological survey or building material sampling was performed in the flooded basement due to safety concerns and accessibility restrictions.

Table 4-9 lists analytical results for radiological COPC concentrations in building materials for Building 1.

Summary

No evidence for activity concentrations above background levels was detected.[28]

4.2.1.2 Surface Soils

The main floor of Building 1 is constructed atop a basement. As a result, no surface soil samples for Building 1 were collected. In addition, the basement was flooded during the performance period of the RI; refer to Section 4.2.1.5 for description of sediment samples collected from the flooded basement.

4.2.1.3 Subsurface Soils

The main floor of Building 1 is constructed atop a basement, so no subfloor soil sampling could be performed for the main floor. In addition, the basement was flooded during the performance period of the RI; no subsurface soil sampling was performed in the flooded basement due to safety concerns and access restrictions.

4.2.1.4 Surface Water (Native)

Data Evaluation

Six surface water samples were collected from the flooded basement of Building 1; refer to Table 3-58 for a description of sample locations. The surface water samples were analyzed for COPCs by alpha spectroscopy (uranium and thorium) and GFPC (radium).

[28] The purpose of collecting building volumetric samples was to verify the ratio of nuclides in the various building media. Those ratios were used as input to RESRAD-Build for dose calculations. Within Section 4, these data are compared to building material background to illustrate where MED/AEC impacts may be indicated.

Table 4-10 lists radiological COPC concentrations in surface water samples collected from the flooded basement of Building 1. Table 4-11 shows the radium and uranium concentrations in Table 4-10 converted to concentrations suitable for comparison with USEPA drinking water maximum contaminant levels (MCL). Sample locations and corresponding analytical data are presented on Figure 4-29.

Summary

All six samples show concentrations of total uranium (^{234}U, ^{235}U, plus ^{238}U) that exceed USEPA drinking water standards for total uranium. Radium concentrations are below USEPA drinking water standards. Since the ^{230}Th concentrations for these samples are at background levels, it appears that these samples are contaminated with MED/AEC uranium.

The primary source of surface water in the flooded basement is presumed to be storm water runoff entering the basement via the two vehicle ramps, and in lesser amounts via window and door openings. Given that the historical use of Building 1 was not production-oriented, it appears that the uranium contamination present in the surface water may be explained by the influence of IA02 soil erosion into the basement via vehicle ramp, window, and door openings. A less likely scenario may be groundwater migration into the basement via construction joints or cracks in the basement floor and subgrade walls; however, IA02 groundwater data do not support this possibility.

4.2.1.5 Sediment

Data Evaluation

Six sediment samples were collected from the flooded basement of Building 1. In addition, sediment sample A08-B1SL-001 was collected from the surface soil in the alleyway between Building 1 and Building 2, directly below the work room addition described in Section 4.2.1. The sample was collected below an abandoned and open-ended drain pipe that originated within the work room, southern work bench sink (i.e., the location identified by ORISE to show elevated radiological activity.) The sink trap was plugged with grout, so the drain pipe was traced to the first accessible location for sampling.

The sediment samples were analyzed at the offsite fixed laboratory for COPCs by gamma spectroscopy (all COPCs), alpha spectroscopy (uranium and thorium COPCs), and GFPC (radium COPCs). Table 3-57 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-12 lists analytical results for radiological COPC concentrations for Building 1 sediment samples. Table 4-13 lists the SOR for Building 1 sediment samples. Sample locations and corresponding analytical data are shown on Figure 4-30.

Seven Building 1 sediment samples were analyzed for ^{226}Ra. One of the seven GFPC results indicated that ^{226}Ra was present at a concentration about twice the ^{226}Ra background concentration. The other six GFPC results were at or near the ^{226}Ra background concentration. The offsite gamma spectroscopy ^{226}Ra results for the seven samples were statistically consistent with the GFPC results. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-B1-SD-004 contained the greatest ^{226}Ra concentration for Building 1 sediment samples, (1.8 ± 0.3) pCi/g, which is about twice the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Seven Building 1 sediment samples were analyzed for ^{228}Ra. All seven GFPC results were at or near the ^{228}Ra background concentration. All seven offsite gamma spectroscopy results were at or near the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-B1-SD-004 contained the greatest ^{228}Ra concentration for Building 1 sediment samples, (1.4 ± 0.5) pCi/g, which is about the

same as the ^{228}Ra background concentration; its comparison with the ^{228}Ra screening level plus background concentration is inconclusive.

Seven Building 1 sediment samples were analyzed for ^{228}Th. All seven alpha spectroscopy results were at or near the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-B1-SD-004 contained the greatest ^{228}Th concentration for Building 1 sediment samples, (1.2 ± 0.3) pCi/g, which is the same as the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Seven Building 1 sediment samples were analyzed for ^{230}Th. All seven alpha spectroscopy results were at or near the ^{230}Th background concentration. All samples for which data were available for comparison indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A08-B1-SD-004 contained the greatest ^{230}Th concentration for Building 1 sediment samples, (0.8 ± 0.2) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

Seven Building 1 sediment samples were analyzed for ^{232}Th. All seven alpha spectroscopy results and all seven offsite gamma spectroscopy results were at or near the ^{232}Th background concentration. Sample A08-B1-SD-004 contained the greatest ^{232}Th concentration, (0.9 ± 0.4) pCi/g, which is about the same as the ^{232}Th background concentration and less than its screening level plus background concentration.

Seven Building 1 sediment samples were analyzed for ^{234}U. The alpha spectroscopy results indicated that ^{234}U was present in all seven samples at concentrations greater than the ^{234}U background concentration and all were in secular equilibrium with its ^{238}U precursor. Sample A08-B1-SD-004 contained the greatest ^{234}U concentration, (69 ± 7) pCi/g, which is about 100 times the ^{234}U background concentration and is 5 times the ^{234}U screening level plus background concentration.

Seven Building 1 sediment samples were analyzed for ^{235}U. Four of the seven alpha spectroscopy results indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration. Three of the seven gamma spectroscopy results indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration. Sample A08-B1-SD-004 contained the greatest ^{235}U concentration, (5.4 ± 1.1) pCi/g, which is less than the ^{235}U screening level plus background concentration.

Seven Building 1 sediment samples were analyzed for ^{238}U. The results for all seven samples were greater than the ^{238}U background concentration. Sample A08-B1-SD-004 had the greatest ^{238}U concentration, (78 ± 8) pCi/g, which is more than 100 times the ^{238}U background concentration and between 5 and 6 times the ^{238}U screening level plus background concentration.

Summary

Table 4-13 shows four samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

One sample had an SOR that, more likely than not, is greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

The remaining two samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

Given that the historical use of Building 1 was not production-oriented, it appears that the uranium contamination in the flooded basement may be explained by IA02 soil erosion into the basement via vehicle ramp, window, and door openings. A less likely scenario may be groundwater migration into the

basement via construction joints or cracks in the basement floor and subgrade walls; however, IA02 groundwater data do not strongly support this possibility.

4.2.1.6 Groundwater

No groundwater samples were collected from within any IA01 building. Refer to IA02 and IA07 discussions that address the footprint of IA01.

4.2.1.7 Building Surfaces

Contamination greater than the average screening levels for building surfaces (shown in Table 3-4) was detected in Building 1. Of the 225 locations measured (see Table 4-7), 20 exceeded the thorium average screening level but not the uranium average screening level, and two exceeded the average uranium screening level. The maximum measured average surface concentration was approximately 21,000 dpm/100 cm^2.

Contamination greater than the removable screening levels for building surfaces (shown in Table 3-4) was not detected in Building 1. The maximum measured removable surface concentration (see Table 4-8) was (60 ± 20) dpm/100 cm^2.

Figure 4-31 depicts Building 1 sampling locations with results greater than screening levels for building surfaces.

These results are consistent with results shown in Table 1 of the ORISE report (ORISE, 1999).

4.2.2 Building 2

Building 2 was originally built in 1914 and has a floor area of approximately 6401 square meters (68,900 square feet). The building is constructed of masonry exterior walls with metal interior frame system. Floor materials encountered during this RI included soil, concrete, and brick.

According to available records, Building 2 was originally used for metal rolling and manufacturing. Building 2 is subdivided into three large segments: south, center, and north. There are smaller rooms (offices, lockers, laboratories) located on the lateral walls of each segment. The north end contains several large chemical vats formerly used in non-MED/AEC manufacturing processes. A trolley rail connecting Building 3 with Building 2 is located through the west side of the center section.

4.2.2.1 Building Materials

Data Evaluation

Table 4-14 lists analytical results for radiological COPC concentrations in building materials for Building 2. Sample locations are shown in Appendix T.

Summary

In eight of the ten samples, no evidence for concentrations above background levels was detected.

In concrete sample B02-BM-001, the concentrations of ^{226}Ra, ^{230}Th, and ^{234}U appear to be in secular equilibrium, implying that the source of this contamination is unrefined (non-MED) uranium. The alpha spectroscopy results for this sample show a background ^{238}U concentration, however, which is inconsistent with the concentrations of its progeny.

In particle board sample B02-BM-010, the ^{234}U and ^{238}U concentrations imply MED/AEC-uranium contamination.

4.2.2.2 Surface Soils

Data Evaluation

Eleven surface soil samples and 42 detritus samples were collected in Building 2. Two detritus samples were included in the surface soil data set that was selected for offsite analyses. The rationale for this decision was based on the FSP calling for 13 surface soil samples, however only 11 of 59 boring locations had surface soil present. As a result, the two highest ranking SOR detritus samples were selected to supplement the surface soil data set for offsite analyses.

Table 3-42 lists the surface soil and detritus samples analyzed by onsite gamma spectroscopy. Table 3-41 and Table 3-43 list the detritus and surface soil samples analyzed at the offsite laboratory, respectively. Surface soil sample locations are shown on Figure 3-11. Detritus sample locations are shown on Figure 3-12.

Table 4-15 lists analytical results for radiological COPC concentrations in surface soil and detritus samples for Building 2. COPC concentrations relative to average Guterl Site background concentrations are presented in graphical format in Figures 4-7 through 4-28.

Table 4-16 lists the SOR for Building 2 surface soil and detritus samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Only one surface soil sample from Building 2 was analyzed for ^{226}Ra. The GFPC result, (1.0 ± 0.2) pCi/g, indicated that ^{226}Ra was present in this sample at background concentrations and in secular equilibrium with its ^{230}Th precursor.

Only one surface soil sample from Building 2 was analyzed for ^{228}Ra. The GFPC result, (1.3 ± 0.4) pCi/g, indicated that ^{228}Ra was present in this sample at the ^{228}Ra background concentration and was in secular equilibrium with its ^{232}Th precursor.

Two surface soil samples and two detritus samples from Building 2 were analyzed for ^{228}Th. The alpha spectroscopy results indicated that ^{228}Th was present in three samples at the ^{232}Th background concentration and, for the one sample with data available for comparison, in secular equilibrium with its ^{228}Ra precursor. Detritus sample B02SL-739-01 contained the greatest ^{228}Th concentration, (2.0 ± 0.4) pCi/g, which is between 2 and 3 times the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Two surface soil samples and two detritus samples from Building 2 were analyzed for ^{230}Th. The alpha spectroscopy results indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Detritus sample B02SL-739-01 contained the greatest ^{230}Th concentration, (1.7 ± 0.3) pCi/g, which is about twice the ^{228}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All Building 2 surface soil samples were analyzed for ^{232}Th in the onsite gamma spectroscopy laboratory. The results for four samples also analyzed by alpha spectroscopy agreed with the onsite results. All but five of the results were at or slightly greater than the ^{232}Th background concentration. Detritus sample B02SL-739-01 contained the highest ^{232}Th concentration, (2.0 ± 0.4) pCi/g, which is between 2 and 3 times the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Two surface soil samples and two detritus samples from Building 2 were analyzed for ^{234}U. The alpha spectroscopy results indicated that ^{234}U was present in all samples at concentrations greater than the ^{234}U background concentration and in secular equilibrium with its ^{238}U precursor. Detritus sample B02SL-721-01 contained the greatest ^{234}U concentration, (16.1 ± 1.6) pCi/g, which is about the same as the ^{234}U screening level plus background concentration.

Two surface soil samples and two detritus samples from Building 2 were analyzed for ^{235}U. The alpha spectroscopy results indicated that ^{235}U was present in at least one sample at a concentration greater than the ^{235}U background concentration. Detritus sample B02SL-721-01 contained the highest ^{235}U concentration, (1.0 ± 0.3) pCi/g, which is less than the ^{235}U screening level plus background concentration.

All Building 2 surface soil samples were analyzed for ^{238}U in the onsite gamma spectroscopy laboratory. The results for four samples also analyzed by alpha spectroscopy generally agreed with the onsite results (one sample did not have both results overlap within two standard deviations but both were greater than the ^{238}U background concentration). More than half of the results were greater than the ^{238}U background concentration. Detritus sample B02SL-721-01 had the highest concentration, (16.7 ± 1.6) pCi/g, which is about 24 times the ^{238}U background concentration and about the same as the ^{238}U screening level plus background concentration.

Summary

Table 4-16 shows one surface soil sample and two detritus samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Two surface soil samples and one detritus sample have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$] according to gamma spectroscopy results.

One surface soil sample and four of the detritus samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 7 surface soil samples and 35 detritus samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

Page 17 of the ORISE report (ORISE, 1999) shows maximum ^{226}Ra (8.4 pCi/g), ^{232}Th (2.3 pCi/g), ^{235}U (4.4 pCi/g), and ^{238}U (113 pCi/g) surface soil concentrations for Building 2 that are greater than any found in the current survey.

^{226}Ra and ^{228}Ra, shown in Table 4-15, occur at concentrations similar to the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.2.3 Subsurface Soils

Data Evaluation

One hundred subsurface soil samples were collected in Building 2. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-6.

Table 4-17 lists analytical results for radiological COPC concentrations in subsurface soil samples for Building 2. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-18 lists the SOR for Building 2 subsurface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Sixteen subsurface soil samples from Building 2 were analyzed for ^{226}Ra. Seven of the 12 GFPC results indicated that ^{226}Ra was present at concentrations up to 3 times the ^{226}Ra background concentration. The other five GFPC results were at or near the ^{226}Ra background concentration. All four offsite gamma spectroscopy results were at or near the ^{226}Ra background concentration. All samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample B02SL-018-02 contained the greatest ^{226}Ra concentration for Building 2 subsurface soil samples, (3.1 ± 0.4) pCi/g, which is about 3 times the ^{226}Ra background concentration and almost twice the ^{226}Ra screening level plus background concentration.

Sixteen subsurface soil samples from Building 2 were analyzed for ^{228}Ra. Eight of the 12 GFPC results indicated that ^{228}Ra was present at concentrations up to 3 times the ^{228}Ra background concentration. The other four GFPC results were at or near the ^{228}Ra background concentration. All four offsite gamma spectroscopy results were at or near the ^{228}Ra background concentration. All samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B02SL-018-02 contained the greatest ^{228}Ra concentration for Building 2 subsurface soil samples, (2.1 ± 0.4) pCi/g, which is about 2.6 times the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Twenty-two subsurface soil samples from Building 2 were analyzed for ^{228}Th. Seven of the alpha spectroscopy results indicated that ^{228}Th was present at concentrations up to 3 times the ^{228}Th background concentration. The other 15 alpha spectroscopy results were at or near the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample B02SL-018-01 contained the greatest ^{228}Th concentration for Building 2 subsurface soil samples, (3.0 ± 0.6) pCi/g, which is about 3.3 times the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Twenty-two subsurface soil samples from Building 2 were analyzed for ^{230}Th. Five of the alpha spectroscopy results indicated that ^{230}Th was present at concentrations up to 3 times the ^{230}Th background concentration. The other 17 alpha spectroscopy results were at or near the ^{230}Th background concentration. All samples for which data were available for comparison indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor. Sample B02SL-045-01 contained the greatest ^{230}Th concentration for Building 2 subsurface soil samples, (3.0 ± 0.6) pCi/g, which is about 3.4 times the ^{230}Th background concentration and about the same as the ^{230}Th screening level plus background concentration.

All 100 Building 2 subsurface soil samples were analyzed for ^{232}Th in the onsite gamma spectroscopy laboratory. The results for 22 samples also analyzed by alpha spectroscopy and four samples also analyzed by offsite gamma spectroscopy generally agreed with the onsite results. Thirty results were greater than the ^{232}Th background concentration. Sample B02SL-049-02 contained the highest ^{232}Th concentration, (3.0 ± 0.4) pCi/g, which is between 4 and 5 times the ^{232}Th background concentration and almost twice its screening level plus background concentration.

Twenty-two subsurface soil samples from Building 2 were analyzed for ^{234}U. The alpha spectroscopy results indicated that ^{234}U was present in 21 of the 22 samples at concentrations greater than the ^{234}U background concentration and all were in secular equilibrium with its ^{238}U precursor. Sample B02SL-302-05 contained the highest ^{234}U concentration, (29 ± 3) pCi/g, which is more than twice its screening level plus background concentration.

Twenty-five subsurface soil samples from Building 2 were analyzed for ^{235}U. The 22 alpha spectroscopy results indicated that ^{235}U was present in eight samples at concentrations greater than the ^{235}U background concentration. The four offsite gamma spectroscopy results did not statistically detect ^{235}U.

Sample B02SL-008-01 contained the highest ^{235}U concentration, (1.5 ± 0.3) pCi/g, which is less than the ^{235}U screening level plus background concentration.

All 100 Building 2 subsurface soil samples were analyzed for ^{238}U in the onsite gamma spectroscopy laboratory. The results for 22 samples also analyzed by alpha spectroscopy generally agreed with the onsite results with a few discrepancies. More than half of the results were greater than the ^{238}U background concentration. Sample B02SL-302-05 had the highest concentration, (28 ± 3) pCi/g, which is about 40 times the ^{238}U background concentration and about the same as twice the ^{238}U screening level plus background concentration.

Summary

Table 4-18 shows 27 samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Fifteen samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$] according to gamma spectroscopy results.

Eighteen samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 40 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-17, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.2.4 Surface Water (Site Utilities)

Data Evaluation

Two surface water samples were collected from utility features within Building 2. The surface water samples were analyzed for COPCs by alpha spectroscopy (uranium and thorium) and GFPC (radium). Table 3-56 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-19 lists radiological COPC concentrations in surface water samples collected in Building 2. Table 4-20 shows the radium and uranium concentrations in Table 4-19 converted to concentrations suitable for comparison with USEPA drinking water MCLs. Sample locations and corresponding analytical data are presented on Figure 4-29.

Summary

Both samples show elevated concentrations of ^{234}U, ^{235}U, and ^{238}U. One sample clearly exceeds the USEPA drinking water MCL for total uranium (^{234}U, ^{235}U, plus ^{238}U). Since the ^{230}Th concentrations for these samples are at background levels, it appears that these samples are contaminated with MED/AEC uranium.

4.2.2.5 Sediment (Site Utilities)

Data Evaluation

Three sediment samples were collected from utility features within Building 2. The sediment samples were analyzed at the offsite fixed laboratory for COPCs by gamma spectroscopy (all COPCs), alpha spectroscopy (uranium and thorium COPCs), and GFPC (radium COPCs). Table 3-57 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-21 lists analytical results for radiological COPC concentrations in sediment for Building 2. Table 4-22 lists the SOR for Building 2 sediment samples. Sample locations and corresponding analytical data are presented on Figure 4-30.

Three Building 2 sediment samples were analyzed for ^{226}Ra. All three GFPC results were at or near the ^{226}Ra background concentration. The gamma spectroscopy ^{226}Ra results for the three samples were statistically consistent with the GFPC results. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-B2-SD-003 contained the greatest ^{226}Ra concentration for Building 2 sediment samples, (1.0 ± 0.2) pCi/g, which is about the same as the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

Three Building 2 sediment samples were analyzed for ^{228}Ra. All three GFPC results were at or near the ^{228}Ra background concentration. The gamma spectroscopy results for ^{228}Ra for all three samples were statistically consistent with the GFPC results; however, one gamma spectroscopy result indicated a ^{228}Ra concentration greater than the ^{228}Ra background concentration due to its uncertainty being about one-third of the corresponding alpha spectroscopy uncertainty. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-B2-SD-001 contained the greatest ^{228}Ra concentration for Building 2 sediment samples, (1.77 ± 0.17) pCi/g, which is about twice the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Three Building 2 sediment samples were analyzed for ^{228}Th. The alpha spectroscopy results indicated that ^{228}Th was present in one sample at a concentration greater than the ^{228}Th background concentration. Two alpha spectroscopy results were at or near the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-B2-SD-001 contained the greatest ^{228}Th concentration for Building 2 sediment samples, (1.5 ± 0.3) pCi/g, which is about twice the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Three Building 2 sediment samples were analyzed for ^{230}Th. All three alpha spectroscopy results were at or near the ^{230}Th background concentration. The results for two samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A08-B2-SD-001 contained the greatest ^{230}Th concentration for Building 2 sediment samples, (0.84 ± 0.19) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

Three Building 2 sediment samples were analyzed for ^{232}Th. The alpha spectroscopy results indicated that ^{232}Th was present in one sample at a concentration greater than the ^{232}Th background concentration. Two alpha spectroscopy results were at or near the ^{232}Th background concentration. The gamma spectroscopy results were consistent with the alpha spectroscopy results. Sample A08-B2-SD-001 contained the greatest ^{232}Th concentration, (1.77 ± 0.17) pCi/g, which is almost 3 times the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Three Building 2 sediment samples were analyzed for ^{234}U. The alpha spectroscopy results indicated that ^{234}U was present in all three samples at concentrations greater than the ^{234}U background concentration and all were in secular equilibrium with the ^{238}U precursor. Sample A08-B2-SD-002 contained the greatest ^{234}U concentration, (5.6 ± 0.8) pCi/g, which is about 8 times the ^{234}U background concentration and is less than the ^{234}U screening level plus background concentration.

Three Building 2 sediment samples were analyzed for ^{235}U. None of the alpha spectroscopy results or gamma spectroscopy results indicated that ^{235}U was present statistically at concentrations greater than

the ^{235}U background concentration. Sample A08-B2-SD-003 contained the greatest ^{235}U concentration, (0.3 ± 0.3) pCi/g, which is not different statistically from the ^{235}U background concentration.

Three Building 2 sediment samples were analyzed for ^{238}U. The results for all three samples were greater than the ^{238}U background concentration. Sample A08-B2-SD-003 had the greatest ^{238}U concentration, (5.7 ± 0.8) pCi/g, which is about 8 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

Table 4-22 shows one sample with an SOR that, more likely than not, is greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

The remaining two samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-21, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.2.6 Groundwater

No groundwater samples were collected from within any IA01 building. Refer to IA02 and IA07 discussions that address the footprint of IA01.

4.2.2.7 Building Surfaces

Contamination greater than the average screening levels for building surfaces (shown in Table 3-4) was detected in Building 2. Of the 1,380 locations measured (see Table 4-7), 137 exceeded the thorium average screening level but not the uranium average screening level, and seven exceeded the average uranium screening level. The maximum measured average surface concentration was approximately 140,000 dpm/100 cm^2.

Contamination greater than the removable screening levels for building surfaces (shown in Table 3-4) was not detected in Building 2. The maximum measured removable surface concentration (see Table 4-8) was (18 ± 13) dpm/100 cm^2.

Figure 4-32 and Figure 4-33 depict Building 2 sampling locations with results greater than screening levels for building surfaces.

These results are consistent with results shown in Table 2 of the ORISE report (ORISE, 1999).

4.2.3 Building 3

Building 3 was originally built in 1920 and has a floor area of approximately 6299 square meters (67,400 square feet). Building additions occurred in 1946 and 1951. The building is constructed of masonry exterior walls with metal interior frame system. Floor materials encountered during this RI included dirt, concrete, and brick.

According to available records, Building 3 was used as a mill area for metal rolling and grinding. Several furnaces and associated exhaust stacks remain; the stacks are typically severely deteriorated, up to and including complete collapse. A former cafeteria is located along the east wall of the building. A trolley rail connecting Building 3 with Building 2 is located through the east side of the center section. There is a small room subdivided off the south end of the building that may have been used for secure storage or as supervisory offices. The south end, west side, of Building 3 is fully open to Building 4/9; i.e., there is no

wall separating the direct connection to the adjoining building. The same condition exists for adjoining Building 6 and Building 8, located at about the mid-point of the west side of Building 3. There are several large floor trenches present within the building; during this RI, some were found to be uncovered and some were found covered with plywood or thin gauge steel. At least one reference (ORISE, 1999) indicates that several small lots of MED/AEC materials may have been processed "in the 10-inch rolling mill located in Building 2."

4.2.3.1 Building Materials

Data Evaluation

Table 4-23 lists analytical results for radiological COPC concentrations in building materials for Building 3.

Summary

Sample B03-BM-001 and sample B03-BM-002, both concrete samples, show elevated uranium concentrations. Since the ^{230}Th concentrations for these samples are at background levels, it appears that these samples are contaminated with MED/AEC uranium. The same appears to be true for sample B03-BM-006, a metal sample. The other building material samples seem to contain COPC concentrations at naturally occurring levels.

4.2.3.2 Surface Soils

Data Evaluation

Twenty surface soil samples and 36 detritus samples were collected in Building 3. Table 3-42 lists the surface soil and detritus samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Table 3-19 lists the surface soil samples (the -01 samples) analyzed by ICP-MS for uranium isotopes. Surface soil sample locations are shown on Figure 3-11. Detritus sample locations are shown on Figure 3-12.

Table 4-24 lists analytical results for radiological COPC concentrations in surface soil samples for Building 3. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-25 lists the SOR for Building 3 surface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Table 4-26 lists the surface soil results for the surface soil sample analyzed by ICP-MS.

Four Building 3 surface soil samples and no Building 3 detritus samples were analyzed for ^{226}Ra. All three GFPC results and the gamma spectroscopy result were at or near the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample B03SL-016-01 contained the greatest ^{226}Ra concentration for Building 3 surface soil samples, (1.5 ± 0.3) pCi/g, which is about the same as the ^{226}Ra background concentration and, statistically, about the same as the ^{226}Ra screening level plus background concentration.

Four Building 3 surface soil samples and no Building 3 detritus samples were analyzed for ^{228}Ra. All three GFPC results and the single gamma spectroscopy result were at or near the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B03SL-037-01 contained the greatest ^{228}Ra concentration for Building 3 surface soil samples and Building 3 detritus samples, (0.9 ± 0.3) pCi/g, which is about the same as the ^{228}Ra background concentration.

Five Building 3 surface soil samples and no Building 3 detritus samples were analyzed for ^{228}Th. All five alpha spectroscopy results were at or near the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample B03SL-020-01 contained the greatest ^{228}Th concentration for Building 3 surface soil samples, (1.3 ± 0.3) pCi/g, which is not different statistically from the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Five Building 3 surface soil samples and no Building 3 detritus samples were analyzed for ^{230}Th. All five alpha spectroscopy results were at or near the ^{230}Th background concentration. The results for all five samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample B03SL-016-01 contained the greatest ^{230}Th concentration for Building 3 surface soil samples, (1.4 ± 0.3) pCi/g, which is not different statistically from the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

Twenty Building 3 surface soil samples and 36 Building 3 detritus samples were analyzed for ^{232}Th. None of the five alpha spectroscopy, three offsite gamma spectroscopy, or 20 onsite gamma spectroscopy surface soil results indicated that ^{232}Th was present at a concentration greater than the ^{232}Th background concentration. Three of the 36 onsite gamma spectroscopy detritus results indicated that ^{232}Th was present at a concentration greater than the ^{232}Th background concentration. Sample B03SL-016-01 contained the greatest ^{232}Th surface soil concentration, (1.1 ± 0.2) pCi/g, which is about the same as the ^{232}Th background concentration and less than the ^{232}Th screening level plus background concentration. Sample B03SL-720-01 contained the greatest ^{232}Th detritus concentration, (1.4 ± 0.3) pCi/g, which is slightly greater than the ^{232}Th background concentration and less than the ^{232}Th screening level plus background concentration.

Five Building 3 surface soil samples and no Building 3 detritus samples were analyzed for ^{234}U. All of the alpha spectroscopy results indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration and all were in secular equilibrium with the ^{238}U precursor. Sample B03SL-016-01 contained the greatest ^{234}U concentration, (33 ± 3) pCi/g, which is almost 50 times the ^{234}U background concentration and is about 2.4 times the ^{234}U screening level plus background concentration.

Six Building 3 surface soil samples and no Building 3 detritus samples were analyzed for ^{235}U. Four of the five alpha spectroscopy results indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration. The single gamma spectroscopy result did not indicate that ^{235}U was present statistically at a concentration greater than the ^{235}U background concentration. Sample B03SL-016-01 contained the greatest ^{235}U concentration, (1.7 ± 0.4) pCi/g, which is about 65 times the ^{235}U background concentration and less than the ^{235}U screening level plus background concentration.

Twenty Building 3 surface soil samples and 36 Building 3 detritus samples were analyzed for ^{238}U. All five alpha spectroscopy results for surface soil samples were greater than the ^{238}U background concentration. Nineteen of the 20 gamma spectroscopy results for surface soil samples and all 36 gamma spectroscopy results for detritus samples were greater than the ^{238}U background concentration. Sample B03SL-016-01 had the greatest ^{238}U surface soil concentration, (36 ± 3) pCi/g, which is about 50 times the ^{238}U background concentration and about 2.4 times the ^{238}U screening level plus background concentration. Sample B03SL-721-01 contained the greatest ^{238}U detritus concentration, (59 ± 3) pCi/g, which is about 70 times the ^{238}U background concentration and about 4 times the ^{238}U screening level plus background concentration.

Summary

Table 4-25 shows four surface soil samples and 14 detritus samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

One surface soil sample and one detritus sample have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$] according to gamma spectroscopy results.

Two surface soil samples and one detritus sample have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 33 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

The ICP-MS results for the analyzed surface soil sample imply that the sample contains natural uranium. However, the derived ^{235}U and ^{238}U relative mass abundances in the sample differ slightly (in the direction towards depleted uranium) from those in natural uranium, and so the sample may contain a blend of natural uranium and depleted uranium.

Page 17 of the ORISE report (ORISE, 1999) shows maximum ^{226}Ra (3.0 pCi/g), ^{232}Th (78.5 pCi/g), ^{235}U (796 pCi/g), and ^{238}U (41,600 pCi/g) surface soil concentrations for Building 3 that are greater than any found in the current survey. Samples were not taken in the same locations as in the ORISE report.

^{226}Ra and ^{228}Ra, shown in Table 4-24, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.3.3 Subsurface Soils

Data Evaluation

Sixty-three subsurface soil samples were analyzed for COPCs in Building 3. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Table 3-19 lists the subsurface soil samples (other than -01 samples) analyzed by ICP-MS for uranium isotopes. Soil boring locations are shown on Figure 3-6.

Table 4-27 lists analytical results for radiological COPC concentrations in subsurface soil samples for Building 3. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-28 lists the SOR for Building 3 subsurface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Table 4-29 lists the results for the subsurface samples analyzed by ICP-MS.

Eight Building 3 subsurface soil samples were analyzed for ^{226}Ra. Four of the five GFPC results and three of the six gamma spectroscopy result were at or near the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample B03SL-016-05 contained the greatest ^{226}Ra concentration for Building 3 subsurface soil samples, (2.0 ± 0.4) pCi/g, which is about twice the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Eight Building 3 subsurface soil samples were analyzed for ^{228}Ra. All five GFPC results and all six of the gamma spectroscopy result were at or near the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B03SL-036-02 contained the greatest ^{228}Ra concentration for Building 3 subsurface soil samples, (1.4 ± 0.3) pCi/g, which, statistically, is about the same as the ^{228}Ra background concentration.

Eleven Building 3 subsurface soil samples were analyzed for ^{228}Th. Three of the 11 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample B03SL-025-03 contained the greatest ^{228}Th concentration for Building 3 subsurface soil samples, (1.8 ± 0.3) pCi/g, which is about twice the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Eleven Building 3 subsurface soil samples were analyzed for ^{230}Th. Four of the 11 alpha spectroscopy results were greater than the ^{230}Th background concentration. The alpha spectroscopy results for 6 of the 11 samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample B03SL-025-03 contained the greatest ^{230}Th concentration for Building 3 subsurface soil samples, (2.0 ± 0.3) pCi/g, which is about twice the ^{230}Th background concentration and about the same as the ^{230}Th screening level plus background concentration.

All 63 Building 3 subsurface soil samples were analyzed for ^{232}Th. None of the 11 alpha spectroscopy, six offsite gamma spectroscopy, and 35 of the 63 onsite gamma spectroscopy subsurface soil results indicated that ^{232}Th was present at a concentration greater than the ^{232}Th background concentration. Sample B03SL-027-03 contained the greatest ^{232}Th subsurface soil concentration, (1.7 ± 0.3) pCi/g, which is about 2.6 times the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Eleven Building 3 subsurface soil samples were analyzed for ^{234}U. Nine of the 11 alpha spectroscopy results indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration and all were in secular equilibrium with the ^{238}U precursor. Sample B03SL-014-05 contained the greatest ^{234}U concentration, (399 ± 43) pCi/g, which is almost 600 times the ^{234}U background concentration and is almost 30 times the ^{234}U screening level plus background concentration.

Thirteen Building 3 subsurface soil samples were analyzed for ^{235}U. Four of the 11 alpha spectroscopy results indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration. Two of the six gamma spectroscopy results indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration. Sample B03SL-014-05 contained the greatest ^{235}U concentration, (19 ± 8) pCi/g, which is more than 700 times the ^{235}U background concentration and about 2.4 times the ^{235}U screening level plus background concentration.

All 63 Building 3 subsurface soil samples were analyzed for ^{238}U. Nine of the 11 alpha spectroscopy results for subsurface soil samples were greater than the ^{238}U background concentration. 32 of the 63 gamma spectroscopy results for subsurface soil samples were greater statistically than the ^{238}U background concentration. Sample B03SL-014-05 had the greatest ^{238}U subsurface soil concentration, (396 ± 43) pCi/g, which is almost 600 times the ^{238}U background concentration and almost 30 times the ^{238}U screening level plus background concentration.

Summary

Table 4-28 shows 14 sample locations with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Eight samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$] according to gamma spectroscopy results.

Fourteen samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 27 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

The ICP-MS results for sample B03SL-014-05 imply that the sample contains natural uranium. However, the derived ^{235}U and ^{238}U relative mass abundances in the sample differ slightly (in the direction towards depleted uranium) from those in natural uranium, and so sample B03SL-014-05 may contain a blend of natural uranium and depleted uranium. Similarly, the results for sample B03SL-016-05 show that the uranium in this sample may be a blend of natural and enriched uranium.

^{226}Ra and ^{228}Ra, shown in Table 4-27, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.3.4 Surface Water (Site Utilities)

Data Evaluation

Twelve surface water samples were collected from utility features within Building 3. The surface water samples were analyzed for COPCs by alpha spectroscopy (uranium and thorium) and GFPC (radium). One sample (A08-B3-SW-001) was analyzed by gamma spectroscopy in lieu of alpha spectroscopy because the laboratory determined that the sample matrix was more like oil than water. Table 3-56 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-30 lists radiological COPC concentrations in surface water samples collected in Building 3. Table 4-31 shows the radium and uranium concentrations in Table 4-30 converted to concentrations suitable for comparison with USEPA drinking water MCLs. Sample locations and corresponding analytical data are presented on Figure 4-29.

Summary

All twelve samples show elevated concentrations of ^{234}U, ^{235}U, and ^{238}U. Five of the samples exceed the USEPA drinking water MCL for total uranium (^{234}U, ^{235}U, and ^{238}U). Since the ^{230}Th concentrations for these samples are at background levels, it appears that these samples are contaminated with MED/AEC uranium.

4.2.3.5 Sediment (Site Utilities)

Data Evaluation

Fourteen sediment samples were collected from utility features within Building 3. The sediment samples were analyzed at the offsite fixed laboratory for COPCs by gamma spectroscopy (all COPCs), alpha spectroscopy (uranium and thorium COPCs), and GFPC (radium COPCs). Table 3-57 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-32 lists analytical results for radiological COPC concentrations in sediment for Building 3. Table 4-33 lists the SOR for Building 3 sediment samples. Sample locations and corresponding analytical data are presented on Figure 4-30.

All 14 Building 3 sediment samples were analyzed for ^{226}Ra. Ten of the 14 GFPC results and ten of the 14 gamma spectroscopy result were at or near the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-B3-SD-013 contained the greatest ^{226}Ra concentration for Building 3 sediment samples, (2.8 ± 0.5) pCi/g, which is about 2.7 times the ^{226}Ra background concentration and about 1.6 times the ^{226}Ra screening level plus background concentration.

All 14 Building 3 sediment samples were analyzed for ^{228}Ra. Thirteen of the 14 GFPC results and 12 of the 14 gamma spectroscopy result were at or near the ^{228}Ra background concentration. The results for all

samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-B3-SD-015 contained the greatest ^{228}Ra concentration for Building 3 sediment samples, (3.0 ± 0.4) pCi/g, which is between 4 and 5 times the ^{228}Ra background concentration and about 1.6 times the ^{228}Ra screening level plus background concentration.

All 14 Building 3 sediment samples were analyzed for ^{228}Th. Three of the 14 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-B3-SD-014 contained the greatest ^{228}Th concentration for Building 3 sediment samples, (2.2 ± 0.4) pCi/g, which is about 2.6 times the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

All 14 Building 3 sediment samples were analyzed for ^{230}Th. Three of the 14 alpha spectroscopy results were greater than the ^{230}Th background concentration. The alpha spectroscopy results for all 14 samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A08-B3-SD-010 contained the greatest ^{230}Th concentration for Building 3 sediment samples, (2.4 ± 0.5) pCi/g, which is about 2.7 times the ^{230}Th background concentration and about the same as the ^{230}Th screening level plus background concentration.

All 14 Building 3 sediment samples were analyzed for ^{232}Th. Three of the 14 alpha spectroscopy and two of the 14 offsite gamma spectroscopy sediment sample results indicated that ^{232}Th was present at a concentration greater than the ^{232}Th background concentration. Sample A08-B3-SD-015 contained the greatest ^{232}Th sediment concentration, (3.0 ± 0.4) pCi/g, which is almost 4 times the ^{232}Th background concentration and about 1.6 times the ^{232}Th screening level plus background concentration.

All 14 Building 3 sediment samples were analyzed for ^{234}U. All 14 alpha spectroscopy results indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration and all were in secular equilibrium with the ^{238}U precursor. Sample A08-B3-SD-008 contained the greatest ^{234}U concentration, (278 ± 26) pCi/g, which is more than 400 times the ^{234}U background concentration and is about 22 times the ^{234}U screening level plus background concentration.

All 14 Building 3 sediment samples were analyzed for ^{235}U. Eight of the 14 alpha spectroscopy results indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration. Three of the 14 gamma spectroscopy results indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration. Sample A08-B3-SD-008 contained the greatest ^{235}U concentration, (14 ± 3) pCi/g, which is more than 50 times the ^{235}U background concentration and less than the ^{235}U screening level plus background concentration.

All 14 Building 3 sediment samples were analyzed for ^{238}U. All 14 alpha spectroscopy results for sediment samples were greater than the ^{238}U background concentration. Sample A08-B3-SD-008 had the greatest ^{238}U sediment concentration, (289 ± 27) pCi/g, which is more than 400 times the ^{238}U background concentration and about 20 times the ^{238}U screening level plus background concentration.

Summary

Eleven of the fourteen sediment samples appear to be contaminated above screening levels [$(S - 2\sigma) > 1$]. The remaining three samples appear to not be contaminated above screening levels [$(S + 2\sigma) < 1$].

^{226}Ra and ^{228}Ra, shown in Table 4-27, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

Table 11 of the ORISE report (ORISE, 1999) lists a Building 3 sediment sample with a ^{238}U concentration of (30 ± 13) pCi/g, consistent with the current results. The maximum concentration of ^{238}U in Building 3 utility sediment measured by ORISE was about an order of magnitude less than what was found in the current investigation.

4.2.3.6 Groundwater

No groundwater samples were collected from within any IA01 building. Refer to IA02 and IA07 discussions that address the footprint of IA01.

4.2.3.7 Building Surfaces

Contamination greater than the average screening levels for building surfaces (shown in Table 3-4) was detected in Building 3. Of the 1,561 locations measured (see Table 4-7), 323 exceeded the thorium average screening level but not the uranium average screening level, and 270 exceeded the average uranium screening level. The maximum measured average surface concentration was approximately 150,000 dpm/100 cm^2.

Contamination greater than the removable screening levels for building surfaces (shown in Table 3-4) was detected in Building 3. Of the 1,376 locations measured (see Table 4-8), one exceeded the removable thorium screening level but not the removable uranium screening level, and none exceeded the removable uranium screening level. The maximum measured removable surface concentration was (280 ± 50) dpm/100 cm^2.

Figure 4-34 and Figure 4-35 depict Building 3 sampling locations with results greater than screening levels for building surfaces.

These results are consistent with results shown in Table 3 of the ORISE report (ORISE, 1999).

4.2.4 Building 4/9

Building 4 and 9 are commonly referred to together because there is no internal partitioning between the buildings; i.e., the entire complex appears to be a single, large building. Available records indicate an original construction date of 1920 for Building 4, with construction of an addition in 1951. Building 9 was originally built in 1918 with an addition dated 1951. The combined Building 4/9 complex has a floor area of approximately 3403 square meters (47,400 square feet). The building is constructed of masonry exterior walls with metal interior frame system. Floor materials encountered during this RI included dirt, concrete, and brick. The roof is of a “saw tooth” design, with vertical panels of glass – many of which have fallen into disrepair and the roof is no longer weatherproof.

According to available records, Building 4/9 was used as a mill area for metal rolling, manufacturing, and for a rail car accessible loading dock. Several furnaces and associated exhaust stacks remain; the stacks are typically severely deteriorated, up to and including complete collapse. There are no lateral rooms associated with this building. The east end of the building is completely open to Building 3. A rail car accessible loading dock exists at the west end of the building. Due to the availability of light, soil, and moisture, portions of the building contains ferns and moss.

4.2.4.1 Building Materials

Data Evaluation

Table 4-34 lists analytical results for radiological COPC concentrations in building materials for Building 4/9.

Summary

The building material samples seem to contain COPC concentrations at naturally occurring levels.

4.2.4.2 Surface Soils

Data Evaluation

Seven surface soil samples and 34 detritus samples were collected in Building 4/9. Table 3-42 lists the surface soil and detritus samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Surface soil sample locations are shown on Figure 3-11. Detritus sample locations are shown on Figure 3-12.

Table 4-35 lists analytical results for radiological COPC concentrations in surface soil samples for Building 4/9. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-36 lists the SOR for Building 4/9 surface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Three Building 4/9 surface soil samples and no Building 4/9 detritus samples were analyzed for ^{226}Ra. Two of the three GFPC results for Building 4/9 surface soil samples were at or near the ^{226}Ra background concentration. The results for two samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. The ^{226}Ra in sample B04&B09SL-018-01 did not appear to be in secular equilibrium with the ^{230}Th in the sample. Sample B04&B09SL-018-01 contained the greatest ^{226}Ra concentration for Building 4/9 surface soil samples, (1.9 ± 0.3) pCi/g, which is about twice the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Three Building 4/9 surface soil samples and no Building 4/9 detritus samples were analyzed for ^{228}Ra. All three GFPC results for Building 4/9 surface soil samples were at or near the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B04&B09SL-015-01 contained the greatest ^{228}Ra concentration for Building 4/9 surface soil samples, (1.0 ± 0.3) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Four Building 4/9 surface soil samples and no Building 4/9 detritus samples were analyzed for ^{228}Th. All four alpha spectroscopy results were at or near the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample B04&B09SL-015-01 contained the greatest ^{228}Th concentration for Building 4/9 surface soil samples, (1.2 ± 0.2) pCi/g, which is about the same as the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Four Building 4/9 surface soil samples and no Building 4/9 detritus samples were analyzed for ^{230}Th. All four alpha spectroscopy results were at or near the ^{230}Th background concentration. The alpha spectroscopy results for all four samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample B04&B09SL-017-01 contained the greatest ^{230}Th concentration for Building 4/9 surface soil samples, (1.4 ± 0.3) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All seven Building 4/9 surface soil samples were analyzed for ^{232}Th. Three of the four alpha spectroscopy and four of the seven onsite gamma spectroscopy surface soil results indicated that ^{232}Th was present at a concentration greater than the ^{232}Th background concentration. Sample B04&B09SL-017-01 contained the greatest ^{232}Th surface soil concentration, (1.43 ± 0.20) pCi/g, which is about twice the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration. Two of the 34 onsite gamma spectroscopy detritus results indicated that ^{232}Th was present at a concentration greater than the ^{232}Th background concentration. Sample B04&B09SL-717-01 contained the greatest ^{232}Th surface soil concentration, (1.13 ± 0.16) pCi/g, which is almost twice the ^{232}Th background concentration and less than the ^{232}Th screening level plus background concentration.

Four Building 4/9 surface soil samples were analyzed for ^{234}U. All four alpha spectroscopy results for Building 4/9 surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration and all were in secular equilibrium with the ^{238}U precursor. Sample B04&B09SL-015-01 contained the greatest ^{234}U concentration, (16.5 ± 1.6) pCi/g, which is about 21 times the ^{234}U background concentration and is about 1.2 times ^{234}U screening level plus background concentration.

Four Building 4/9 surface soil samples and no Building 4/9 detritus samples were analyzed for ^{235}U. Two of the four alpha spectroscopy results for Building 4/9 surface soil samples indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration. Sample B04&B09SL-015-01 contained the greatest ^{235}U concentration, (0.72 ± 0.20) pCi/g, which is about 23 times the ^{235}U background concentration and less than the ^{235}U screening level plus background concentration.

All seven Building 4/9 surface soil samples and all 34 Building 4/9 detritus samples were analyzed for ^{238}U. All four alpha spectroscopy results and four of the seven onsite gamma spectroscopy results for surface soil samples were greater than the ^{238}U background concentration. Sample B04&B09SL-015-01 had the greatest ^{238}U surface soil concentration, (19.9 ± 1.9) pCi/g, which is more than 20 times the ^{238}U background concentration and about 1.3 times the ^{238}U screening level plus background concentration. Thirty-one of the 34 onsite gamma spectroscopy results for surface soil samples were greater than the ^{238}U background concentration. Sample B04&B09SL-711-01 had the greatest ^{238}U surface soil concentration, (28.2 ± 1.8) pCi/g, which is more than 30 times the ^{238}U background concentration and almost twice the ^{238}U screening level plus background concentration.

Summary

Table 4-36 shows 20 sample locations (16 of these were detritus) with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

One detritus sample had an SOR that, more likely than not, is greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

One surface soil sample had an SOR that, more likely than not, is less than one [that is, $S < 1$ and $(S + 2\sigma) > 1$].

The remaining 19 (17 were detritus) samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

Page 17 of the ORISE report (ORISE, 1999) shows maximum ^{226}Ra (0.6 pCi/g), ^{232}Th (0.6 pCi/g), ^{235}U (0.1 pCi/g), and ^{238}U (4.1 pCi/g) surface soil concentrations for Building 4 that are less than the greatest respective concentrations found in the current survey.

^{226}Ra and ^{228}Ra, shown in Table 4-35, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.4.3 Subsurface Soils

Data Evaluation

Eighty-three subsurface soil samples were analyzed for COPCs in Building 4/9. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-6.

Table 4-37 lists analytical results for radiological COPC concentrations in subsurface soil samples for Building 4/9. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-38 lists the SOR for Building 4/9 subsurface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Twelve Building 4/9 subsurface soil samples were analyzed for ^{226}Ra. Five of the seven GFPC results and six of the eight offsite gamma spectroscopy results for Building 4/9 subsurface soil samples were at or near the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample B04&B09SL-040-01 contained the greatest ^{226}Ra concentration for Building 4/9 subsurface soil samples, (2.1 ± 0.3) pCi/g, which is between 2 and 3 times the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Twelve Building 4/9 subsurface soil samples were analyzed for ^{228}Ra. All seven GFPC results and seven of the eight offsite gamma spectroscopy results for Building 4/9 subsurface soil samples were at or near the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B04&B09SL-036-02 contained the greatest ^{228}Ra concentration for Building 4/9 subsurface soil samples, (1.4 ± 0.2) pCi/g, which is about 1.8 times the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Fourteen Building 4/9 subsurface soil samples were analyzed for ^{228}Th. All 14 alpha spectroscopy results were at or near the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample B04&B09SL-025-02 contained the greatest ^{228}Th concentration for Building 4/9 subsurface soil samples, (1.5 ± 0.3) pCi/g, which is about the same as or slightly greater than the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Fourteen Building 4/9 subsurface soil samples were analyzed for ^{230}Th. Twelve of the 14 alpha spectroscopy results were at or near the ^{230}Th background concentration. The alpha spectroscopy results for five of the 14 alpha spectroscopy samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample B04&B09SL-025-02 contained the greatest ^{230}Th concentration for Building 4/9 subsurface soil samples, (2.0 ± 0.3) pCi/g, which is about twice the ^{230}Th background concentration and about the same as the ^{230}Th screening level plus background concentration.

All 83 Building 4/9 subsurface soil samples were analyzed for ^{232}Th. None of the 14 alpha spectroscopy results, one of the eight offsite gamma spectroscopy results, and 62 of the 83 onsite gamma spectroscopy subsurface soil results indicated that ^{232}Th was present at a concentration greater than the ^{232}Th background concentration. Sample B04&B09SL-038-03 contained the greatest ^{232}Th subsurface soil concentration, (1.5 ± 0.2) pCi/g, which is about twice the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Fourteen Building 4/9 subsurface soil samples were analyzed for ^{234}U. Ten of the 14 alpha spectroscopy results for Building 4/9 subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and that all but one were in secular equilibrium with the ^{238}U precursor. Sample B04&B09SL-017-02 contained the greatest ^{234}U concentration, (7.7 ± 0.9) pCi/g, which is about 11 times the ^{234}U background concentration and is less than the ^{234}U screening level plus background concentration.

Eighteen Building 4/9 subsurface soil samples were analyzed for ^{235}U. Two of the 14 alpha spectroscopy results and none of the eight of the offsite gamma spectroscopy results for Building 4/9 subsurface soil samples indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration. Sample B04&B09SL-030-01 contained the greatest ^{235}U concentration, (0.37 ± 0.14) pCi/g, which is statistically greater than the ^{235}U background concentration and less than the ^{235}U screening level plus background concentration. [Sample B04&B09SL-025-02 contained (0.4 ± 0.5) pCi/g, which is not conclusively above background.]

All 83 Building 4/9 subsurface soil samples were analyzed for ^{238}U. Ten of the 14 alpha spectroscopy results and 53 of the 83 onsite gamma spectroscopy results for subsurface soil samples were greater than the ^{238}U background concentration. Thirty-one of the 35 onsite gamma spectroscopy results for subsurface soil samples were greater than the ^{238}U background concentration. Sample B04&B09SL-030-01 had the greatest ^{238}U subsurface soil concentration, (15.1 ± 1.5) pCi/g, which is more than 20 times the ^{238}U background concentration and about the same as the ^{238}U screening level plus background concentration.

Summary

Table 4-38 shows nine samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Twelve samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Twenty-two samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 40 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-37, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.4.4 Surface Water (Site Utilities)

Data Evaluation

Five surface water samples were collected from utility features within Building 4/9. The surface water samples were analyzed for COPCs by alpha spectroscopy (uranium and thorium) and GFPC (radium). Table 3-56 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-39 lists radiological COPC concentrations in surface water samples collected in Building 4/9. Table 4-40 shows the radium and uranium concentrations in Table 4-39 converted to concentrations suitable for comparison with USEPA drinking water MCLs. Sample locations and corresponding analytical data are presented on Figure 4-29.

Summary

Table 4-40 shows that the radium and uranium mass concentrations in all of the samples are less than the applicable USEPA drinking water MCLs, although the uranium MCL is within two standard deviations of the uranium mass concentration in sample ID A08-B04&B09-SW-003. Since the ^{230}Th concentration for this sample is at background level, it appears that sample ID A08-B04&B09-SW-003 is contaminated with MED/AEC uranium. The same appears to be true for sample ID A08-B04&B09-SW-002 and sample ID A08-B04&B09-SW-005, although these two samples meet the USEPA drinking water MCL.

4.2.4.5 *Sediment (Site Utilities)*

Data Evaluation

Five sediment samples were collected from utility features within Building 4/9. The sediment samples were analyzed at the offsite fixed laboratory for COPCs by gamma spectroscopy (all COPCs), alpha spectroscopy (uranium and thorium COPCs), and GFPC (radium COPCs). Table 3-57 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-41 lists analytical results for radiological COPC concentrations in sediment for Building 4/9. Table 4-42 lists the SOR for Building 4/9 sediment samples. Sample locations and corresponding analytical data are presented on Figure 4-30.

Five Building 4/9 sediment samples were analyzed for ^{226}Ra. All five GFPC results and all five offsite gamma spectroscopy results for Building 4/9 sediment samples were at or near the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-B04&B09-SD-002 contained the greatest ^{226}Ra concentration for Building 4/9 sediment samples, (0.56 ± 0.17) pCi/g, which is about the same as the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

Five Building 4/9 sediment samples were analyzed for ^{228}Ra. All five GFPC results and all five offsite gamma spectroscopy results for Building 4/9 sediment samples were at or near the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-B04&B09-SD-003 contained the greatest ^{228}Ra concentration for Building 4/9 sediment samples, (0.6 ± 0.4) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Five Building 4/9 sediment samples were analyzed for ^{228}Th. All five alpha spectroscopy results were at or near the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-B04&B09-SD-001 contained the greatest ^{228}Th concentration for Building 4/9 sediment samples, (0.35 ± 0.09) pCi/g, which is about the same as the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Five Building 4/9 sediment samples were analyzed for ^{230}Th. All five alpha spectroscopy results were at or near the ^{230}Th background concentration. The alpha spectroscopy results for all five alpha spectroscopy samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A08-B04&B09-SD-003 contained the greatest ^{230}Th concentration for Building 4/9 sediment samples, (0.45 ± 0.16) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

Five Building 4/9 sediment samples were analyzed for ^{232}Th. None of the five alpha spectroscopy results and none of the five offsite gamma spectroscopy results indicated that ^{232}Th was present at a concentration greater than the ^{232}Th background concentration. Sample A08-B04&B09-SD-005 contained the greatest ^{232}Th sediment concentration, (0.3 ± 0.4) pCi/g, which is about the same as the ^{232}Th background concentration and less than as the ^{232}Th screening level plus background concentration.

Five Building 4/9 sediment samples were analyzed for ^{234}U. All of the five alpha spectroscopy results for Building 4/9 sediment samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and that all were in secular equilibrium with the ^{238}U precursor. Sample A08-B04&B09-SD-003 contained the greatest ^{234}U concentration, (18 ± 2) pCi/g, which is almost 30 times the ^{234}U background concentration and is about 1.3 times the ^{234}U screening level plus background concentration.

Five Building 4/9 sediment samples were analyzed for ^{235}U. Four of the five alpha spectroscopy results and three of the five offsite gamma spectroscopy results for Building 4/9 sediment samples indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration. Sample A08-B04&B09-SD-003 contained the greatest ^{235}U concentration, (1.2 ± 0.5) pCi/g, which is statistically greater than the ^{235}U background concentration and less than the ^{235}U screening level plus background concentration.

Five Building 4/9 sediment samples were analyzed for ^{238}U. All five of the alpha spectroscopy results for sediment samples were greater than the ^{238}U background concentration. Sample A08-B04&B09-SD-003 had the greatest ^{238}U sediment concentration, (21 ± 3) pCi/g, which is about 30 times the ^{238}U background concentration and about 1.4 times the ^{238}U screening level plus background concentration.

Summary

Two of the five sediment samples appear to be contaminated above screening levels [$(S - 2\sigma) > 1$]. Results for one of the three remaining samples indicated that the sample more likely than not was contaminated below screening levels [$S < 1$; $(S + 2\sigma) > 1$]. Two samples appear to not be contaminated above screening levels [$(S + 2\sigma) < 1$].

^{226}Ra and ^{228}Ra, shown in Table 4-41, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.4.6 Groundwater

No groundwater samples were collected from within any IA01 building. Refer to IA02 and IA07 discussions that address the footprint of IA01.

4.2.4.7 Building Surfaces

Contamination greater than the average screening levels for building surfaces (shown in Table 3-4) was detected in Building 4/9. Of the 813 locations measured (see Table 4-7), 263 exceeded the thorium average screening level but not the uranium average screening level, and 29 exceeded the average uranium screening level. The maximum measured average surface concentration was approximately 31,000 dpm/100 cm^2.

Contamination greater than the removable screening levels for building surfaces (shown in Table 3-4) was not detected in Building 4/9. The maximum measured removable surface concentration (see Table 4-8) was (27 ± 16) dpm/100 cm^2.

Figure 4-36 and Figure 4-37 depict Building 4/9 sampling locations with results greater than screening levels for building surfaces.

These results are consistent with results shown in Table 4 of the ORISE report (ORISE, 1999).

4.2.5 Building 5

Available records indicate Building 5 was constructed in 1918 with a floor area of approximately 350 square meters (3770 square feet). The building is constructed of a metal frame system. The building is located in an alcove with limited lateral clearance created by Building 4/9 (south), Building 3 (west), and Building 6 (north).

According to available records, Building 5 originally housed the heat exchanger (ORNL, 1978); however, ORISE (1999) states the use as transformer station and power house. Observations made during this RI are consistent with the ORISE description. The floor of the building consists of a suspended steel grate walkway along the center aisle of the building; electrical equipment lines the walls and a subfloor area of unknown dimensions exists below the walkway.

4.2.5.1 Building Materials

Data Evaluation

Table 4-43 lists analytical results for radiological COPC concentrations in building materials for Building 5.

Summary

The building material samples seem to contain COPC concentrations at naturally occurring levels.

4.2.5.2 Surface Soils

Building 5 is a former electrical switch/control room. The building contains a suspended metal grate floor that runs the long-axis of the building; abandoned control switches and meters line the walls and subfloor areas. Access by motorized equipment was not possible given the configuration and contents of the building. As a result, no surface soil samples for Building 5 were collected.

4.2.5.3 Subsurface Soils

Access by motorized equipment was not possible as described in the prior subsection. As a result, no subsurface soil samples for Building 5 were collected.

4.2.5.4 Surface Water

No surface water samples for Building 5 were collected.

4.2.5.5 Sediment

No sediment samples for Building 5 were collected.

4.2.5.6 Groundwater

No groundwater samples were collected from within any IA01 building. Refer to IA02 and IA07 discussions that address the footprint of IA01.

4.2.5.7 Building Surfaces

Contamination greater than the average screening levels for building surfaces (shown in Table 3-4) was detected in Building 5. Of the 38 locations measured (see Table 4-7), 15 exceeded the thorium average screening level but not the uranium average screening level, but none exceeded the average uranium screening level. The maximum measured average surface concentration was approximately 2,000 dpm/100 cm^2.

Contamination greater than the removable screening levels for building surfaces (shown in Table 3-4) was not detected in Building 5. The maximum measured removable surface concentration (see Table 4-8) was (6 ± 9) dpm/100 cm^2.

Figure 4-38 depicts Building 5 sampling locations with results greater than screening levels for building surfaces.

ORISE reported no building surface contamination results for Building 5 (ORISE, 1999).

4.2.6 Building 6

Building 6 was originally built in 1918 and has a floor area of approximately 1402 square meters (15,090 square feet). The building is constructed of masonry exterior walls with metal interior frame system. Floor materials encountered during this RI included soil, concrete, brick, and metal plate. The roof is of a "saw tooth" design, with vertical panels of glass – many of which have fallen into disrepair and the roof is no longer weatherproof.

According to available records, Building 6 was used for metal rolling and manufacturing. A loading dock exists at the west end of the building. The east end of the building is open to Building 3. The north side of the building is open to Building 8. Building 6 was one of the two main buildings (along with Building 8) used to process MED/AEC materials; refer to Section 2.1.2 for additional discussion on the material handling process. The building contains numerous items of machinery, including furnaces and a rolling mill.

4.2.6.1 Building Materials

Data Evaluation

Table 4-44 lists analytical results for radiological COPC concentrations in building materials for Building 6.

Summary

Two of the brick samples (B06-BM-003 and B06-BM-005), the metal sample, and the wood sample appear to contain uranium concentrations elevated a few times above naturally occurring levels. Since, except for one brick sample (B06-BM-005), the ^{230}Th concentrations are near naturally occurring levels, the contamination likely is due to MED/AEC support operations. For sample B06-BM-005, the ^{230}Th and ^{226}Ra concentrations are elevated but are not in equilibrium with the ^{234}U and ^{238}U, implying that at least some of the uranium in this sample is of natural origin.

4.2.6.2 Surface Soils

Data Evaluation

Eight surface soil samples and five detritus samples were collected in Building 6. Table 3-42 lists the surface soil and detritus samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface

soil samples analyzed at the offsite laboratory. Surface soil sample locations are shown on Figure 3-11. Detritus sample locations are shown on Figure 3-12.

Table 4-45 lists analytical results for radiological COPC concentrations in surface soil samples for Building 6. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-45 lists the SOR for Building 6 surface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Three Building 6 surface soil samples and no Building 6 detritus samples were analyzed for ^{226}Ra. Two of the three GFPC results and the one offsite gamma spectroscopy result for Building 6 surface soil samples were at or near the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample B06SL-021-01 contained the greatest ^{226}Ra concentration for Building 6 surface soil samples, (3.6 ± 0.5) pCi/g according to alpha spectroscopy, which is about 3.5 times the ^{226}Ra background concentration and about twice the ^{226}Ra screening level plus background concentration. However, the offsite gamma spectroscopy result for the same sample was only (0.4 ± 0.3) pCi/g, which is at the ^{226}Ra background concentration.

Three Building 6 surface soil samples and no Building 6 detritus samples were analyzed for ^{228}Ra. One of the three GFPC results and the only offsite gamma spectroscopy result for Building 6 surface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B06SL-021-01 contained the greatest ^{228}Ra concentration for Building 6 surface soil samples, (22.9 ± 1.6) pCi/g, which is almost 30 times the ^{228}Ra background concentration and more than ten times the ^{228}Ra screening level plus background concentration.

Three Building 6 surface soil samples and no Building 6 detritus samples were analyzed for ^{228}Th. One of the three alpha spectroscopy results was greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample B06SL-021-01 contained the greatest ^{228}Th concentration for Building 6 surface soil samples, (23 ± 2) pCi/g, which is almost 30 times the ^{228}Th background concentration and about four times the ^{228}Th screening level plus background concentration.

Three Building 6 surface soil samples were analyzed for ^{230}Th. One of the three alpha spectroscopy results was greater than the ^{230}Th background concentration. The alpha spectroscopy results for all three alpha spectroscopy samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample B06SL-021-01 contained the greatest ^{230}Th concentration for Building 6 surface soil samples, (2.0 ± 0.3) pCi/g, which is about twice the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All eight Building 6 surface soil samples and all five Building 6 detritus samples were analyzed for ^{232}Th. Two of the three alpha spectroscopy results, the single offsite gamma spectroscopy result, and two of the eight onsite gamma spectroscopy results indicated that ^{232}Th was present in surface soil samples at a concentration greater than the ^{232}Th background concentration. Sample B06SL-021-01 contained the greatest ^{232}Th surface soil concentration, (22.9 ± 1.6) pCi/g, which is almost 30 times the ^{232}Th background concentration and about 12 times the ^{232}Th screening level plus background concentration. One of the five onsite gamma spectroscopy results indicated that ^{232}Th was present in detritus samples at a concentration greater than the ^{232}Th background concentration. Sample B06SL-708-01 contained the greatest ^{232}Th detritus concentration, (1.5 ± 0.2) pCi/g, which is about 2.3 times the ^{232}Th background concentration and less than the ^{232}Th screening level plus background concentration.

Three Building 6 surface soil samples and no Building 6 detritus samples were analyzed for ^{234}U. All three alpha spectroscopy results for Building 6 surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and that all were in secular equilibrium with the ^{238}U precursor. Sample B06SL-005-01 contained the greatest ^{234}U concentration, (66 ± 6) pCi/g, which is almost 100 times the ^{234}U background concentration and is almost 5 times the ^{234}U screening level plus background concentration.

Three Building 6 surface soil samples and no Building 6 detritus samples were analyzed for ^{235}U. All three alpha spectroscopy results for Building 6 surface soil samples indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration; the single gamma spectroscopy result was inconclusive. Sample B06SL-005-01 contained the greatest ^{235}U concentration, (3.1 ± 0.6) pCi/g, which is more than 100 times the ^{235}U background concentration and less than the ^{235}U screening level plus background concentration.

All eight Building 6 surface soil samples and all five Building 6 detritus samples were analyzed for ^{238}U. All three of the alpha spectroscopy results and five of the eight onsite gamma spectroscopy results for surface soil samples were greater than the ^{238}U background concentration. Sample B06SL-005-01 had the greatest ^{238}U surface soil concentration, (68 ± 6) pCi/g, which is about 100 times the ^{238}U background concentration and about 4.6 times the ^{238}U screening level plus background concentration. All five of the onsite gamma spectroscopy results for detritus samples were greater than the ^{238}U background concentration. Sample B06SL-702-01 had the greatest ^{238}U surface soil concentration, (46 ± 4) pCi/g, which is about 56 times the ^{238}U background concentration and about 3 times the ^{238}U screening level plus background concentration.

Summary

Table 4-46 shows eight samples (five samples are detritus) with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

The remaining five samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

Page 17 of the ORISE report (ORISE, 1999) shows maximum ^{226}Ra (0.7 pCi/g), ^{232}Th (68.7 pCi/g), ^{235}U (10.9 pCi/g), and ^{238}U (297 pCi/g) surface soil concentrations for Building 6 that, except for ^{226}Ra, are greater than any found in the current survey.

^{226}Ra and ^{228}Ra, shown in Table 4-45, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.6.3 Subsurface Soils

Data Evaluation

Forty-four subsurface soil samples were analyzed for COPCs in Building 6. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-6.

Table 4-47 lists analytical results for radiological COPC concentrations in subsurface soil samples for Building 6. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-48 lists the SOR for Building 6 subsurface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Four Building 6 subsurface soil samples were analyzed for ^{226}Ra. Two of the three GFPC results and the two offsite gamma spectroscopy results for Building 6 subsurface soil samples were at or near the ^{226}Ra background concentration; however, one offsite gamma spectroscopy result was inconsistent with its corresponding alpha spectroscopy result. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor (the inconsistent offsite gamma spectroscopy result also was inconsistent in this instance). Sample B06SL-021-05 contained the greatest ^{226}Ra concentration for Building 6 subsurface soil samples, (3.4 ± 0.3) pCi/g according to alpha spectroscopy, which is about 3.3 times the ^{226}Ra background concentration and about twice the ^{226}Ra screening level plus background concentration.

Four Building 6 subsurface soil samples were analyzed for ^{228}Ra. Two of the three GFPC results and one of the two offsite gamma spectroscopy results for Building 6 subsurface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B06SL-021-05 contained the greatest ^{228}Ra concentration for Building 6 subsurface soil samples, (17.6 ± 1.7) pCi/g, which is about 25 times the ^{228}Ra background concentration and about ten times the ^{228}Ra screening level plus background concentration.

Seven Building 6 subsurface soil samples were analyzed for ^{228}Th. Four of the seven alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample B06SL-021-05 contained the greatest ^{228}Th concentration for Building 6 subsurface soil samples, (21.5 ± 2.0) pCi/g, which is about 25 times the ^{228}Th background concentration and about four times the ^{228}Th screening level plus background concentration.

Seven Building 6 subsurface soil samples were analyzed for ^{230}Th. One of the seven alpha spectroscopy results was greater than the ^{230}Th background concentration. The alpha spectroscopy results for six of the seven alpha spectroscopy samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample B06SL-021-05 contained the greatest ^{230}Th concentration for Building 6 subsurface soil samples, (2.5 ± 0.6) pCi/g, which is almost three times the ^{230}Th background concentration and about 1.5 times the ^{230}Th screening level plus background concentration.

All 44 Building 6 subsurface soil samples were analyzed for ^{232}Th. Three of the seven alpha spectroscopy results, one of the two offsite gamma spectroscopy results, and 17 of the 44 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample B06SL-021-05 contained the greatest ^{232}Th subsurface soil concentration, (19.5 ± 1.9) pCi/g, which is about 24 times the ^{232}Th background concentration and about 10 times the ^{232}Th screening level plus background concentration.

Seven Building 6 subsurface soil samples were analyzed for ^{234}U. All seven alpha spectroscopy results for Building 6 subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and that all were in secular equilibrium with the ^{238}U precursor (although for two samples the ^{234}U and ^{238}U concentrations did not statistically overlap, they were both significantly above their respective background concentrations). Sample B06SL-006-02 contained the greatest ^{234}U concentration, (82 ± 7) pCi/g, which is about 120 times the ^{234}U background concentration and is about six times the ^{234}U screening level plus background concentration.

Eight Building 6 subsurface soil samples were analyzed for ^{235}U. Six of the seven alpha spectroscopy results for Building 6 subsurface soil samples indicated that ^{235}U was present statistically at concentrations greater than the ^{235}U background concentration; the two gamma spectroscopy results were inconclusive. Sample B06SL-006-02 contained the greatest ^{235}U concentration, (4.4 ± 0.8) pCi/g,

which is more than 100 times the ^{235}U background concentration and less than the ^{235}U screening level plus background concentration.

All 44 Building 6 subsurface soil samples were analyzed for ^{238}U. All seven of the alpha spectroscopy results and 31 of the 44 onsite gamma spectroscopy results for subsurface soil samples were greater than the ^{238}U background concentration. Sample B06SL-006-02 had the greatest ^{238}U subsurface soil concentration, (107 ± 9) pCi/g, which is about 130 times the ^{238}U background concentration and about 7 times the ^{238}U screening level plus background concentration.

Summary

Table 4-48 shows nine samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

One sample has an SOR that, more likely than not, is greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Five samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 29 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-47, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.6.4 Surface Water (Site Utilities)

No surface water samples for Building 6 were collected.

4.2.6.5 Sediment (Site Utilities)

Data Evaluation

Two sediment samples were collected from utility features within Building 6. The sediment samples were analyzed at the offsite fixed laboratory for COPCs by gamma spectroscopy (all COPCs), alpha spectroscopy (uranium and thorium COPCs), and GFPC (radium COPCs). Table 3-57 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-49 lists analytical results for radiological COPC concentrations in sediment for Building 6. Table 4-50 lists the SOR for Building 6 sediment samples. Sample locations and corresponding analytical data are presented on Figure 4-30.

Two Building 6 sediment samples were analyzed for ^{226}Ra. Both GFPC results and both offsite gamma spectroscopy results for Building 6 sediment samples were at or near the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-B6-SD-001 contained the greatest ^{226}Ra concentration for Building 6 sediment samples, (0.68 ± 0.14) pCi/g, which is about the same as the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

Two Building 6 sediment samples were analyzed for ^{228}Ra. One of the two GFPC results and one of the two offsite gamma spectroscopy results for Building 6 sediment samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-B6-SD-001 contained the greatest ^{228}Ra concentration for Building 6 sediment samples, (1.7 ± 0.3) pCi/g, which is about twice the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Two Building 6 sediment samples were analyzed for ^{228}Th. One of the two alpha spectroscopy results was greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-B6-SD-001 contained the greater ^{228}Th concentration for Building 6 sediment samples, (2.1 ± 0.3) pCi/g, which is about 2.5 times the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Two Building 6 sediment samples were analyzed for ^{230}Th. Neither alpha spectroscopy result was greater than the ^{230}Th background concentration. The alpha spectroscopy results for both alpha spectroscopy samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A08-B6-SD-001 contained the greater ^{230}Th concentration for Building 6 sediment samples, (0.72 ± 0.15) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

Two Building 6 sediment samples were analyzed for ^{232}Th. One of the two alpha spectroscopy results and one of the two offsite gamma spectroscopy results indicated that ^{232}Th was present in sediment samples at a concentration greater than the ^{232}Th background concentration. Sample A08-B6-SD-001 contained the greatest ^{232}Th sediment concentration, (2.0 ± 0.3) pCi/g, which is about 2.5 times the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Two Building 6 sediment samples were analyzed for ^{234}U. Both alpha spectroscopy results for Building 6 sediment samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and both were in secular equilibrium with the ^{238}U precursor. Sample A08-B6-SD-001 contained the greater ^{234}U concentration, (49 ± 5) pCi/g, which is about 70 times the ^{234}U background concentration and is about 3.6 times the ^{234}U screening level plus background concentration.

Two Building 6 sediment samples were analyzed for ^{235}U. Both alpha spectroscopy results and both offsite gamma spectroscopy results for Building 6 sediment samples indicated that ^{235}U was present at concentrations greater than the ^{235}U background concentration. Sample A08-B6-SD-001 contained the greatest ^{235}U concentration, (3.0 ± 0.5) pCi/g, which is almost 30 times the ^{235}U background concentration and less than the ^{235}U screening level plus background concentration.

Two Building 6 sediment samples were analyzed for ^{238}U. Both of the alpha spectroscopy results for sediment samples were greater than the ^{238}U background concentration. Sample A08-B6-SD-001 had the greater ^{238}U sediment concentration, (51 ± 5) pCi/g, which is about 70 times the ^{238}U background concentration and about 3.5 times the ^{238}U screening level plus background concentration.

Summary

Both sediment samples appear to be contaminated above screening levels [$(S - 2\sigma) > 1$].

^{226}Ra and ^{228}Ra, shown in Table 4-49, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.6.6 Groundwater

No groundwater samples were collected from within any IA01 building. Refer to IA02 and IA07 discussions that address the footprint of IA01.

4.2.6.7 Building Surfaces

Contamination on building surfaces (shown in Table 3-4) was detected on the outside surfaces of Building 6 (no measurements were taken inside Building 6). Of the 43 locations measured (see Table 4-7), four exceeded the thorium average screening level but not the uranium average screening level, but none exceeded the average uranium screening level. The maximum measured average surface concentration was approximately 1,600 dpm/100 cm^2.

Contamination greater than the removable screening levels for building surfaces (shown in Table 3-4) was not detected in Building 6. The maximum measured removable surface concentration (see Table 4-8) was (6 ± 9) dpm/100 cm^2.

Figure 4-39 depicts Building 6 sampling locations with results greater than screening levels for building surfaces.

These results are consistent with results shown in Table 5 of the ORISE report (ORISE, 1999), except for one report of a "total activity" of 30,000 dpm/100 cm^2.

4.2.7 Building 8

Building 8 was originally built in 1918 and has a floor area of approximately 2590 square meters (27,880 square feet). The building is constructed of masonry exterior walls with metal interior frame system. Floor materials encountered during this RI included soil, concrete, brick, and metal plate. The roof is of a "saw tooth" design, with vertical panels of glass – many of which have fallen into disrepair and the roof is no longer weatherproof.

According to available records, Building 8 was used for metal rolling and manufacturing. A loading dock exists at the west end of the building. The east end of the building is open to Building 3. The south side of the building is open to Building 6. Building 8 was one of the two main buildings (along with Building 6) used to process MED/AEC materials; refer to Section 2.1.2 for additional discussion on the material handling process. The building contains numerous items of machinery, including furnaces, rolling mills, and cooling beds.

4.2.7.1 Building Materials

Data Evaluation

Table 4-51 lists analytical results for radiological COPC concentrations in building materials for Building 8.

Summary

The concrete sample and the brick sample appear to contain uranium concentrations elevated a few times above naturally occurring levels. Since the ^{230}Th concentration is near naturally occurring levels, the contamination likely is due to MED/AEC support operations.

4.2.7.2 Surface Soils

Data Evaluation

Ten surface soil samples and one detritus sample were collected in Building 8. Table 3-42 lists the surface soil and detritus samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Table 3-19 lists the surface soil samples (the -01 samples) analyzed by ICP-MS for uranium isotopes. Surface soil sample locations are shown on Figure 3-11. Detritus sample locations are shown on Figure 3-12.

Table 4-52 lists analytical results for radiological COPC concentrations in surface soil samples for Building 8. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-53 lists the SOR for Building 8 surface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Table 4-54 lists the results for the surface soil sample analyzed by ICP-MS.

Two Building 8 surface soil samples and no Building 8 detritus samples were analyzed for ^{226}Ra. The GFPC result and both offsite gamma spectroscopy results for Building 8 surface soil samples were at or near the ^{226}Ra background concentration. The results for two samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor; the ^{226}Ra results for sample B08SL-003-01 were not consistent statistically with the ^{230}Th alpha spectroscopy result for demonstrating secular equilibrium. Sample B08SL-003-01 contained the greatest ^{226}Ra concentration for Building 8 surface soil samples, (1.0 ± 0.2) pCi/g, which is about the same as the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

Two Building 8 surface soil samples and no Building 8 detritus samples were analyzed for ^{228}Ra. The GFPC result and both offsite gamma spectroscopy results for Building 8 surface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B08SL-003-01 contained the greatest ^{228}Ra concentration for Building 8 surface soil samples, (2.8 ± 0.5) pCi/g, which is almost four times the ^{228}Ra background concentration and about 1.5 times the ^{228}Ra screening level plus background concentration.

Two Building 8 surface soil samples were analyzed for ^{228}Th. Both alpha spectroscopy results were greater than the ^{228}Th background concentration. The sample for which data were available for comparison indicated marginally that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor; the ^{228}Th result was in much closer agreement with the result for its ^{232}Th precursor, implying that the intermediate precursor ^{228}Ra result may be greater than the true ^{228}Ra concentration. Sample B08SL-023-01 contained the greater ^{228}Th concentration for Building 8 surface soil samples, (5.3 ± 0.6) pCi/g, which is about 6 times the ^{228}Th background concentration and about the same as the ^{228}Th screening level plus background concentration.

Two Building 8 surface soil samples were analyzed for ^{230}Th. Both alpha spectroscopy results were greater than the ^{230}Th background concentration. The results for both alpha spectroscopy samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample B08SL-003-01 contained the greater ^{230}Th concentration for Building 8 surface soil samples, (2.3 ± 0.3) pCi/g, which is about 2.6 times the ^{230}Th background concentration and about the same as the ^{230}Th screening level plus background concentration.

All ten Building 8 surface soil samples and one Building 8 detritus sample were analyzed for ^{232}Th. All three alpha spectroscopy results, two of the three offsite gamma spectroscopy results (the third was inconclusive), and four of the 11 onsite gamma spectroscopy results (one was inconclusive) indicated that ^{232}Th was present in surface soil samples at a concentration greater than the ^{232}Th background concentration. Sample B08SL-023-01 contained the greatest ^{232}Th surface soil concentration, (5.3 ± 0.6) pCi/g, which is almost 7 times the ^{232}Th background concentration and about 3 times the ^{232}Th screening level plus background concentration. The ^{232}Th onsite gamma spectroscopy result for the Building 8 detritus sample was (0.6 ± 0.3) pCi/g, which is about the same as the ^{232}Th background concentration.

Two Building 8 surface soil samples were analyzed for ^{234}U. Both alpha spectroscopy results for Building 8 surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background

concentration, and both were in secular equilibrium with the ^{238}U precursor. Sample B08SL-003-01 contained the greater ^{234}U concentration, (3226 ± 228) pCi/g, which is about 4700 times the ^{234}U background concentration and is greater than 200 times the ^{234}U screening level plus background concentration.

Two Building 8 surface soil samples were analyzed for ^{235}U. Both alpha spectroscopy results and both offsite gamma spectroscopy results for Building 8 surface soil samples indicated that ^{235}U was present at concentrations greater than the ^{235}U background concentration. Sample B08SL-003-01 contained the greatest ^{235}U concentration, (168 ± 31) pCi/g, which is greater than 6000 times the ^{235}U background concentration and about 20 times the ^{235}U screening level plus background concentration.

All ten Building 8 surface soil samples and one Building 8 detritus sample were analyzed for ^{238}U. All three of the alpha spectroscopy results and all 10 of the onsite gamma spectroscopy results for Building 8 surface soil samples were greater than the ^{238}U background concentration. Sample B08SL-003-01 had the greatest ^{238}U surface soil concentration, (3232 ± 230) pCi/g, which is about 4300 times the ^{238}U background concentration and about 200 times the ^{238}U screening level plus background concentration. The ^{238}U onsite gamma spectroscopy result for the Building 8 detritus sample was (18 ± 2) pCi/g, which is about 20 times the ^{238}U background concentration and about 1.2 times the ^{238}U screening level plus background concentration.

Summary

Table 4-53 shows 8 surface soil samples and one detritus sample with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

The remaining two locations have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

The ICP-MS results for surface soil sample B08SL-003-01 imply that the sample contains natural uranium rather than depleted, enriched, or recycled uranium.

Page 17 of the ORISE report (ORISE, 1999) shows maximum ^{226}Ra (2.2 pCi/g), ^{232}Th (442 pCi/g), ^{235}U (348 pCi/g), and ^{238}U (25,200 pCi/g) surface soil concentrations for Building 8 that are greater than any found in the current survey. Samples were not taken in the same locations as in the ORISE report.

^{226}Ra and ^{228}Ra, shown in Table 4-55, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.7.3 Subsurface Soils

Data Evaluation

Fifty-five subsurface soil samples were analyzed for COPCs in Building 8. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-6.

Table 4-55 lists analytical results for radiological COPC concentrations in subsurface soil samples for Building 8. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-56 lists the SOR for Building 8 subsurface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Table 4-57 lists the results for the subsurface soil samples analyzed by ICP-MS.

Ten Building 8 subsurface soil samples were analyzed for ^{226}Ra. Two of the five GFPC results and two of the 10 offsite gamma spectroscopy results for Building 8 subsurface soil samples were greater than the ^{226}Ra background concentration. The results for all but two samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor; the ^{226}Ra results for two samples were not consistent statistically with the ^{230}Th alpha spectroscopy result for demonstrating secular equilibrium. Sample B08SL-017-01 contained the greatest ^{226}Ra concentration for Building 8 subsurface soil samples, (2.1 ± 0.4) pCi/g, which is about twice the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Eleven Building 8 subsurface soil samples were analyzed for ^{228}Ra. Four of the five GFPC results and six of the 11 offsite gamma spectroscopy results for Building 8 subsurface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B08SL-017-01 contained the greatest ^{228}Ra concentration for Building 8 subsurface soil samples, (11.0 ± 1.1) pCi/g, but this value is suspect because it was much greater than the corresponding ^{228}Ra offsite gamma spectroscopy result, the ^{232}Th alpha spectroscopy result, the offsite ^{232}Th gamma spectroscopy result, and the ^{232}Th onsite gamma spectroscopy result, all of which were otherwise consistent with each other. The next greatest ^{228}Ra concentration for Building 8 subsurface soil samples, (6.6 ± 0.6) pCi/g, was for sample B08SL-023-03, and was approximately 10 times the ^{228}Ra background concentration and almost 4 times the ^{228}Ra screening level plus background concentration.

Nine Building 8 subsurface soil samples were analyzed for ^{228}Th. Five of the nine alpha spectroscopy results were greater than the ^{228}Th background concentration. All but one sample for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor; the ^{228}Th result was in much closer agreement with the result for its ^{232}Th precursor, implying that the intermediate precursor ^{228}Ra result may be greater than the true ^{228}Ra concentration. Sample B08SL-023-03 contained the greatest ^{228}Th concentration for Building 8 subsurface soil samples, (7.6 ± 0.9) pCi/g, which is about 9 times the ^{228}Th background concentration and about 1.4 times the ^{228}Th screening level plus background concentration.

Nine Building 8 subsurface soil samples were analyzed for ^{230}Th. Four of the nine alpha spectroscopy result were greater than the ^{230}Th background concentration. The results for all alpha spectroscopy samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample B08SL-017-01 contained the greatest ^{230}Th concentration for Building 8 subsurface soil samples, (8.5 ± 0.7) pCi/g, which is about 10 times the ^{230}Th background concentration and about 5 times the ^{230}Th screening level plus background concentration.

All 55 Building 8 subsurface soil samples were analyzed for ^{232}Th. Five of the nine alpha spectroscopy results, five of the 10 offsite gamma spectroscopy results, and 27 of the 55 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample B08SL-023-03 contained the greatest ^{232}Th subsurface soil concentration, (8.1 ± 0.6) pCi/g, which is more than 10 times the ^{232}Th background concentration and almost 5 times the ^{232}Th screening level plus background concentration.

Nine Building 8 subsurface soil samples were analyzed for ^{234}U. All nine alpha spectroscopy results for Building 8 subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all nine were in secular equilibrium with the ^{238}U precursor. Sample B08SL-017-01 contained the greatest ^{234}U concentration, (1.85 ± 0.12) × 10^4 pCi/g, which is about 30,000 times the ^{234}U background concentration and about 1300 times the ^{234}U screening level plus background concentration.

Ten Building 8 subsurface soil samples were analyzed for ^{235}U. All nine alpha spectroscopy results and all ten offsite gamma spectroscopy results for Building 8 subsurface soil samples indicated that ^{235}U was

present at concentrations greater than the ^{235}U background concentration. Sample B08SL-017-01 contained the greatest ^{235}U concentration, $(1.02 \pm 0.15) \times 10^3$ pCi/g, which is more than 30,000 times the ^{235}U background concentration and about 125 times the ^{235}U screening level plus background concentration.

All 55 Building 8 subsurface soil samples were analyzed for ^{238}U. All nine of the alpha spectroscopy results and 54 of the 55 onsite gamma spectroscopy results for Building 8 subsurface soil samples were greater than the ^{238}U background concentration. Sample B08SL-017-01 had the greatest ^{238}U subsurface soil concentration, $(1.79 \pm 0.12) \times 10^4$ pCi/g, which is about 4300 times the ^{238}U background concentration and about 200 times the ^{238}U screening level plus background concentration.

Summary

Table 4-56 shows 31 samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Eight samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Three samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 13 locations have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

The ICP-MS results for subsurface soil sample B08SL-017-01 imply that the sample contains natural uranium. The ICP-MS results for sample B08SL-015-09 imply that the sample contains mostly natural uranium; however, the derived ^{235}U and ^{238}U relative mass abundances in this sample differ slightly (in the direction towards depleted uranium) from those in natural uranium, and so this sample may contain a blend of natural uranium and depleted uranium. Further, the trace concentration of ^{236}U in B08SL-015-09 is consistent with the possible presence of recycled uranium.

^{226}Ra and ^{228}Ra, shown in Table 4-55, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.7.4 Surface Water (Site Utilities)

Data Evaluation

Two surface water samples were collected from utility features within Building 8. The surface water samples were analyzed for COPCs by alpha spectroscopy (uranium and thorium) and GFPC (radium). Table 3-56 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-58 lists radiological COPC concentrations in surface water samples collected in Building 8. Table 4-59 shows the radium and uranium concentrations in Table 4-58 converted to concentrations suitable for comparison with USEPA drinking water MCLs. Sample locations and corresponding analytical data are presented on Figure 4-29.

Summary

Both samples show elevated concentrations of ^{234}U, ^{235}U, and ^{238}U that exceed the USEPA drinking water MCL for total uranium (^{234}U, ^{235}U, and ^{238}U). Since the ^{230}Th concentrations for these samples are at background levels, it appears that these samples are contaminated with MED/AEC uranium.

4.2.7.5 Sediment (Site Utilities)

Data Evaluation

Two sediment samples were collected from utility features within Building 8. The sediment samples were analyzed at the offsite fixed laboratory for COPCs by gamma spectroscopy (all COPCs), alpha spectroscopy (uranium and thorium COPCs), and GFPC (radium COPCs). Table 3-57 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-60 lists analytical results for radiological COPC concentrations in sediment for Building 8. Table 4-61 lists the SOR for Building 8 sediment samples. Sample locations and corresponding analytical data are presented on Figure 4-30.

Two Building 8 sediment samples were analyzed for ^{226}Ra. Both GFPC results and both offsite gamma spectroscopy results for Building 8 sediment samples were not greater than the ^{226}Ra background concentration. The results for both samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-B8-SD-001 contained the greatest ^{226}Ra concentration for Building 8 sediment samples, (0.71 ± 0.14) pCi/g, which is about the same as the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

Two Building 8 sediment samples were analyzed for ^{228}Ra. Both GFPC results (marginally) and both offsite gamma spectroscopy results for Building 8 sediment samples were greater than the ^{228}Ra background concentration. The results for both samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-B8-SD-002 contained the greatest ^{228}Ra concentration for Building 8 sediment samples, (1.5 ± 0.4) pCi/g, which is greater than the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Two Building 8 sediment samples were analyzed for ^{228}Th. Both alpha spectroscopy results were greater than the ^{228}Th background concentration. Both samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-B8-SD-002 contained the greater ^{228}Th concentration for Building 8 sediment samples, (2.6 ± 0.5) pCi/g, which is about 3 times the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Two Building 8 sediment samples were analyzed for ^{230}Th. Neither alpha spectroscopy result was greater than the ^{230}Th background concentration. The results for both alpha spectroscopy samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A08-B8-SD-002 contained the greater ^{230}Th concentration for Building 8 sediment samples, (1.1 ± 0.3) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

Both Building 8 sediment samples were analyzed for ^{232}Th. Both of the alpha spectroscopy results and both of the offsite gamma spectroscopy results indicated that ^{232}Th was present in sediment samples at a concentration greater than the ^{232}Th background concentration. Sample A08-B8-SD-002 contained the greatest ^{232}Th sediment concentration, (2.6 ± 0.5) pCi/g, which is about 3 times the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Both Building 8 sediment samples were analyzed for ^{234}U. Both alpha spectroscopy results for Building 8 sediment samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and both were in secular equilibrium with the ^{238}U precursor. Sample A08-B8-SD-002

contained the greater ^{234}U concentration, (199 ± 29) pCi/g, which is almost 300 times the ^{234}U background concentration and is about 15 times the ^{234}U screening level plus background concentration.

Both Building 8 sediment samples were analyzed for ^{235}U. Both alpha spectroscopy results and both offsite gamma spectroscopy results for Building 8 sediment samples indicated that ^{235}U was present at concentrations greater than the ^{235}U background concentration. Sample A08-B8-SD-002 contained the greatest ^{235}U concentration, (11.4 ± 1.8) pCi/g, which is almost 300 times the ^{235}U background concentration and about 1.3 times the ^{235}U screening level plus background concentration.

Both Building 8 sediment samples were analyzed for ^{238}U. Both alpha spectroscopy results for Building 8 sediment samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A08-B8-SD-002 contained the greater ^{238}U concentration, (224 ± 32) pCi/g, which is about 320 times the ^{238}U background concentration and about 15 times the ^{238}U screening level plus background concentration.

Summary

Both sediment samples appear to be contaminated above screening levels [$(S - 2\sigma) > 1$].

^{226}Ra and ^{228}Ra, shown in Table 4-60, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

Table 11 of the ORISE report (ORISE, 1999) lists a Building 8 sediment sample with ^{238}U concentrations of (97 ± 8) pCi/g and (90 ± 7) pCi/g consistent with the current results.

4.2.7.6 Groundwater

No groundwater samples were collected from within any IA01 building. Refer to IA02 and IA07 discussions that address the footprint of IA01.

4.2.7.7 Building Surfaces

Contamination greater than the average screening levels for building surfaces (shown in Table 3-4) was detected in Building 8. Of the 71 locations measured (see Table 4-7), none exceeded the thorium average screening level but not the uranium average screening level, and 11 exceeded the average uranium screening level. The maximum measured average surface concentration was approximately 50,000 dpm/100 cm^2.

Contamination greater than the removable screening levels for building surfaces (shown in Table 3-4) was not detected in Building 8. The maximum measured removable surface concentration (see Table 4-8) was (170 ± 40) dpm/100 cm^2.

Figure 4-40 depicts Building 8 sampling locations with results greater than screening levels for building surfaces.

These results are consistent with results shown in Table 6 of the ORISE report (ORISE, 1999).

4.2.8 Building 17

Building 17 is located outside IA01 (south of Building 4/9); however, historical records indicated that a metallurgy laboratory was formerly housed in the second floor of the building. The laboratory was found to be present but abandoned at the time of the RI. A radiological scanning survey was conducted in the laboratory; no other matrices were sampled.

4.2.8.1 Building Materials

No building material samples for Building 17 were collected.

4.2.8.2 Surface Soils

The former metallurgy laboratory is located on the second floor of Building 17. As a result, no surface soil samples for Building 17 were collected.

4.2.8.3 Subsurface Soils

The former metallurgy laboratory is located on the second floor of Building 17. As a result, no subsurface soil samples for Building 17 were collected.

4.2.8.4 Surface Water (Site Utilities)

The former metallurgy laboratory is located on the second floor of Building 17. As a result, no surface water samples for Building 17 were collected.

4.2.8.5 Sediment (Site Utilities)

The former metallurgy laboratory is located on the second floor of Building 17. As a result, no sediment samples for Building 17 were collected.

4.2.8.6 Groundwater

No groundwater samples were collected from within any IA01 building. Refer to IA02 and IA07 discussions that address the footprint of IA01.

4.2.8.7 Building Surfaces

Contamination greater than the average screening levels for building surfaces (shown in Table 3-4) was detected in Building 17. Of the 60 locations measured (see Table 4-7), one exceeded the thorium average screening level but not the uranium average screening level, and none exceeded the average uranium screening level. The maximum measured average surface concentration was approximately 1,700 dpm/100 cm^2.

Contamination greater than the removable screening levels for building surfaces (shown in Table 3-4) was not detected in Building 17. The maximum measured removable surface concentration (see Table 4-8) was (8 ± 10) dpm/100 cm^2.

Figure 4-41 depicts Building 17 sampling locations with results greater than screening levels for building surfaces.

ORISE did not collect data from Building 17 (ORISE, 1999).

4.2.9 Building 24

Building 24 is not part of the Excised Area but is included in IA01 because the southwest portion of the building was constructed in 1941 and was used during the time MED/AEC support operations were being performed. A small (45 feet × 50 feet) addition was built in 1951 onto the north end of the original 1941 structure. The addition of what is currently the southeast portion of the building was completed in 1959; this addition “squared off” the 1941-1951 footprint, extending Building 24 from Building 8 to the north end

of the 1951 addition. A final northern addition was completed in 1966 that matched the full width of the then-existing building. ORISE (1999) subdivided the building into southwest, southeast, and northern evaluation areas to account for the possible effects of building construction and use over time.

Building 24 is an active warehouse facility for Allegheny Ludlum. The floor of the building is wall-to-wall concrete with periodically-spaced, shallow, concrete lined trenches covered with steel grate. The windows, walls, and roof are well-maintained.

4.2.9.1 Building Materials

Data Evaluation

Prior reports indicated that ^{238}U was detected in dust samples collected from the building roof trusses (NLO, 1953), so three samples of roof truss dust were collected in Building 24. One cinder block sample and three concrete samples were also collected in Building 24. Table 4-62 lists analytical results for radiological COPC concentrations in building materials and in roof truss dust for Building 24.

Table 4-63 lists the SOR for Building 24 roof truss dust samples.

One Building 24 roof truss dust sample was analyzed for ^{226}Ra. The GFPC result and the offsite gamma spectroscopy result for the Building 24 roof truss dust sample was marginally greater than the ^{226}Ra background concentration. The result also indicated that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor; since the ^{230}Th was not in equilibrium with its ^{234}U precursor (if none of the uranium present was due to MED/AEC support operations, then ^{230}Th likely would be in secular equilibrium with its ^{234}U and ^{238}U parents), it appears that the ^{226}Ra is not related to MED/AEC support operations. The GFPC result for sample B24SL-603-01 contained the greater ^{226}Ra concentration, (1.6 ± 0.4) pCi/g, which is about the same as the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

The cinder block sample and the three concrete samples were analyzed for ^{226}Ra. The GFPC and offsite gamma spectroscopy results indicated that the ^{226}Ra concentrations in these samples were about the same as the average concentrations for this COPCs and these materials. The results also indicated that the ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. According to its offsite gamma spectroscopy result, sample B24-BM-002 contained the largest ^{226}Ra concentration, (0.61 ± 0.14) pCi/g, which includes the average concentration for concrete within its range.

One Building 24 roof truss dust sample was analyzed for ^{228}Ra. The GFPC result and the offsite gamma spectroscopy result for this Building 24 roof truss dust sample were both greater than the ^{228}Ra background concentration. The results also indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. The GFPC result for sample B24SL-603-01 contained the greater ^{228}Ra concentration, (3.8 ± 0.8) pCi/g, which is greater than the ^{228}Ra background concentration and about twice the ^{228}Ra screening level plus background concentration.

The cinder block sample and the three concrete samples were analyzed for ^{228}Ra. The GFPC and offsite gamma spectroscopy results indicated that the ^{228}Ra concentrations in these samples were about the same as the average concentrations for this COPC and these materials. The results also indicated that the ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. According to its GFPC result, sample B24-BM-003 contained the largest ^{228}Ra concentration, (0.6 ± 0.3) pCi/g, which includes the average concentration for concrete within its range.

All three Building 24 roof truss dust samples were analyzed for ^{228}Th. All three alpha spectroscopy results were greater than the ^{228}Th background concentration. The results for the sample for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample B24SL-602-01 contained the greatest ^{228}Th concentration for Building 24 roof truss dust samples, (16.8 ±

1.6) pCi/g, which is almost 20 times the ^{228}Th background concentration and about 3 times the ^{228}Th screening level plus background concentration.

The cinder block sample and the three concrete samples were analyzed for ^{228}Th. The alpha spectroscopy results were about the same as the average concentrations for this COPC in these materials. The results also indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Samples B24-BM-001 and B24-BM-002 contained the greatest ^{228}Th concentration, (0.36 ± 0.14) pCi/g, which includes the average concentration for concrete within its range.

All three Building 24 roof truss dust samples were analyzed for ^{230}Th. All three alpha spectroscopy results were greater than the ^{230}Th background concentration. All three alpha spectroscopy results indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample B24SL-602-01 contained the greatest ^{230}Th concentration for Building 24 roof truss dust samples, (4.1 ± 0.5) pCi/g, which is about 4.7 times the ^{230}Th background concentration and about 1.5 times the ^{230}Th screening level plus background concentration.

The cinder block sample and the three concrete samples were analyzed for ^{230}Th. The alpha spectroscopy results were about the same as the average concentrations for this COPC in these materials. The results also indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor in the cinder block sample and in two of the three concrete samples. The exception (B24-BM-002) showed a perhaps slightly elevated ^{230}Th concentration along with uranium COPC concentrations clearly above average. Sample B24-BM-002 contained the greatest ^{230}Th concentration, (0.8 ± 0.2) pCi/g, which includes the average concentration for concrete within its range.

All three Building 24 roof truss dust samples were analyzed for ^{232}Th. All three alpha spectroscopy results, the offsite gamma spectroscopy result, and all three onsite gamma spectroscopy results indicated that ^{232}Th was present in roof truss dust samples at a concentration greater than the ^{232}Th background concentration. Sample B24SL-602-01 contained the greatest ^{232}Th roof truss dust concentration, (17.8 ± 1.1) pCi/g, which is almost 30 times the ^{232}Th background concentration and about 10 times the ^{232}Th screening level plus background concentration.

The cinder block sample and the three concrete samples were analyzed for ^{232}Th. The alpha and offsite gamma spectroscopy results were about the same as the average concentrations for this COPC in these materials. Sample B24-BM-001 contained the greatest ^{232}Th concentration, (0.34 ± 0.13) pCi/g, which is about the same as the average concentrations for this COPC in these materials.

All three Building 24 roof truss dust samples were analyzed for ^{234}U. All three alpha spectroscopy results for Building 24 roof truss dust samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all three were in secular equilibrium with the ^{238}U precursor. Sample B24SL-602-01 contained the greatest ^{234}U concentration, (2110 ± 198) pCi/g, which is more than 3000 times the ^{234}U background concentration and is more than 150 times the ^{234}U screening level plus background concentration.

The cinder block sample and the three concrete samples were analyzed for ^{234}U. The alpha spectroscopy results for the cinder block sample and one of the concrete samples were about the same as the average concentrations for this COPC in these materials. The other two concrete samples indicated ^{234}U concentrations above the average concentration. The results also indicated that ^{234}U was in secular equilibrium with its ^{238}U precursor in the cinder block sample and in the three concrete samples. Sample B24-BM-002 contained the greatest ^{234}U concentration, (3.0 ± 0.5) pCi/g, which is greater than the average concentration for concrete.

All three Building 24 roof truss dust samples were analyzed for ^{235}U. All three alpha spectroscopy results and the offsite gamma spectroscopy result for Building 24 roof truss dust samples indicated that ^{235}U was

present at concentrations greater than the ^{235}U background concentration. Sample B24SL-602-01 contained the greatest ^{235}U concentration, (94 ± 17) pCi/g, which is more than 2000 times the ^{235}U background concentration and about 11 times the ^{235}U screening level plus background concentration.

The cinder block sample and the three concrete samples were analyzed for ^{235}U. The alpha spectroscopy and gamma spectroscopy results for the cinder block sample and the concrete samples were about the same as the average concentrations for this COPC in these materials. Sample B24-BM-002 contained the greatest ^{235}U concentration, (0.3 ± 0.3) pCi/g, includes the average concentration for concrete within its range.

All three Building 24 roof truss dust samples were analyzed for ^{238}U. All three alpha spectroscopy results and all three onsite gamma spectroscopy results for Building 24 roof truss dust samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample B24SL-602-01 contained the greatest ^{238}U concentration, (2169 ± 205) pCi/g, which is about 3000 times the ^{238}U background concentration and almost 150 times the ^{238}U screening level plus background concentration.

The cinder block sample and the three concrete samples were analyzed for ^{238}U. The alpha spectroscopy results for the cinder block sample and one of the concrete samples were about the same as the average concentrations for this COPC in these materials. The other two concrete samples indicated ^{238}U concentrations above the average concentration. Sample B24-BM-002 contained the greatest ^{238}U concentration, (2.8 ± 0.5) pCi/g, which is greater than the average concentration for concrete.

Summary

The cinder block sample and one of the concrete samples appear to contain uranium at naturally occurring concentrations. Two of the concrete samples appear to contain uranium elevated to greater than naturally occurring levels. Since the ^{230}Th concentrations are near naturally occurring levels, the contamination likely is due to MED/AEC support operations.

Table 4-63 shows all three roof truss dust samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Uranium concentrations in roof truss dust reported earlier (NLO, 1953) were confirmed. Air sampling efforts to determine the concentration of COPCs in air that may result from dust resuspension are discussed in Section 3.12.

4.2.9.2 Surface Soils

Data Evaluation

No surface soil samples were collected in Building 24 because the floor surface is wall-to-wall concrete. However, 10 detritus samples were collected in Building 24. Detritus samples were analyzed for U and Th COPCs at the onsite gamma spectroscopy laboratory. Detritus sample locations are shown on Figure 3-12.

Table 4-64 lists analytical results for radiological COPC concentrations in detritus samples for Building 24. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-65 lists the SOR for Building 24 detritus samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

No Building 24 detritus samples were analyzed for ^{226}Ra.

No Building 24 detritus samples were analyzed for ^{228}Ra.

No Building 24 detritus samples were analyzed for ^{228}Th.

No Building 24 detritus samples were analyzed for ^{230}Th.

Ten Building 24 detritus samples were analyzed for ^{232}Th. Two of the ten onsite gamma spectroscopy results indicated that ^{232}Th was present in detritus samples at a concentration greater than the ^{232}Th background concentration. Sample B24SL-732-01 contained the greatest ^{232}Th detritus concentration, (1.0 ± 0.2) pCi/g, which is about 1.5 times the ^{232}Th background concentration and less than the ^{232}Th screening level plus background concentration.

No Building 24 detritus samples were collected for ^{234}U.

No Building 24 detritus samples were collected for ^{235}U.

Ten Building 24 detritus samples were analyzed for ^{238}U. Five of the ten onsite gamma spectroscopy results for Building 24 detritus samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample B24SL-731-01 contained the greatest ^{238}U concentration, (58 ± 3) pCi/g, which is more than 80 times the ^{238}U background concentration and almost 4 times the ^{238}U screening level plus background concentration.

Summary

Table 4-65 shows three detritus samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

One detritus sample had an SOR that, more likely than not, is greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

The remaining six detritus samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

Page 17 of the ORISE report (ORISE, 1999) shows maximum ^{226}Ra (1.7 pCi/g), ^{232}Th (1.7 pCi/g), ^{235}U (1.5 pCi/g), and ^{238}U (37.4 pCi/g) surface soil concentrations for Building 24. The maximum ^{232}Th and ^{238}U concentrations that ORISE reported are comparable to the maximum concentrations measured in the current survey.

4.2.9.3 Subsurface Soils

Sixty-two subsurface soil samples were analyzed for COPCs in Building 24. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-6.

Table 4-66 lists analytical results for radiological COPC concentrations in subsurface soil samples for Building 24. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-67 lists the SOR for Building 24 subsurface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Twelve Building 24 subsurface soil samples were analyzed for ^{226}Ra. One of eight GFPC results and none of eight offsite gamma spectroscopy results for Building 24 subsurface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample B24SL-019-02 contained the greatest ^{226}Ra concentrations for Building 24 subsurface soil samples, (1.6 ± 0.3) pCi/g, which is 1.7 times the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

Twelve Building 24 subsurface soil samples were analyzed for ^{228}Ra. All eight GFPC results and all eight offsite gamma spectroscopy results for Building 24 subsurface soil samples were not greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B24SL-019-02 contained the greatest ^{228}Ra concentration for Building 24 subsurface soil samples, (1.4 ± 0.4) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Fourteen Building 24 subsurface soil samples were analyzed for ^{228}Th. Three of the 14 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample B24SL-019-02 contained the greatest ^{228}Th concentration for Building 24 subsurface soil samples, (2.2 ± 0.3) pCi/g, which is about 2.6 times the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Fourteen Building 24 subsurface soil samples were analyzed for ^{230}Th. Two of the 14 alpha spectroscopy results were greater than the ^{230}Th background concentration. One of these samples had a ^{230}Th concentration about the same as its ^{234}U concentration (implying non-MED uranium). The other sample had a ^{230}Th concentration greater than the ^{234}U concentration, which likely is anomalous. Ten of the 14 alpha spectroscopy results indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). The alpha spectroscopy results for the remaining two samples indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor. Sample B24SL-019-02 contained the greatest ^{230}Th concentration for Building 24 subsurface soil samples, (1.7 ± 0.3) pCi/g, which is about 1.5 times the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All 62 Building 24 subsurface soil samples were analyzed for ^{232}Th. One of the 14 alpha spectroscopy results, none of the seven offsite gamma spectroscopy results, and 17 of the 62 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample B24SL-019-02 contained the greatest ^{232}Th subsurface soil concentration, (2.1 ± 0.3) pCi/g, which is about 2.6 times the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Fourteen Building 24 subsurface soil samples were analyzed for ^{234}U. Ten of the 14 alpha spectroscopy results for Building 24 subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample B24SL-021-01 contained the greatest ^{234}U concentration, (17.3 ± 1.2) pCi/g, which is about 25 times the ^{234}U background concentration and is about 1.2 times the ^{234}U screening level plus background concentration.

Sixteen Building 24 subsurface soil samples were analyzed for ^{235}U. Four of the 14 alpha spectroscopy results for Building 24 subsurface soil samples indicated that ^{235}U was present at concentrations greater than the ^{235}U background concentration; all seven offsite gamma spectroscopy results were not different statistically from the ^{235}U background concentration. Sample B24SL-021-01 contained the greatest ^{235}U concentration, (0.65 ± 0.13) pCi/g, which is more than 20 times the ^{235}U background concentration and less than the ^{235}U screening level plus background concentration.

All 62 Building 24 subsurface soil samples were analyzed for ^{238}U. Ten of 14 alpha spectroscopy results and 34 of 62 onsite gamma spectroscopy results for Building 24 subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample B24SL-021-01 contained the greatest ^{238}U concentration, (20.5 ± 1.7) pCi/g, which is about 25 times the ^{238}U background concentration and about 1.4 times the ^{238}U screening level plus background concentration.

Summary

Table 4-67 shows six samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Five samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Five samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 46 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-66, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The distribution of apparent MED/AEC-related constituents north and east of the original 1941 construction suggests that the subfloor contamination is an artifact of the building addition construction date (i.e., the 1959 southeast addition was built over pre-existing contamination).

4.2.9.4 Surface Water (Site Utilities)

The shallow floor trenches located with Building 24 were dry during the RI. Therefore, no surface water samples for Building 24 were collected.

4.2.9.5 Sediment (Site Utilities)

Data Evaluation

Seven sediment samples were collected from utility features within Building 24. The sediment samples were analyzed at the offsite fixed laboratory for COPCs by gamma spectroscopy (all COPCs), alpha spectroscopy (uranium and thorium COPCs), and GFPC (radium COPCs). Table 3-57 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-68 lists analytical results for radiological COPC concentrations in sediment for Building 24. Table 4-69 lists the SOR for Building 24 sediment samples. Sample locations and corresponding analytical data are shown on Figure 4-30.

Seven Building 24 sediment samples were analyzed for ^{226}Ra. One of seven GFPC results and one of seven offsite gamma spectroscopy results for Building 24 sediment samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-B24-SD-006 contained the greatest ^{226}Ra concentrations for Building 24 sediment samples, (1.9 ± 0.3) pCi/g, which is about 2.3 times the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Seven Building 24 sediment samples were analyzed for ^{228}Ra. One of seven GFPC results and one of seven offsite gamma spectroscopy results for Building 24 sediment samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-B24-SD-006 contained the greatest ^{228}Ra concentration for Building 24 sediment samples, (1.9 ± 0.5) pCi/g, which is about 2.6 times the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Seven Building 24 sediment samples were analyzed for ^{228}Th. One of the seven alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available

for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-B24-SD-006 contained the greatest ^{228}Th concentration for Building 24 sediment samples, (2.1 ± 0.5) pCi/g, which is about 2.5 times the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Seven Building 24 sediment samples were analyzed for ^{230}Th. One of the seven alpha spectroscopy results was greater than the ^{230}Th background concentration. All of the alpha spectroscopy results indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A08-B24-SD-006 contained the greatest ^{230}Th concentration for Building 24 sediment samples, (1.3 ± 0.4) pCi/g, which is about 1.4 times the ^{230}Th background concentration and is less than the ^{230}Th screening level plus background concentration.

Seven Building 24 sediment samples were analyzed for ^{232}Th. One of the seven alpha spectroscopy results and one of the seven offsite gamma spectroscopy results indicated that ^{232}Th was present in sediment samples at a concentration greater than the ^{232}Th background concentration. Sample A08-B24-SD-006 contained the greatest ^{232}Th sediment concentration, (2.1 ± 0.5) pCi/g, which is about 2.6 times the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Seven Building 24 sediment samples were analyzed for ^{234}U. All of the seven alpha spectroscopy results for Building 24 sediment samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A08-B24-SD-007 contained the greatest ^{234}U concentration, (30 ± 4) pCi/g, which is more than 40 times the ^{234}U background concentration and is about twice the ^{234}U screening level plus background concentration.

Seven Building 24 sediment samples were analyzed for ^{235}U. Four of the seven alpha spectroscopy results and four of the seven offsite gamma spectroscopy results for Building 24 sediment samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A08-B24-SD-007 contained the greatest ^{235}U concentration, (1.9 ± 0.5) pCi/g, which is almost 20 times the ^{235}U background concentration and less than the ^{235}U screening level plus background concentration.

Seven Building 24 sediment samples were analyzed for ^{238}U. All of the alpha spectroscopy results for Building 24 sediment samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A08-B24-SD-007 contained the greatest ^{238}U concentration, (31 ± 4) pCi/g, which is more than 40 times the ^{238}U background concentration and about twice the ^{238}U screening level plus background concentration.

Summary

Five of the seven sediment samples appear to be clearly contaminated above screening levels [that is, $(S - 2\sigma) > 1$].

The remaining two samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-68, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.2.9.6 Groundwater

No groundwater samples were collected from within any IA01 building. Refer to IA02 and IA07 discussions that address the footprint of IA01.

4.2.9.7 Building Surfaces

Contamination greater than the average screening levels for building surfaces (shown in Table 3-4) was detected in Building 24. Of the 541 locations measured (see Table 4-7), 105 exceeded the thorium average screening level but not the uranium average screening level, and 99 exceeded the average uranium screening level. The maximum measured average surface concentration was approximately 120,000 dpm/100 cm^2.

Contamination greater than the removable screening levels for building surfaces (shown in Table 3-4) was detected in Building 24. Of the 538 locations measured (see Table 4-8), two exceeded the removable thorium screening level but not the removable uranium screening level, and none exceeded the removable uranium screening level. The maximum measured removable surface concentration was (250 ± 50) dpm/100 cm^2.

Figure 4-42, Figure 4-43, and Figure 4-44 depict Building 24 sampling locations with results greater than screening levels for building surfaces.

These results are consistent with results shown in Table 7 and Table 8 of the ORISE report (ORISE, 1999), except that ORISE reported no removable contamination greater than the thorium screening level.

4.2.10 Building 35

Building 35 was originally built in 1950 and has a floor area of approximately 305 square meters (3,280 square feet). The building is constructed of masonry exterior walls with metal interior frame system. The floor consists of wall-to-wall concrete. According to available records, Building 35 was used for metal rolling and grinding. At the time of the RI, only limited amounts of miscellaneous wood and metal debris (shelving, etc.) was located in the building.

4.2.10.1 Building Materials

Data Evaluation

Table 4-70 lists analytical results for radiological COPC concentrations in building materials for Building 35.

Summary

The concrete sample and the brick sample do not appear to contain radiological COPC concentrations above naturally occurring levels.

4.2.10.2 Surface Soils

No surface soil samples were collected in Building 35 because the floor surface is wall-to-wall concrete. No detritus was noted in Building 35 and therefore no detritus samples were collected in Building 35.

4.2.10.3 Subsurface Soils

Data Evaluation

Twenty-four subsurface soil samples were analyzed for COPCs in Building 35. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-6.

Table 4-71 lists analytical results for radiological COPC concentrations in subsurface soil samples for Building 35. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-72 lists the SOR for Building 35 subsurface soil samples. SOR are presented in graphical format in Figure 4-1, Figure 4-3, and Figure 4-5.

Two Building 35 subsurface soil samples were analyzed for ^{226}Ra. One of two GFPC results and one of two offsite gamma spectroscopy results for Building 35 subsurface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample B35SL-003-07 contained the greatest ^{226}Ra concentrations for Building 35 subsurface soil samples, (2.5 ± 0.4) pCi/g, which is about 2.5 times the ^{226}Ra background concentration and about 1.5 times the ^{226}Ra screening level plus background concentration.

Two Building 35 subsurface soil samples were analyzed for ^{228}Ra. Both GFPC results and one of two offsite gamma spectroscopy results for Building 35 subsurface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample B35SL-001-01 contained the greatest ^{228}Ra concentration for Building 35 subsurface soil samples, (2.0 ± 0.5) pCi/g, which is almost 3 times the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Two Building 35 subsurface soil samples were analyzed for ^{228}Th. Both alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample B35SL-003-07 contained the greater ^{228}Th concentration for Building 35 subsurface soil samples, (2.1 ± 0.5) pCi/g, which is about 2.5 times the ^{228}Th background concentration and less than the ^{228}Th screening level plus background concentration.

Two Building 35 subsurface soil samples were analyzed for ^{230}Th. One of the two alpha spectroscopy results was greater than the ^{230}Th background concentration. One of the two alpha spectroscopy results (the greater concentration) indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor. The ^{230}Th in the other sample was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample B35SL-003-07 contained the greater ^{230}Th concentration for Building 35 subsurface soil samples, (2.5 ± 0.5) pCi/g, which is almost 3 times the ^{230}Th background concentration and about the same as the ^{230}Th screening level plus background concentration.

Twenty-four Building 35 subsurface soil samples were analyzed for ^{232}Th. One of the two alpha spectroscopy results, one of the two offsite gamma spectroscopy results, and 14 of the 24 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample B35SL-001-05 contained the greatest ^{232}Th subsurface soil concentration, (3.3 ± 0.3) pCi/g, which is about 5 times the ^{232}Th background concentration and almost twice the ^{232}Th screening level plus background concentration.

Two Building 35 subsurface soil samples were analyzed for ^{234}U. Both of the alpha spectroscopy results for Building 35 subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and both were in secular equilibrium with the ^{238}U precursor. Sample B35SL-001-01 contained the greater ^{234}U concentration, (6.7 ± 1.0) pCi/g, which is almost 10 times the ^{234}U background concentration and is less than the ^{234}U screening level plus background concentration.

Two Building 35 subsurface soil samples were analyzed for ^{235}U. Neither of the two alpha spectroscopy results and neither of the two offsite gamma spectroscopy results for Building 35 subsurface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample B35SL-001-01 contained the greatest ^{235}U concentration, (0.30 ± 0.13) pCi/g, which is not different statistically from the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

Twenty-four Building 35 subsurface soil samples were analyzed for ^{238}U. Both of the alpha spectroscopy results and 15 of the 24 onsite gamma spectroscopy results for Building 35 subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample B35SL-001-01 contained the greatest ^{238}U concentration, (6.6 ± 1.0) pCi/g, which is more than 7 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

Table 4-72 shows 11 samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

One sample had an SOR that, more likely than not, is less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 12 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-71, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The presence of MED/AEC-related constituents beneath the concrete floor of Building 35 is believed to be an artifact of the location and construction date (1950) of the building (i.e., the contamination is presumed to have been present at the time of construction as opposed to have migrated from within the building through the floor).

4.2.10.4 Surface Water (Site Utilities)

No floor trenches, floor drains, or utility pits were identified in Building 35. Therefore, no surface water samples for Building 35 were collected.

4.2.10.5 Sediment (Site Utilities)

No floor trenches, floor drains, or utility pits were identified in Building 35. Therefore, no sediment samples for Building 35 were collected.

4.2.10.6 Groundwater

No groundwater samples were collected from within any IA01 building. Refer to IA02 and IA07 discussions that address the footprint of IA01.

4.2.10.7 Building Surfaces

Contamination greater than the average screening levels for building surfaces (shown in Table 3-4) was detected in Building 35. Of the 123 locations measured (see Table 4-7), 11 exceeded the thorium average screening level but not the uranium average screening level, and none exceeded the average uranium screening level. The maximum measured average surface concentration was approximately 2,900 dpm/100 cm^2.

Contamination greater than the removable screening levels for building surfaces (shown in Table 3-4) was not detected in Building 35. The maximum measured removable surface concentration (see Table 4-8) was (6 ± 9) dpm/100 cm^2.

Figure 4-45 and Figure 4-46 depict Building 35 sampling locations with results greater than screening levels for building surfaces.

Table 9 of the ORISE report (ORISE, 1999) lists no location in Building 35 with a "total activity" greater than 650 dpm/100 cm^2.

4.3 IA02 – Excised Area, Building Exterior Areas

The exterior grounds of the Excised Area include a railroad siding and crane yard to the east of Buildings 1 and 2; an alleyway between Buildings 2 and 3; an alleyway surrounding Building 5; a courtyard area between Buildings 3 and 24; and the exterior loading dock area to the west of Buildings 6 and 8 and north of the west end of Building 4 and 9.

4.3.1 Surface Soils

Data Evaluation

Forty-eight surface soil samples were collected in IA02. Table 3-42 lists the surface soil samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Table 3-19 lists the surface soil samples (the -01 samples) analyzed by ICP-MS for uranium isotopes. Surface soil sample locations are shown on Figure 3-10.

Table 4.73 lists analytical results for radiological COPC concentrations in surface soil samples for IA02. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-74 lists the SOR for IA02 surface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Fifteen IA02 surface soil samples were analyzed for ^{226}Ra. All 14 GFPC results and the only offsite gamma spectroscopy result for IA02 surface soil samples were not greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A02SL-015-01 and sample A02SL-215-01 contained the greatest ^{226}Ra concentrations for IA02 surface soil samples, (1.5 ± 0.3) pCi/g, which is less than twice the ^{226}Ra background concentration and is less than the ^{226}Ra screening level plus background concentration.

Fifteen IA02 surface soil samples were analyzed for ^{228}Ra. Thirteen of 14 GFPC results and the only offsite gamma spectroscopy results for IA02 surface soil samples were not greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A02SL-015-01 contained the greatest ^{228}Ra concentration for IA02 surface soil samples, (1.7 ± 0.4) pCi/g, which is about 2.4 times

the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Twenty-eight IA02 surface soil samples were analyzed for ^{228}Th. Two of 28 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A02SL-020-01 contained the greatest ^{228}Th concentration for IA02 surface soil samples, (1.28 ± 0.20) pCi/g, which is about 1.5 times the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Twenty-eight IA02 surface soil samples were analyzed for ^{230}Th. One of the 28 alpha spectroscopy results was greater than the ^{230}Th background concentration. All of alpha spectroscopy results, except for the sample with the least ^{234}U concentration (A02SL-020-01), indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A02SL-215-01 contained the greatest ^{230}Th concentration for IA02 surface soil samples, (1.4 ± 0.3) pCi/g, which is about 1.6 times the ^{230}Th background concentration and is less than the ^{230}Th screening level plus background concentration.

All 48 IA02 surface soil samples were analyzed for ^{232}Th. All of the 28 alpha spectroscopy results, the single offsite gamma spectroscopy result, and 39 of the 48 onsite gamma spectroscopy results indicated that ^{232}Th was present in surface soil samples at a concentration at or near the ^{232}Th background concentration. Sample A02SL-215-01 contained the greatest ^{232}Th surface soil concentration, (1.6 ± 0.2) pCi/g, which is about two times the ^{232}Th background concentration and less than the ^{232}Th screening level plus background concentration.

Twenty-eight IA02 surface soil samples were analyzed for ^{234}U. All 28 alpha spectroscopy results for IA02 surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A02SL-234-01 contained the greatest ^{234}U concentration, (29 ± 3) pCi/g, which is more than 40 times the ^{234}U background concentration and more than twice the ^{234}U screening level plus background concentration.

Twenty-nine IA02 surface soil samples were analyzed for ^{235}U. Fourteen of the 28 alpha spectroscopy results and the only offsite gamma spectroscopy results for IA02 surface soil samples did not indicate that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A02SL-234-01 contained the greatest ^{235}U concentration, (1.7 ± 0.4) pCi/g, which is more than 40 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 48 IA02 surface soil samples were analyzed for ^{238}U. All 28 alpha spectroscopy results and 40 of the 48 onsite gamma spectroscopy results for IA02 surface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A02SL-234-01 contained the greatest ^{238}U concentration, (44 ± 4) pCi/g, which is more than 60 times the ^{238}U background concentration and about 3 times the ^{238}U screening level plus background concentration.

Summary

Table 4-74 shows eleven samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

One sample had an SOR that, more likely than not, is greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Seven samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 29 locations have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4.73, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The GWS (Figure 3-9) identified a few small areas (along former rail spur) of elevated gamma count rates in IA02 east of Building 2 that the surface soil concentration results confirmed.

The current RI data set, as shown on Figure 4-1 through Figure 4-6, corroborates the presence of MED/AEC-related constituents in the same general locations as ORISE designations “Area 12” through “Area 21” (see ORISE 1999, pp 24-27 and Figure 36). Direct comparison of impacted areas and soil volumes is not possible given the lower screening values and additional COPCs considered in this RI; however, it is reasonable to assume impacted surface area and soil volume will be greater using the current RI COPC list and screening levels as compared to the ORISE screening levels.

4.3.2 Subsurface Soils

Data Evaluation

Sixty-nine subsurface soil samples were analyzed for COPCs in IA02. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-5.

Table 4-75 lists analytical results for radiological COPC concentrations in subsurface soil samples for IA02. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-76 lists the SOR for IA02 subsurface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Table 4-77 lists the results for the subsurface soil sample analyzed by ICP-MS.

Seventeen IA02 subsurface soil samples were analyzed for ^{226}Ra. Ten of the 16 GFPC results and three of the eight offsite gamma spectroscopy results for IA02 subsurface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A02SL-021-03 contained the greatest ^{226}Ra concentrations for IA02 subsurface soil samples, (3.2 ± 0.3) pCi/g, which is about 3 times the ^{226}Ra background concentration and almost twice the ^{226}Ra screening level plus background concentration.

Seventeen IA02 subsurface soil samples were analyzed for ^{228}Ra. Eight of the 16 GFPC results and one of the eight offsite gamma spectroscopy results for IA02 subsurface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A02SL-028-01 contained the greatest ^{228}Ra concentration for IA02 subsurface soil samples, (2.3 ± 0.4) pCi/g, which is about 2.3 times the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Thirty-two IA02 subsurface soil samples were analyzed for ^{228}Th. Seventeen of the 32 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A02SL-028-01 contained the greatest ^{228}Th concentration for IA02 subsurface soil samples, (2.5 ± 0.2) pCi/g,

which is about 3 times the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Thirty-two IA02 subsurface soil samples were analyzed for ^{230}Th. Seventeen of the 32 alpha spectroscopy results were greater than the ^{230}Th background concentration. All ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor when the ^{234}U concentration was at or near the ^{234}U background concentration. Except for two samples, all ^{230}Th alpha spectroscopy results indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). This implies that IA02 has a background naturally occurring uranium concentration greater than that of the background reference area. Sample A02SL-021-03 contained the greatest ^{230}Th concentration for IA02 subsurface soil samples, (2.8 ± 0.3) pCi/g, which is about 3 times as ^{230}Th background concentration and is about the same as the ^{230}Th screening level plus background concentration.

All 69 IA02 subsurface soil samples were analyzed for ^{232}Th. Sixteen of the 32 alpha spectroscopy results, seven of the eight offsite gamma spectroscopy results, and 40 of the 69 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A02SL-037-10 contained the greatest ^{232}Th subsurface soil concentration, (3.1 ± 0.3) pCi/g, which is almost 4 times the ^{232}Th background concentration and about 1.6 times the ^{232}Th screening level plus background concentration.

Thirty-two IA02 subsurface soil samples were analyzed for ^{234}U. Twenty-nine of the 32 alpha spectroscopy results for IA02 subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor except for two samples (A02SL-028-01 and A02SL-028-02, both of which were taken at the same location and are out of secular equilibrium at about the same activity ratio, ^{234}U:^{238}U::1:4). Sample A02SL-028-01 contained the greatest ^{234}U concentration, (64 ± 5) pCi/g, which is almost 100 times the ^{234}U background concentration and about 4.6 times the ^{234}U screening level plus background concentration. In addition, according to ICP-MS results, sample A02SL-028-01 contains 0.017 µg ^{236}U per g of soil, which indicates the presence of recycled uranium in this sample.

Thirty-two IA02 subsurface soil samples were analyzed for ^{235}U. Ten of the 32 alpha spectroscopy results and one of the eight offsite gamma spectroscopy results for IA02 subsurface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A02SL-028-01 contained the greatest ^{235}U concentration, (5.50 ± 0.19) pCi/g, which is about 140 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 69 IA02 subsurface soil samples were analyzed for ^{238}U. Thirty-one of the 32 alpha spectroscopy results and 62 of the 69 onsite gamma spectroscopy results for IA02 subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A02SL-028-01 contained the greatest ^{238}U concentration, (247 ± 14) pCi/g, which is about 353 times the ^{238}U background concentration and about 18 times the ^{238}U screening level plus background concentration.

Summary

Table 4-76 shows 28 samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Eleven samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Seven samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 24 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

The ICP-MS results for subsurface soil sample A02SL-028-01 imply that the sample contains mostly depleted, recycled uranium rather than natural or enriched uranium.

^{226}Ra and ^{228}Ra, shown in Table 4-75, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The current RI data set, as shown on Figure 4-1 through Figure 4-6, corroborates the presence of MED/AEC-related constituents in the same general locations as ORISE designations "Area 12" through "Area 21" (see ORISE 1999, pp 24-27 and Figure 36). Direct comparison of impacted areas and soil volumes is not possible given the lower screening values and additional COPCs considered in this RI; however, it is reasonable to assume impacted surface area and soil volume will be greater using the current RI COPC list and screening levels as compared to the ORISE screening levels.

4.3.3 Surface Water (Site Utilities)

Data Evaluation

Based on historical information, the occurrence of native surface water in IA02 was not anticipated and therefore no native surface water samples were planned for IA02. Native surface water was not observed within IA02 during the RI, and no surface water samples were collected.

Table 4-78 lists radiological COPC concentrations in seven non-native[29] surface water samples collected in IA02. The samples were collected from site utility features, such as catch basins, manholes, etc. Table 3-58 describes the locations where these samples were taken. Figure 4-29 shows where the samples were taken. Table 4-79 shows the radium and uranium concentrations in Table 4-78 converted to concentrations suitable for comparison with USEPA drinking water MCLs.

Summary

Two of the non-native surface water samples appear to have uranium mass concentrations that exceed the USEPA drinking water MCL for total uranium (^{234}U, ^{235}U, and ^{238}U). Since the ^{230}Th activity concentrations in these samples appear to be at background levels, this indicates that these samples contain MED/AEC uranium.

4.3.4 Sediment (Site Utilities)

Data Evaluation

Based on historical information, the occurrence of native sediment in IA02 was not anticipated and therefore no native sediment samples were planned for IA02. Native sediment was not observed within IA02 during the RI, and no sediment samples were collected.

Table 4-80 lists radiological COPC concentrations in 13 non-native sediment samples collected in IA02. Table 4-81 lists the SOR for IA02 non-native sediment samples. The samples were collected from the Guterl Site utility features, such as catch basins, manholes, etc. Table 3-58 describes the locations where these samples were taken. Figure 4-30 shows where the samples were taken.

[29] "Non-native" samples represent certain material (for example, water and sediment) that is non-environmental, that is, not likely to be available for ecological receptors.

All 13 IA02 non-native sediment samples were analyzed for ^{226}Ra. None of the 13 GFPC results and none of the 13 offsite gamma spectroscopy results for IA02 non-native sediment samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-A01-SD-008 and sample A08-A01-SD-013 contained the greatest ^{226}Ra concentrations for IA02 non-native sediment samples, (0.9 ± 0.2) pCi/g, which is about the same as the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

All 13 IA02 non-native sediment samples were analyzed for ^{228}Ra. None of the 13 GFPC results and none of the 13 offsite gamma spectroscopy results for IA02 non-native sediment samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-A01-SD-008 contained the greatest ^{228}Ra concentration for IA02 non-native sediment samples, (1.1 ± 0.5) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

All 13 IA02 non-native sediment samples were analyzed for ^{228}Th. None of the 13 alpha spectroscopy results was greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-A01-SD-013 contained the greatest ^{228}Th concentration for IA02 non-native sediment samples, (0.9 ± 0.2) pCi/g, which is about the same as the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

All 13 IA02 non-native sediment samples were analyzed for ^{230}Th. None of the 13 alpha spectroscopy results was greater than the ^{230}Th background concentration. All ^{230}Th alpha spectroscopy results indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A08-A01-SD-013 contained the greatest ^{230}Th concentration for IA02 non-native sediment samples, (1.0 ± 0.2) pCi/g, which is about the same as the ^{230}Th background concentration and is less than the ^{230}Th screening level plus background concentration.

All 13 IA02 non-native sediment samples were analyzed for ^{232}Th. None of the 13 alpha spectroscopy results and none of the 13 offsite gamma spectroscopy results indicated that ^{232}Th was present in non-native sediment samples at a concentration greater than the ^{232}Th background concentration. Sample A08-A01-SD-013 contained the greatest ^{232}Th non-native sediment concentration, (0.9 ± 0.2) pCi/g, which is the same as the ^{232}Th background concentration and less than the ^{232}Th screening level plus background concentration.

All 13 IA02 non-native sediment samples were analyzed for ^{234}U. All 13 alpha spectroscopy results for IA02 non-native sediment samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A08-A01-SD-011 contained the greatest ^{234}U concentration, (36 ± 5) pCi/g, which is about 50 times the ^{234}U background concentration and about 2.6 times the ^{234}U screening level plus background concentration.

All 13 IA02 non-native sediment samples were analyzed for ^{235}U. Five of the 13 alpha spectroscopy results and two of the 13 offsite gamma spectroscopy results for IA02 non-native sediment samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A08-A01-SD-011 contained the greatest ^{235}U concentration, (2.6 ± 0.6) pCi/g, which is more than 20 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 13 IA02 non-native sediment samples were analyzed for ^{238}U. All 13 alpha spectroscopy results for IA02 non-native sediment samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A08-A01-SD-011 contained the greatest ^{238}U concentration, (41 ± 5)

pCi/g, which is about 70 times the ^{238}U background concentration and about 2.8 times the ^{238}U screening level plus background concentration.

Summary

Table 4-81 shows four samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

The remaining nine samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-75, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains. The source of elevated radium concentrations likely is erosion of surface soils with deposition in the Guterl Site utility feature where the sample was collected.

4.3.5 Groundwater

No overburden groundwater monitoring wells exist within IA02.

Groundwater samples for radiological parameters were collected from nine shallow bedrock monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-5, MW-06, MW-08, MW-09, and MW-11) located within IA02; refer to Figure 3-13 for monitoring well locations.

Groundwater samples were collected during July-August 2007 and November 2007. A filtered sample and an unfiltered sample were collected at each location during each round. Groundwater samples were analyzed for radiological COPCs by alpha spectroscopy (uranium and thorium), GFPC (radium), gross alpha and gross beta; the unfiltered sample was also analyzed for TSS.

Data Evaluation

Groundwater analytical results for the July-August 2007 and November 2007 rounds of sampling are presented on Figures 4-47 and 4-48, respectively. Table 4-82 lists weighted average analytical results for groundwater samples collected in IA02. Table 4-83 shows the radium and uranium concentrations in Table 4-82 converted to concentrations suitable for comparison with USEPA drinking water MCLs.

MW-4, located immediately west of Building 6 and Building 8 loading dock that was in use during the period of MED/AEC support operations, displays the greatest concentration of ^{238}U. MW-2 and MW-09, located on the southeast side (downgradient side) of IA01 buildings, show elevated uranium activity. The presence of elevated uranium in these three wells is likely explained by location within, or immediately downgradient of, suspected source terms in overburden soil.

Summary

The radium and thorium concentrations in all samples appear to be at background levels. However, most of the nine shallow bedrock well locations sampled within IA02 show uranium concentrations significantly greater than the background uranium concentration and one location (MW4) exceeds the USEPA drinking water MCL for total uranium (^{234}U, ^{235}U, and ^{238}U).

4.4 IA03 – Landfill Area

The Landfill Area is a Class 2 NYSDEC Inactive Hazardous Waste Site (Site No. 932032). It consists of an 8.6-acre area in the northwest part of the Guterl Site. From 1962 to 1980, Simonds (to 1963), or Wallace-Murray (1963 to 1972), or Guterl (1972 to 1980) disposed of wastes such as slag, baghouse flue dust, foundry sand, and other plant rubbish in the landfill. It should be noted that the landfill is not reported

to have accepted wastes until a number of years after the MED/AEC support operations ceased (in 1956), although historic aerial photographs (1938, 1951, and 1958) show apparent disturbances in the northeast corner of the landfill area. In August 1980, NYSDEC required Guterl to stop disposing chromium-contaminated baghouse dust in the landfill, as it was a listed Resource Conservation and Recovery Act (RCRA) hazardous waste (K091). In 1982, Guterl salvaged approximately two million pounds of metal slag from the landfill for recycling. The landfill has not been used since (NYSDEC, 2005).

In 1983 (at which point the landfill had been inactive for approximately two years), representatives of the Niagara County Health Department (NCHD) conducted a visual inspection of the landfill. Disposed refuse included brick, slag, wood, foundry sand, empty oil drums, ore products, grinding dust, and baghouse dust. The NCHD inspector noted that "the waste has not been properly covered or graded which has led to minor ponding and erosion problems" (NCHD, 1983). At that time, waste oil was being salvaged by a private contractor, and the hazardous blower dust was being manifested for off-site disposal.

4.4.1 Surface Soils

Data Evaluation

Seventy-five surface soil samples were collected in IA03 (includes both primary borings and secondary borings). Table 3-42 lists the surface soil samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Surface soil sample locations are shown on Figure 3-10.

Table 4-84 lists analytical results for radiological COPC concentrations in surface soil samples for IA03. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-85 lists the SOR for IA03 surface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Sixteen IA03 surface soil samples were analyzed for ^{226}Ra. Two of the 15 GFPC results and one of the four offsite gamma spectroscopy results for IA03 surface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A03SL-203-01 contained the greatest ^{226}Ra concentrations for IA03 surface soil samples, (1.9 ± 0.3) pCi/g, which is almost twice the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Fifteen IA03 surface soil samples were analyzed for ^{228}Ra. One of the 15 GFPC results and none of the four offsite gamma spectroscopy results for IA03 surface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A03SL-203-01 contained the greatest ^{228}Ra concentration for IA03 surface soil samples, (1.5 ± 0.4) pCi/g, which is almost twice the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Thirty IA03 surface soil samples were analyzed for ^{228}Th. Five of the 30 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A03SL-203-01 contained the greatest ^{228}Th concentration for IA03 surface soil samples, (1.6 ± 0.3) pCi/g, which is almost twice the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Thirty IA03 surface soil samples were analyzed for ^{230}Th. Two of the 30 alpha spectroscopy results were greater than the ^{230}Th background concentration. All ^{230}Th alpha spectroscopy results indicated that ^{230}Th

was in secular equilibrium with its ^{234}U precursor only when the ^{234}U concentration was at or near the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A03SL-021-01 contained the greatest ^{230}Th concentration for IA03 surface soil samples, (2.6 ± 0.4) pCi/g, which is about 3 times the ^{230}Th background concentration and is about the same as the ^{230}Th screening level plus background concentration.

All 75 IA03 surface soil samples were analyzed for ^{232}Th. One of the 30 alpha spectroscopy results, none of the four offsite gamma spectroscopy results, and 14 of the 75 onsite gamma spectroscopy results indicated that ^{232}Th was present in surface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A03SL-203-01 contained the greatest ^{232}Th surface soil concentration, (2.6 ± 0.4) pCi/g, which is about 4 times the ^{232}Th background concentration and about 1.5 times the ^{232}Th screening level plus background concentration.

Thirty IA03 surface soil samples were analyzed for ^{234}U. All 30 alpha spectroscopy results for IA03 surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A03SL-038-01 contained the greatest ^{234}U concentration, (56 ± 5) pCi/g, which is about 80 times the ^{234}U background concentration and about 4 times the ^{234}U screening level plus background concentration.

Thirty IA03 surface soil samples were analyzed for ^{235}U. 14 of the 30 alpha spectroscopy results and none of the four offsite gamma spectroscopy results for IA03 surface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A03SL-038-01 contained the greatest ^{235}U concentration, (3.2 ± 0.5) pCi/g, which is about 100 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 75 IA03 surface soil samples were analyzed for ^{238}U. All 30 alpha spectroscopy results and 74 of the 75 onsite gamma spectroscopy results for IA03 surface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A03SL-038-01 contained the greatest ^{238}U concentration, (58 ± 5) pCi/g, which is about 80 times the ^{238}U background concentration and about 4 times the ^{238}U screening level plus background concentration.

Summary

Table 4-85 shows eight samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Six samples had SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Seven samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 54 locations have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-84, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The GWS (Figure 3-9) identified a few small areas of elevated gamma count rates in the northeast corner of IA03 that the surface soil concentration results confirmed.

The current RI data set, as shown on Figure 4-1 through Figure 4-6, corroborates the presence of MED/AEC-related constituents in the same general locations as ORISE designation “Area 1” and northwest of “Area 2” (ORISE 1999, page 24 and Figure 36). Direct comparison of impacted areas and soil volumes is not possible given the lower screening values and additional COPCs considered in this RI;

however, it is reasonable to assume impacted surface area and soil volume will be greater using the current RI COPC list and screening levels as compared to the ORISE screening levels.

4.4.2 Subsurface Soils

Data Evaluation

Seventy-eight subsurface soil samples were analyzed for COPCs in IA03. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Table 3-19 lists the subsurface soil samples (other than -01 samples) analyzed by ICP-MS for uranium isotopes. Soil boring locations are shown on Figure 3-5.

Table 4-86 lists analytical results for radiological COPC concentrations in subsurface soil samples for IA03. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-87 lists the SOR for IA03 subsurface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Table 4-88 lists the results for the subsurface soil sample analyzed by ICP-MS.

Sixteen IA03 subsurface soil samples were analyzed for ^{226}Ra. Two of the 15 GFPC results and none of the four offsite gamma spectroscopy results for IA03 subsurface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A03SL-028-03 contained the greatest ^{226}Ra concentrations for IA03 subsurface soil samples, (1.7 ± 0.2) pCi/g, which is about 1.7 times the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Sixteen IA03 subsurface soil samples were analyzed for ^{228}Ra. One of the 15 GFPC results and one of the four offsite gamma spectroscopy results for IA03 subsurface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A03SL-028-03 and A03SL-233-07 contained the greatest ^{228}Ra concentration for IA03 subsurface soil samples, (2.1 ± 0.3) pCi/g, which is almost three times the ^{228}Ra background concentration and about 1.1 times the ^{228}Ra screening level plus background concentration.

Thirty IA03 subsurface soil samples were analyzed for ^{228}Th. Five of the 30 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A03SL-239-11 contained the greatest ^{228}Th concentration for IA03 subsurface soil samples, (3.5 ± 0.5) pCi/g, which is about 4 times the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Thirty IA03 subsurface soil samples were analyzed for ^{230}Th. Five of the 30 alpha spectroscopy results were greater than the ^{230}Th background concentration. All ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor only when the ^{234}U concentration was at or near the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A03SL-239-11 contained the greatest ^{230}Th concentration for IA03 subsurface soil samples, (3.0 ± 0.5) pCi/g, which is about 3.4 times the ^{230}Th background concentration and is about the same as the ^{230}Th screening level plus background concentration.

All 78 IA03 subsurface soil samples were analyzed for ^{232}Th. Four of the 30 alpha spectroscopy results, one of the four offsite gamma spectroscopy results, and 26 of the 78 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A03SL-239-11 contained the greatest ^{232}Th subsurface soil concentration, (3.7 ± 0.4) pCi/g, which is almost 6 times the ^{232}Th background concentration and about twice the ^{232}Th screening level plus background concentration.

Thirty IA03 subsurface soil samples were analyzed for ^{234}U. All 30 alpha spectroscopy results for IA03 subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A03SL-217-13 contained the greatest ^{234}U concentration, (119 ± 9) pCi/g, which is about 175 times the ^{234}U background concentration and about 8.6 times the ^{234}U screening level plus background concentration.

Thirty IA03 subsurface soil samples were analyzed for ^{235}U. Seventeen of the 30 alpha spectroscopy results and one of the four offsite gamma spectroscopy results for IA03 subsurface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A03SL-217-13 contained the greatest ^{235}U concentration, (4.4 ± 0.8) pCi/g, which is about 110 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 78 IA03 subsurface soil samples were analyzed for ^{238}U. All 30 alpha spectroscopy results and 65 of the 75 onsite gamma spectroscopy results for IA03 subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A03SL-217-13 contained the greatest ^{238}U concentration, (122 ± 9) pCi/g, which is about 175 times the ^{238}U background concentration and about 8.3 times the ^{238}U screening level plus background concentration.

Summary

Table 4-87 shows 16 samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Three samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Fourteen samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 45 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

The ICP-MS results for the analyzed subsurface soil sample show that the uranium in this sample may be a blend of natural and depleted uranium.

^{226}Ra and ^{228}Ra, shown in Table 4-86, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The current RI data set, as shown on Figure 4-1 through Figure 4-6, corroborates the presence of MED/AEC-related constituents in the same general locations as ORISE designation “Area 1” and northwest of “Area 2” (ORISE 1999, page 24 and Figure 36). Direct comparison of impacted areas and soil volumes is not possible given the lower screening values and additional COPCs considered in this RI; however, it is reasonable to assume impacted surface area and soil volume will be greater using the current RI COPC list and screening levels as compared to the ORISE screening levels.

4.4.3 Surface Water (Native)

Although five surface water samples were planned for IA03, surface water was not present within IA03 during the RI. As a result, no surface water samples for IA03 were collected.

4.4.4 Sediment (Native)

Data Evaluation

Six native sediment samples were collected in IA03. The sediment samples were analyzed at the offsite fixed laboratory for COPCs by gamma spectroscopy (all COPCs), alpha spectroscopy (uranium and thorium COPCs), and GFPC (radium COPCs). Table 3-57 lists the sample IDs and requested analyses. Table 3-58 presents a description of sample locations.

Table 4-89 lists analytical results for radiological COPC concentrations in sediment for IA03. Table 4-90 lists the SOR for IA03 sediment samples. Sample locations and corresponding analytical data are shown on Figure 4-49.

All six IA03 sediment samples were analyzed for ^{226}Ra. None of the three GFPC results and one of the six offsite gamma spectroscopy results for IA03 sediment samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample sample A03-SD-005 contained the greatest ^{226}Ra concentrations for IA03 sediment samples, (1.6 ± 0.3) pCi/g, which is about 1.7 times the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

All six IA03 sediment samples were analyzed for ^{228}Ra. None of the three GFPC results and none of the six offsite gamma spectroscopy results for IA03 sediment samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A03-SD-005 contained the greatest ^{228}Ra concentration for IA03 sediment samples, (1.3 ± 0.4) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

All six IA03 sediment samples were analyzed for ^{228}Th. None of the six alpha spectroscopy results was greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A03-SD-002 contained the greatest ^{228}Th concentration for IA03 sediment samples, (1.0 ± 0.3) pCi/g, which is about the same as the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

All six IA03 sediment samples were analyzed for ^{230}Th. None of the six alpha spectroscopy results was greater than the ^{230}Th background concentration. All ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A03-SD-005 contained the greatest ^{230}Th concentration for IA03 sediment samples, (1.3 ± 0.3) pCi/g, which is about the same as the ^{230}Th background concentration and is less than the ^{230}Th screening level plus background concentration.

All six IA03 sediment samples were analyzed for ^{232}Th. None of the six alpha spectroscopy results and none of the six offsite gamma spectroscopy results indicated that ^{232}Th was present in sediment samples at a concentration greater than the ^{232}Th background concentration. Sample A03-SD-005 contained the greatest ^{232}Th sediment concentration, (1.3 ± 0.4) pCi/g, which is the same as the ^{232}Th background concentration and less than the ^{232}Th screening level plus background concentration.

All six IA03 sediment samples were analyzed for ^{234}U. Five of the six alpha spectroscopy results for IA03 sediment samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A03-SD-001 contained

the greatest ^{234}U concentration, (2.8 ± 0.5) pCi/g, which is about 4 times the ^{234}U background concentration and less than the ^{234}U screening level plus background concentration.

All six IA03 sediment samples were analyzed for ^{235}U. None of the six alpha spectroscopy results and none of the six offsite gamma spectroscopy results for IA03 sediment samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A03-SD-001 contained the greatest ^{235}U concentration, (0.17 ± 0.09) pCi/g, which is about the same as the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All six IA03 sediment samples were analyzed for ^{238}U. All six alpha spectroscopy results for IA03 sediment samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A03-SD-006 contained the greatest ^{238}U concentration, (3.0 ± 0.5) pCi/g, which is about 5 times the ^{238}U background concentration and is less than the ^{238}U screening level plus background concentration.

Summary

Table 4-90 shows one sample with an SOR that, more likely than not, is less than 1 [that is, ($S < 1$ and ($S + 2\sigma$) > 1].

The remaining five sediment samples have SOR clearly less than 1 [that is, ($S + 2\sigma$) < 1)].

^{226}Ra and ^{228}Ra, shown in Table 4-89, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.4.5 Groundwater

Five overburden groundwater monitoring wells exist within IA03; refer to Figure 3-13 for monitoring well locations. However, overburden groundwater samples were not collected during this RI because four of the five overburden wells were determined to be in poor condition (i.e., sample quality would not meet project DQOs), and the fifth well (MW-13S) was found to be dry during each round of sampling.

Two new shallow bedrock monitoring wells (MW-606DR and MW-607D) were installed within IA03 during this RI; refer to Section 3.8 for discussion of installation, development, and slug testing.

Groundwater samples for radiological parameters were collected from six shallow bedrock monitoring wells (MW-13D, MW-14, MW-15, MW-16, MW-17, and MW-607D) located within IA03 during July-August 2007 and from seven shallow bedrock monitoring wells (MW-13D, MW-14, MW-15, MW-16, MW-17, MW-606DR, and MW-607D) during November 2007. A filtered sample and an unfiltered sample were collected at each location during each round. Groundwater samples were analyzed for radiological COPCs by alpha spectroscopy (uranium and thorium), GFPC (radium), gross alpha and gross beta; the unfiltered sample was also analyzed for TSS.

Data Evaluation

Groundwater analytical results for the July-August 2007 and November 2007 rounds of sampling are presented on Figures 4-47 and 4-48, respectively. Table 4-91 lists weighted average analytical results for groundwater samples collected in IA03. Table 4-92 shows the radium and uranium concentrations in Table 4-91 converted to concentrations suitable for comparison with USEPA drinking water MCLs.

Monitoring well MW-13D, located down-gradient of the landfill center and close to the elevated ^{238}U concentrations discovered in the surface and subsurface soils in the western portion of IA04A, displays the greatest concentration of ^{238}U. MW-16 and MW-606D-R, located on the northwest toe and southeast

toe of the landfill, respectively, also show elevated uranium activity. The presence of elevated uranium in these three wells is likely explained by location within, or immediately downgradient of, suspected source terms in overburden soil.

Summary

The radium and thorium concentrations in all the samples appear to be at background levels. However, one of the seven shallow bedrock well locations sampled within IA03 (MW-13D) shows uranium concentrations that exceeds the USEPA drinking water MCL for total uranium (^{234}U, ^{235}U, and ^{238}U).

4.5 IA04A

4.5.1 Surface Soils

Data Evaluation

One hundred seventeen surface soil samples were collected in IA04A. Table 3-42 lists the surface soil samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Table 3-19 lists the surface soil samples (the -01 samples) analyzed by ICP-MS for uranium isotopes. Surface soil sample locations are shown on Figure 3-10.

Table 4-93 lists analytical results for radiological COPC concentrations in surface soil samples for IA04A. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-94 lists the SOR for IA04A surface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Table 4-95 lists the surface soil results for the surface soil sample analyzed by ICP-MS.

Seventeen IA04A surface soil samples were analyzed for ^{226}Ra. None of the 16 GFPC results and none of the five offsite gamma spectroscopy results for IA04A surface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A04ASL-031-01 and sample A04ASL-056-01 contained the greatest ^{226}Ra concentrations for IA04A surface soil samples, (1.2 ± 0.2) pCi/g for each, which is about the same as the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

Seventeen IA04A surface soil samples were analyzed for ^{228}Ra. Two of the 16 GFPC results and one of the six offsite gamma spectroscopy results for IA04A surface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A04ASL-056-01 contained the greatest ^{228}Ra concentration for IA04A surface soil samples, (2.0 ± 0.4) pCi/g, which is about 2.8 times the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Twenty-nine IA04A surface soil samples were analyzed for ^{228}Th. Three of the 29 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A04ASL-056-01 contained the greatest ^{228}Th concentration for IA04A surface soil samples, (2.0 ± 0.4) pCi/g, which is about 2.4 times the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Twenty-nine IA04A surface soil samples were analyzed for ^{230}Th. Three of the 29 alpha spectroscopy results were greater than the ^{230}Th background concentration. All ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A04ASL-020-01 contained the greatest ^{230}Th concentration for IA04A surface soil samples, (8.7 ± 1.0) pCi/g, which is about 10 times the ^{230}Th background concentration and about 3 times the ^{230}Th screening level plus background concentration.

All 117 IA04A surface soil samples were analyzed for ^{232}Th. Two of the 29 alpha spectroscopy results, one of the six offsite gamma spectroscopy results, and 29 of the 117 onsite gamma spectroscopy results indicated that ^{232}Th was present in surface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A04ASL-056-01 contained the greatest ^{232}Th surface soil concentration, (1.9 ± 0.2) pCi/g, which is about three times the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Twenty-nine IA04A surface soil samples were analyzed for ^{234}U. All 29 alpha spectroscopy results for IA04A surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A04ASL-051-01 contained the greatest ^{234}U concentration, (149 ± 12) pCi/g, which is more than 200 times the ^{234}U background concentration and about 11 times the ^{234}U screening level plus background concentration.

Twenty-nine IA04A surface soil samples were analyzed for ^{235}U. 22 of the 29 alpha spectroscopy results and one of the six offsite gamma spectroscopy results for IA04A surface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A04ASL-051-01 contained the greatest ^{235}U concentration, (8.00 ± 0.14) pCi/g, which is more than 200 times the ^{235}U background concentration and is about the same as the ^{235}U screening level plus background concentration.

All 117 IA04A surface soil samples were analyzed for ^{238}U. All 29 alpha spectroscopy results and 34 of the 117 onsite gamma spectroscopy results for IA04A surface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A04ASL-051-01 contained the greatest ^{238}U concentration, (152 ± 12) pCi/g, which is more than 200 times the ^{238}U background concentration and is about 10 times the ^{238}U screening level plus background concentration.

Summary

Table 4-94 shows 16 samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Five samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Eleven samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 85 locations have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

The ICP-MS results for the analyzed sample imply that the sample may contain a blend of natural and depleted uranium.

^{226}Ra and ^{228}Ra, shown in Table 4-93, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The GWS (Figure 3-9) identified several areas of elevated gamma count rates in IA04A that the surface soil concentration results confirmed.

The current RI data set, as shown on Figure 4-1 through Figure 4-6, corroborates the presence of MED/AEC-related constituents in the same general locations as ORISE designation “Area 1” through “Area 11” (ORISE 1999, pp 24-25 and Figure 36). Direct comparison of impacted areas and soil volumes is not possible given the lower screening values and additional COPCs considered in this RI; however, it is reasonable to assume impacted surface area and soil volume will be greater using the current RI COPC list and screening levels as compared to the ORISE screening levels.

4.5.2 Subsurface Soils

Data Evaluation

One hundred seventy subsurface soil samples were analyzed for COPCs in IA04A. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Table 3-19 lists the subsurface soil samples (other than -01 samples) analyzed by ICP-MS for uranium isotopes. Soil boring locations are shown on Figure 3-5.

Table 4-96 lists analytical results for radiological COPC concentrations in subsurface soil samples for IA04A. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-97 lists the SOR for IA04A subsurface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Table 4-98 lists the results for the subsurface samples analyzed by ICP-MS.

Twenty-one IA04A subsurface soil samples were analyzed for ^{226}Ra. One of the 16 GFPC results and one of the eight offsite gamma spectroscopy results for IA04A subsurface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor, except for sample A04ASL-003-03, for which the ^{226}Ra and ^{230}Th concentrations were greater than their respective background concentrations but were not consistent with each other. Sample A04ASL-303-03 contained the greatest ^{226}Ra concentrations for IA04A subsurface soil samples, (1.9 ± 0.3) pCi/g, which is twice the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Twenty-one IA04A subsurface soil samples were analyzed for ^{228}Ra. Four of the 16 GFPC results and one of the eight offsite gamma spectroscopy results for IA04A subsurface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor, except for sample A04ASL-003-03, for which the ^{228}Ra and ^{232}Th concentrations were greater than their respective background concentrations but were not consistent with each other. Sample A04ASL-236-09 contained the greatest ^{228}Ra concentration for IA04A subsurface soil samples, (2.1 ± 0.4) pCi/g, which is about 3 times the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Thirty-one IA04A subsurface soil samples were analyzed for ^{228}Th. Six of the 31 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A04ASL-314-03 contained the greatest ^{228}Th concentration for IA04A subsurface soil samples, (3.6 ± 0.6) pCi/g, which is about 4 times the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Thirty-one IA04A subsurface soil samples were analyzed for ^{230}Th. Twelve of the 31 alpha spectroscopy results were greater than the ^{230}Th background concentration. All ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations much greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A04ASL-003-03 contained the greatest ^{230}Th concentration for IA04A subsurface soil samples, (5.3 ± 0.4) pCi/g, which is about 6 times the ^{230}Th background concentration and about 3 times the ^{230}Th screening level plus background concentration.

All 170 IA04A subsurface soil samples were analyzed for ^{232}Th. Four of the 31 alpha spectroscopy results, one of the eight offsite gamma spectroscopy results, and 57 of the 170 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A04ASL-314-03 contained the greatest ^{232}Th subsurface soil concentration, (3.6 ± 0.5) pCi/g, which is about 4.5 times the ^{232}Th background concentration and about 1.9 times the ^{232}Th screening level plus background concentration.

Thirty-one IA04A subsurface soil samples were analyzed for ^{234}U. All 31 alpha spectroscopy results for IA04A subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A04ASL-278-10 contained the greatest ^{234}U concentration, (339 ± 25) pCi/g, which is about 500 times the ^{234}U background concentration and about 25 times the ^{234}U screening level plus background concentration.

Thirty-one IA04A subsurface soil samples were analyzed for ^{235}U. Twenty-three of the 31 alpha spectroscopy results and two of the eight offsite gamma spectroscopy results for IA04A subsurface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A04ASL-278-10 contained the greatest ^{235}U concentration, (18 ± 4) pCi/g, which is more than 400 times the ^{235}U background concentration and is more than twice the ^{235}U screening level plus background concentration.

All 170 IA04A subsurface soil samples were analyzed for ^{238}U. All 31 alpha spectroscopy results and 124 of the 170 onsite gamma spectroscopy results for IA04A subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A04ASL-278-10 contained the greatest ^{238}U concentration, (347 ± 26) pCi/g, which is about 500 times the ^{238}U background concentration and is about 24 times the ^{238}U screening level plus background concentration.

Summary

Table 4-97 shows 50 samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Sixteen samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Sixteen samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 88 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

The ICP-MS results for both subsurface soil samples show that the uranium in these samples may be a blend of natural and depleted uranium.

^{226}Ra and ^{228}Ra, shown in Table 4-96, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The current RI data set, as shown on Figure 4-1 through Figure 4-6, corroborates the presence of MED/AEC-related constituents in the same general locations as ORISE designation “Area 1” through “Area 11” (ORISE 1999, pp 24-25 and Figure 36). Direct comparison of impacted areas and soil volumes is not possible given the lower screening values and additional COPCs considered in this RI; however, it is reasonable to assume impacted surface area and soil volume will be greater using the current RI COPC list and screening levels as compared to the ORISE screening levels.

4.5.3 Surface Water (Native)

Based on historical information, the occurrence of native surface water in IA04A was not anticipated and therefore no native surface water samples were planned for IA04A. Native surface water was not observed within IA04A during the RI, and no surface water samples were collected.

4.5.4 Sediment (Site Utilities)

Data Evaluation

Based on historical information, the occurrence of native sediment in IA04A was not anticipated and therefore no native sediment samples were planned for IA04A. Native sediment was not observed within IA04A during the RI, and no native sediment samples were collected.

Table 4-99 lists radiological COPC concentrations in five non-native sediment samples collected in IA04A. The samples were collected from site utility features, such as catch basins, manholes, etc. Table 3-58 describes the locations where these samples were taken. Figure 4-29 shows where the samples were taken.

All five IA04A non-native sediment samples were analyzed for ^{226}Ra. None of the five GFPC results and none of the five offsite gamma spectroscopy results for IA04A non-native sediment samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-A01-SD-013 contained the greatest ^{226}Ra concentration for IA04A non-native sediment samples, (0.9 ± 0.2) pCi/g, which is about the same as the ^{226}Ra background concentration and is less than the ^{226}Ra screening level plus background concentration.

All five IA04A non-native sediment samples were analyzed for ^{228}Ra. None of the five GFPC results and none of the five offsite gamma spectroscopy results for IA04A non-native sediment samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-A01-SD-010 contained the greatest ^{228}Ra concentration for IA04A non-native sediment samples, (0.7 ± 0.4) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

All five IA04A non-native sediment samples were analyzed for ^{228}Th. None of the five alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-A01-SD-013 contained the greatest ^{228}Th concentration for IA04A non-native sediment samples, (0.9 ± 0.2) pCi/g, which is about the same as the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

All five IA04A non-native sediment samples were analyzed for ^{230}Th. None of the five alpha spectroscopy results were greater than the ^{230}Th background concentration. All of the ^{230}Th alpha spectroscopy results indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U

and ^{238}U concentrations). Sample A08-A01-SD-013 contained the greatest ^{230}Th concentration for IA04A non-native sediment samples, (1.0 ± 0.2) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All five IA04A non-native sediment samples were analyzed for ^{232}Th. None of the five alpha spectroscopy results and none of the five offsite gamma spectroscopy results indicated that ^{232}Th was present in non-native sediment samples at a concentration greater than the ^{232}Th background concentration. Sample A08-A01-SD-013 contained the greatest ^{232}Th non-native sediment concentration, (0.9 ± 0.2) pCi/g, which is about the same as the ^{232}Th background concentration and is less than the ^{232}Th screening level plus background concentration.

All five IA04A non-native sediment samples were analyzed for ^{234}U. All five alpha spectroscopy results for IA04A non-native sediment samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A08-A01-SD-011 contained the greatest ^{234}U concentration, (36 ± 5) pCi/g, which is about 50 times the ^{234}U background concentration and about 2.6 times the ^{234}U screening level plus background concentration.

All five IA04A non-native sediment samples were analyzed for ^{235}U. Two of the five alpha spectroscopy results and one of the two offsite gamma spectroscopy results for IA04A non-native sediment samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A08-A01-SD-011 contained the greatest ^{235}U concentration, (2.6 ± 0.6) pCi/g, which is more than 60 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All five IA04A non-native sediment samples were analyzed for ^{238}U. All five alpha spectroscopy results for IA04A non-native sediment samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A08-A01-SD-011 contained the greatest ^{238}U concentration, (41 ± 5) pCi/g, which is about 60 times the ^{238}U background concentration and about 2.7 times the ^{238}U screening level plus background concentration.

Summary

Table 4-100 shows one sample with an SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

The remaining four locations have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-99, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.5.5 Groundwater

No overburden groundwater monitoring wells exist within IA04A.

Three new shallow bedrock monitoring wells (MW-601D, MW-602D, and MW-603D) were installed within IA04A during this RI; refer to Section 3.8 for discussion of installation, development, and slug testing.

Groundwater samples for radiological parameters were collected from seven shallow bedrock monitoring wells (MW-20, MW-21, MW-22, MW-23, MW-601D, MW-602D, and MW-603D) located within IA04A; refer to Figure 3-13 for monitoring well locations. Groundwater samples were collected during July-August 2007 and November 2007. A filtered sample and an unfiltered sample were collected at each location during each round. Groundwater samples were analyzed for radiological COPCs by alpha spectroscopy (uranium and thorium), GFPC (radium), gross alpha and gross beta; the unfiltered sample was also analyzed for TSS.

Data Evaluation

Groundwater analytical results for the July-August 2007 and November 2007 rounds of sampling are presented on Figures 4-47 and 4-48, respectively. Table 4-101 lists weighted average analytical results for groundwater samples collected in IA04A. Table 4-102 shows the radium and uranium concentrations in Table 4-101 converted to concentrations suitable for comparison with USEPA drinking water MCLs.

Each of the seven wells sampled within IA04A exhibited at least some level of elevated uranium activity. Monitoring well MW602D, located close to elevated ^{238}U concentrations observed in surface and subsurface soils in the central portion of IA04A, displays the greatest concentration of ^{238}U. MW-21, located at the northwestern corner of IA04A, and MW-603D, located at the southeastern corner of IA04A, exhibited the least elevated uranium levels. Elevated uranium activity in the remaining four wells is likely explained by location in the area of, or immediately downgradient of, elevated uranium activity in overburden soil.

Summary

The radium and thorium concentrations in all the samples appear to be at background levels. Location MW-602D shows uranium concentrations that clearly exceed the USEPA drinking water MCL for total uranium (^{234}U, ^{235}U, and ^{238}U). Concentrations at all other well locations do not exceed this MCL but show uranium concentrations above background levels.

4.6 IA04B

4.6.1 Surface Soils

Data Evaluation

Thirty-nine surface soil samples were collected in IA04B. Table 3-42 lists the surface soil samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Surface soil sample locations are shown on Figure 3-10.

Table 4-103 lists analytical results for radiological COPC concentrations in surface soil samples for IA04B. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-104 lists the SOR for IA04B surface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Thirteen IA04B surface soil samples were analyzed for ^{226}Ra. One of the 13 GFPC results and the only offsite gamma spectroscopy result (but for a different sample) for IA04B surface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A04BSL-042-01 contained the greatest ^{226}Ra concentration for IA04B surface soil samples, (1.5 ± 0.3) pCi/g, which is about 1.5 times the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

Thirteen IA04B surface soil samples were analyzed for ^{228}Ra. None of the 13 GFPC or one offsite gamma spectroscopy results for IA04B surface soil samples was greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A04BSL-043-01 contained the greatest ^{228}Ra concentration for IA04B surface soil samples, (1.2 ± 0.4) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Twenty-four IA04B surface soil samples were analyzed for ^{228}Th. None of the 24 alpha spectroscopy results was greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A04BSL-039-01 contained the greatest ^{228}Th concentration for IA04B surface soil samples, (1.0 ± 0.2) pCi/g, which is the same as the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Twenty-four IA04B surface soil samples were analyzed for ^{230}Th. None of the 24 alpha spectroscopy results was greater than the ^{230}Th background concentration. All of the ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A04BSL-039-01 and sample A04BSL-042-01 contained the greatest ^{230}Th concentrations for IA04B surface soil samples, (1.3 ± 0.3) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All 39 IA04B surface soil samples were analyzed for ^{232}Th. None of the 24 alpha spectroscopy or one offsite gamma spectroscopy results and two of the 39 onsite gamma spectroscopy results indicated that ^{232}Th was present in surface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A04BSL-042-01 contained the greatest ^{232}Th surface soil concentration, (1.9 ± 0.3) pCi/g, which is about 3 times the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Twenty-four IA04B surface soil samples were analyzed for ^{234}U. Nine of the 24 alpha spectroscopy results for IA04B surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A04BSL-043-01 contained the greatest ^{234}U concentration, (6.2 ± 0.7) pCi/g, which is almost 8 times the ^{234}U background concentration and less than the ^{234}U screening level plus background concentration.

Twenty-four IA04B surface soil samples were analyzed for ^{235}U. None of the 24 alpha spectroscopy or one offsite gamma spectroscopy results for IA04B surface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A04BSL-043-01 contained the greatest ^{235}U concentration, (0.32 ± 0.13) pCi/g, which is about the same as the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 39 IA04B surface soil samples were analyzed for ^{238}U. Eight of the 24 alpha spectroscopy results and ten of the 39 onsite gamma spectroscopy results for IA04B surface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A04BSL-043-01 contained the greatest ^{238}U concentration, (11.9 ± 1.6) pCi/g, which is about 14.5 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

Table 4-104 shows one sample with an SOR that, more likely than not, is greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

The remaining 38 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-103, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The GWS (Figure 3-9) did not identify any areas of elevated gamma count rates in IA04B, which is essentially consistent with the surface soil concentration results.

The current RI data set, as shown on Figure 4-1 through Figure 4-6, corroborates the Class 3 designation for IA04B. ORISE (1999) Figure 35 depicted a single sample location north of Building 37 exceeding the ORISE screening criteria; however, this sample is in the IA04A footprint.

4.6.2 Subsurface Soils

Data Evaluation

Seventy-four subsurface soil samples were analyzed for COPCs in IA04B. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-5.

Table 4-105 lists analytical results for radiological COPC concentrations in subsurface soil samples for IA04B. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-106 lists the SOR for IA04B subsurface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Eighteen IA04B subsurface soil samples were analyzed for ^{226}Ra. None of the 17 GFPC results and none of the five offsite gamma spectroscopy results for IA04B subsurface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A04BSL-018-06 and sample A04BSL-032-07 contained the greatest ^{226}Ra concentrations for IA04B subsurface soil samples, (1.4 ± 0.3) pCi/g and (1.4 ± 0.2) pCi/g, respectively, which is about the same as the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

Eighteen IA04B subsurface soil samples were analyzed for ^{228}Ra. None of the 17 GFPC and none of the offsite gamma spectroscopy results for IA04B subsurface soil samples was greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A04BSL-042-02 and sample A04BSL-304-03 contained the greatest ^{228}Ra concentrations for IA04B subsurface soil samples, (1.1 ± 0.4) pCi/g and (1.11 ± 0.19) pCi/g, respectively, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Thirty-six IA04B subsurface soil samples were analyzed for ^{228}Th. None of the 36 alpha spectroscopy results was greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A04BSL-040-03 contained the greatest ^{228}Th concentration for IA04B subsurface soil samples, (1.7 ± 0.3) pCi/g, which is about twice the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Thirty-six IA04B subsurface soil samples were analyzed for ^{230}Th. Nine of the 36 alpha spectroscopy results were greater than the ^{230}Th background concentration. All of the ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A04BSL-015-06 contained the greatest ^{230}Th concentration for IA04B subsurface soil samples, (1.9 ± 0.4) pCi/g, which is about twice the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All 74 IA04B subsurface soil samples were analyzed for ^{232}Th. Four of the 36 alpha spectroscopy results, none of the five offsite gamma spectroscopy results, and 23 of the 74 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Samples A04BSL-040-03 and A04BSL-310-06 contained the greatest ^{232}Th subsurface soil concentration, (1.7 ± 0.3) pCi/g, which is about twice the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Thirty-six IA04B subsurface soil samples were analyzed for ^{234}U. Fifteen of the 36 alpha spectroscopy results for IA04B subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A04BSL-041-03 contained the greatest ^{234}U concentration, (14.8 ± 1.5) pCi/g, which is about 13 times the ^{234}U background concentration and less than the ^{234}U screening level plus background concentration.

Thirty-seven IA04B subsurface soil samples were analyzed for ^{235}U. Three of the 36 alpha spectroscopy and none of the offsite gamma spectroscopy results for IA04B subsurface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A04BSL-041-05 contained the greatest ^{235}U concentration, (0.8 ± 0.2) pCi/g, which is more than 20 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 74 IA04B subsurface soil samples were analyzed for ^{238}U. Eighteen of the 36 alpha spectroscopy results and 29 of the 74 onsite gamma spectroscopy results for IA04B subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A04BSL-041-05 contained the greatest ^{238}U concentration, (14.5 ± 1.4) pCi/g, which is about 20 times the ^{238}U background concentration and about the same as the ^{238}U screening level plus background concentration.

Summary

Table 4-106 shows three samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

One sample has an SOR that, more likely than not, is greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Two samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 68 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-105, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

ORISE (1999) did not collect subsurface soil data in IA04B.

4.6.3 Surface Water (Native)

Based on historical information, the occurrence of native surface water in IA04B was not anticipated and therefore no native surface water samples were planned for IA04B. Native surface water was not observed within IA04B during the RI, and no native surface water samples were collected.

4.6.4 Sediment (Native)

Based on historical information, the occurrence of native sediment in IA04B was not anticipated and therefore no native sediment samples were planned for IA04B. Native sediment was not observed within IA04B during the RI, and no native sediment samples were collected.

4.6.5 Groundwater

No overburden groundwater monitoring wells exist within IA04B.

One new shallow bedrock monitoring well (MW-605D) was installed within IA04B during this RI; refer to Section 3.8 for discussion of installation, development, and slug testing.

Groundwater samples for radiological parameters were collected from four shallow bedrock monitoring wells (MW-18, MW-19, MW-26, and MW-605D) located within IA04B; refer to Figure 3-13 for monitoring well locations. Groundwater samples were collected during July-August 2007 and November 2007. A filtered sample and an unfiltered sample were collected at each location during each round. Groundwater samples were analyzed for radiological COPCs by alpha spectroscopy (uranium and thorium), GFPC (radium), gross alpha and gross beta; the unfiltered sample was also analyzed for TSS.

Data Evaluation

Groundwater analytical results for the July-August 2007 and November 2007 rounds of sampling are presented on Figures 4-47 and 4-48, respectively. Table 4-107 lists weighted average analytical results for groundwater samples collected in IA04B. Table 4-108 shows the radium and uranium concentrations in Table 4-107 converted to concentrations suitable for comparison with USEPA drinking water MCLs.

Monitoring wells MW-26 and MW-605D exhibited similar elevated ^{238}U concentrations (approximately 200 µg/L). Neither well is located close to elevated ^{238}U soil concentrations; however, both are downgradient of elevated ^{238}U concentrations in IA03 and the western portion of IA04A. Monitoring well MW-18, which also exhibited elevated ^{238}U concentrations, is located close to elevated ^{238}U concentrations in IA03 and the southwestern portion of IA04A and is directly downgradient of IA03.

MW-19 exhibited the least amount of uranium activity in IA04B wells. MW-19 is located in the southwest corner of IA04B, distant from potential source terms in overburden soil and located along the approximate shallow bedrock groundwater divide between groundwater influenced by pumping in the bedrock quarry east of the Guterl Site and the Erie Canal.

Summary

The radium and thorium concentrations in all the samples appear to be at background levels. However, 6 of the 8 samples show uranium concentrations that clearly exceed the USEPA drinking water MCL for uranium.

The occurrence of elevated uranium levels in the IA04B shallow bedrock groundwater samples is postulated to be related to downgradient migration of groundwater affected by source term areas identified in IA03 and western IA04A.

4.7 IA04C

4.7.1 Surface Soils

Data Evaluation

Twenty-seven surface soil samples were collected in IA04C. Table 3-42 lists the surface soil samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Surface soil sample locations are shown on Figure 3-10.

Table 4-109 lists analytical results for radiological COPC concentrations in surface soil samples for IA04C. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-110 lists the SOR for IA04C surface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Seven IA04C surface soil samples were analyzed for ^{226}Ra. None of the six GFPC results and the single offsite gamma spectroscopy result for IA04C surface soil samples was greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A04CSL-001-01 and sample A04CSL-002-01 contained the greatest ^{226}Ra concentrations for IA04C surface soil samples, (1.16 ± 0.18) pCi/g and (1.2 ± 0.3) pCi/g, respectively, which is about the same as the ^{226}Ra background concentration and less than the ^{226}Ra screening level plus background concentration.

Seven IA04C surface soil samples were analyzed for ^{228}Ra. None of the six GFPC and the single offsite gamma spectroscopy result for IA04C surface soil samples was greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A04CSL-001-01 contained the greatest ^{228}Ra concentration for IA04C surface soil samples, (1.1 ± 0.3) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Twenty IA04C surface soil samples were analyzed for ^{228}Th. One of the 20 alpha spectroscopy results was greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A04CSL-309-01 contained the greatest ^{228}Th concentration for IA04C surface soil samples, (1.7 ± 0.4) pCi/g, which is about twice the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Twenty IA04C surface soil samples were analyzed for ^{230}Th. Two of the 20 alpha spectroscopy results were greater than the ^{230}Th background concentration. All of the ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A04CSL-309-01 contained the greatest ^{230}Th concentration for IA04C surface soil samples, (2.0 ± 0.5) pCi/g, which is about twice the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All 27 IA04C surface soil samples were analyzed for ^{232}Th. One of the 20 alpha spectroscopy results and 11 of the 27 onsite gamma spectroscopy results indicated that ^{232}Th was present in surface soil samples at a concentration greater than the ^{232}Th background concentration; the single offsite gamma spectroscopy result was at background levels. Sample A04CSL-309-01 contained the greatest ^{232}Th surface soil concentrations (1.6 ± 0.4) pCi/g, which is about twice the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Twenty IA04C surface soil samples were analyzed for ^{234}U. Eight of the 20 alpha spectroscopy results for IA04C surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A04CSL-301-01 contained the greatest ^{234}U concentration, (5.3 ± 0.7) pCi/g, which is about 8 times the ^{234}U background concentration and less than the ^{234}U screening level plus background concentration.

Twenty-one IA04C surface soil samples were analyzed for ^{235}U. One of the 20 alpha spectroscopy results for IA04C surface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration; the single offsite gamma spectroscopy result did not differentiate the

^{235}U concentration statistically from background levels. Sample A04CSL-301-01 contained the greatest ^{235}U concentration, (0.28 ± 0.13) pCi/g, which is more than 7 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 27 IA04C surface soil samples were analyzed for ^{238}U. Ten of the 20 alpha spectroscopy results and 18 of the 27 onsite gamma spectroscopy results for IA04C surface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A04CSL-301-01 contained the greatest ^{238}U concentration, (5.8 ± 1.2) pCi/g, which is about 7 times the ^{238}U background concentration and about the same as the ^{238}U screening level plus background concentration.

Summary

Table 4-110 shows one sample with an SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Two samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 24 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-109, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The GWS (Figure 3-9) did not identify any areas of elevated gamma count rates in the limited area covered in IA04C, although surface soil concentration results identified seven of 20 samples with slightly elevated concentrations (approximately screening level or closely above) of COPCs.

4.7.2 Subsurface Soils

Data Evaluation

Twenty-one subsurface soil samples were analyzed for COPCs in IA04C. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-5.

Table 4-111 lists analytical results for radiological COPC concentrations in subsurface soil samples for IA04C. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-112 lists the SOR for IA04C subsurface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Six IA04C subsurface soil samples were analyzed for ^{226}Ra. Three of the six GFPC results for IA04C subsurface soil samples were greater than the ^{226}Ra background concentration; the single offsite gamma spectroscopy result was at background levels. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A04CSL-004-02, sample A04CSL-006-02, and sample A04CSL-006-03 contained the greatest ^{226}Ra concentrations for IA04C subsurface soil samples, (1.7 ± 0.3) pCi/g each, which is about 1.7 times the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Six IA04C subsurface soil samples were analyzed for ^{228}Ra. One of the six GFPC results for IA04C subsurface soil samples was greater than the ^{228}Ra background concentration; the single offsite gamma spectroscopy result was at background level. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A04CSL-006-

03 contained the greatest ^{228}Ra concentration for IA04C subsurface soil samples, (1.4 ± 0.4) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Thirteen IA04C subsurface soil samples were analyzed for ^{228}Th. Two of the 13 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A04CSL-013-02 and Sample A04CSL-302-05 contained the greatest ^{228}Th concentration for IA04C subsurface soil samples, (1.6 ± 0.3) pCi/g and (1.6 ± 0.2) pCi/g, respectively, which is about twice the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Thirteen IA04C subsurface soil samples were analyzed for ^{230}Th. Four of the 13 alpha spectroscopy results were greater than the ^{230}Th background concentration. All of the ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A04CSL-302-05 contained the greatest ^{230}Th concentration for IA04C subsurface soil samples, (1.6 ± 0.3) pCi/g, which is about twice the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All 21 IA04C subsurface soil samples were analyzed for ^{232}Th. One of the 13 alpha spectroscopy results, the single offsite gamma spectroscopy result, and eight of the 21 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A04CSL-302-05 contained the greatest ^{232}Th subsurface soil concentrations, (1.6 ± 0.2) pCi/g, which is about twice the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Thirteen IA04C subsurface soil samples were analyzed for ^{234}U. Six of the 13 alpha spectroscopy results for IA04C subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A04CSL-013-02 contained the greatest ^{234}U concentration, (3.4 ± 0.6) pCi/g, which is about 5 times the ^{234}U background concentration and less than the ^{234}U screening level plus background concentration.

Thirteen IA04C subsurface soil samples were analyzed for ^{235}U. None of the 13 alpha spectroscopy results for IA04C subsurface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration; the single offsite gamma spectroscopy also did not differentiate the ^{235}U concentration statistically from background levels. Sample A04CSL-013-02 contained the greatest ^{235}U concentration, (0.20 ± 0.20) pCi/g, which is not distinguishable statistically from the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 21 IA04C subsurface soil samples were analyzed for ^{238}U. Six of the 13 alpha spectroscopy results and 15 of the 21 onsite gamma spectroscopy results for IA04C subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A04CSL-310-02 contained the greatest ^{238}U concentration, (4.7 ± 1.3) pCi/g, which is almost 6 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

Table 4-112 shows one sample with an SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

One sample has an SOR that, more likely than not, is less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 19 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-111, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.7.3 Surface Water (Native)

Based on historical information, the occurrence of native surface water in IA04C was not anticipated and therefore no native surface water samples were planned for IA04C. However, native surface water was observed within IA04C during the RI in the form of small, local areas of ephemeral standing water. No surface water samples were collected because the source of the surface water was atmospheric and it is not likely that the surface water will flow offsite given the dense vegetation and local topography.

4.7.4 Sediment (Site Utilities)

Data Evaluation

Based on historical information, the occurrence of native sediment in IA04C was not anticipated and therefore no native sediment samples were planned for IA04C. However, native surface water was observed within IA04C during the RI in the form of small, local areas of ephemeral standing water. No sediment samples were collected because of the ephemeral nature of the surface water; i.e., the seasonally submerged soil will be addressed under the surface soil matrix.

Table 4-113 lists radiological COPC concentrations in two non-native sediment samples collected in IA04C. The samples were collected from sewer manholes. Table 3-58 describes the locations where these samples were taken. Figure 4-29 shows where the samples were taken.

Table 4-114 lists the SOR for IA04C non-native sediment samples. SOR are presented in graphical format in Figure 4-1 through Figure 4-6.

Both IA04C non-native sediment samples were analyzed for ^{226}Ra. None of the two GFPC and two offsite gamma spectroscopy results for IA04C non-native sediment samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-A01-SD-004 contained the greatest ^{226}Ra concentration for IA04C non-native sediment samples, (0.8 ± 0.2) pCi/g, which is about the same as the ^{226}Ra background concentration and is less than the ^{226}Ra screening level plus background concentration.

Both IA04C non-native sediment samples were analyzed for ^{228}Ra. None of the two GFPC and two offsite gamma spectroscopy results for IA04C non-native sediment samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-A01-SD-004 contained the greatest ^{228}Ra concentration for IA04C non-native sediment samples, (1.0 ± 0.6) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Both IA04C non-native sediment samples were analyzed for ^{228}Th. Neither alpha spectroscopy result was greater than the ^{228}Th background concentration. Both samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-A01-SD-004 contained the greater ^{228}Th concentration for IA04C non-native sediment samples, (0.6 ± 0.3) pCi/g, which is about the same as the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Both IA04C non-native sediment samples were analyzed for ^{230}Th. Neither alpha spectroscopy result was greater than the ^{230}Th background concentration. Both ^{230}Th alpha spectroscopy results indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A08-A01-SD-012 contained the greater ^{230}Th concentration for IA04C non-native sediment samples, (0.9 ± 0.2) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

Both IA04C non-native sediment samples were analyzed for ^{232}Th. Neither of the alpha spectroscopy results and neither of the offsite gamma spectroscopy results indicated that ^{232}Th was present in non-native sediment samples at a concentration greater than the ^{232}Th background concentration. Sample A08-A01-SD-004 contained the greatest ^{232}Th non-native sediment concentration, (0.5 ± 0.3) pCi/g, which is about the same as the ^{232}Th background concentration and is less than the ^{232}Th screening level plus background concentration.

Both IA04C non-native sediment samples were analyzed for ^{234}U. Both alpha spectroscopy results for IA04C non-native sediment samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and both were in secular equilibrium with the ^{238}U precursor. Sample A08-A01-SD-004 contained the greater ^{234}U concentration, (10.3 ± 1.7) pCi/g, which is about 15 times the ^{234}U background concentration and is less than the ^{234}U screening level plus background concentration.

Both IA04C non-native sediment samples were analyzed for ^{235}U. Both alpha spectroscopy results but neither of the offsite gamma spectroscopy results for IA04C non-native sediment samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A08-A01-SD-004 contained the greatest ^{235}U concentration, (0.7 ± 0.3) pCi/g, which is much greater than the ^{235}U background concentration but is less than the ^{235}U screening level plus background concentration.

Both IA04C non-native sediment samples were analyzed for ^{238}U. Both alpha spectroscopy results for IA04C non-native sediment samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A08-A01-SD-004 contained the greater ^{238}U concentration, (10.7 ± 1.8) pCi/g, which is about 16 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

Table 4-114 shows one sample with an SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

The remaining sample has an SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-113, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.7.5 Groundwater

No groundwater wells exist within IA04C; therefore, no groundwater samples were collected for IA04C.

4.8 IA04D

4.8.1 Surface Soils

Data Evaluation

Sixty-one surface soil samples were collected in IA04D. Table 3-42 lists the surface soil samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Surface soil sample locations are shown on Figure 3-10.

Table 4-115 lists analytical results for radiological COPC concentrations in surface soil samples for IA04D. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-116 lists the SOR for IA04D surface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Ten IA04D surface soil samples were analyzed for ^{226}Ra. One of the six GFPC results and two of the six offsite gamma spectroscopy results for IA04D surface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A04DSL-023-01 and Sample A04DSL-026-01 contained the greatest ^{226}Ra concentrations for IA04D surface soil samples, (1.6 ± 0.3) pCi/g, which is about twice the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Ten IA04D surface soil samples were analyzed for ^{228}Ra. None of the six GFPC results and three of the six offsite gamma spectroscopy results for IA04D surface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A04DSL-326-01 contained the greatest ^{228}Ra concentration for IA04D surface soil samples, (3.6 ± 0.4) pCi/g, which is about 4.5 times the ^{228}Ra background concentration and almost twice the ^{228}Ra screening level plus background concentration.

Twelve IA04D surface soil samples were analyzed for ^{228}Th. Two of the 12 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A04DSL-326-01 contained the greatest ^{228}Th concentration for IA04D surface soil samples, (2.4 ± 0.8) pCi/g, which is almost three times the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Twelve IA04D surface soil samples were analyzed for ^{230}Th. Three of the 12 alpha spectroscopy results were greater than the ^{230}Th background concentration. All of the ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A04DSL-026-01 and sample A04DSL-307-01 contained the greatest ^{230}Th concentrations for IA04D surface soil samples, (1.5 ± 0.4) pCi/g and (1.5 ± 0.3) pCi/g, respectively, which is about 1.7 times the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All 61 IA04D surface soil samples were analyzed for ^{232}Th. Three of the 12 alpha spectroscopy results, three of the six offsite gamma spectroscopy results, and 15 of the 61 onsite gamma spectroscopy results indicated that ^{232}Th was present in surface soil samples at a concentration greater than the ^{232}Th

background concentration. Sample A04DSL-326-01 contained the greatest ^{232}Th surface soil concentrations, (3.6 ± 0.4) pCi/g, which is about 4.6 times the ^{232}Th background concentration and almost twice the ^{232}Th screening level plus background concentration.

Twelve IA04D surface soil samples were analyzed for ^{234}U. Ten of the 12 alpha spectroscopy results for IA04D surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all but one (sample A04DSL-326-01) were in secular equilibrium with the ^{238}U precursor. Sample A04DSL-220-01 contained the greatest ^{234}U concentration, (14.1 ± 1.0) pCi/g, which is about 20 times the ^{234}U background concentration and about the same as the ^{234}U screening level plus background concentration.

Twelve IA04D surface soil samples were analyzed for ^{235}U. Two of the 12 alpha spectroscopy results and none of the six offsite gamma spectroscopy results for IA04D surface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A04DSL-220-01 contained the greatest ^{235}U concentration, (0.71 ± 0.15) pCi/g, which is much greater than the ^{235}U background concentration but is less than the ^{235}U screening level plus background concentration.

All 61 IA04D surface soil samples were analyzed for ^{238}U. All 12 alpha spectroscopy results and 35 of the 61 onsite gamma spectroscopy results for IA04D surface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A04DSL-220-01 contained the greatest ^{238}U concentration, (15.2 ± 1.1) pCi/g, which is more than 20 times the ^{238}U background concentration and about the same as the ^{238}U screening level plus background concentration.

Summary

Table 4-116 shows three samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Four samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Eleven samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 43 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-115, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The area east of Ohio Street was formerly used for employee parking when the Building 48 gate was in use. Soil boring IA04DSL-326 was performed as a discretionary boring to address a few small areas of elevated GWS readings in IA04D on the side of Ohio Street opposite the Guterl Site. These readings are essentially consistent with the surface soil concentration results.

4.8.2 Subsurface Soils

Data Evaluation

Ninety-five subsurface soil samples were analyzed for COPCs in IA04D. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-5.

Table 4-117 lists analytical results for radiological COPC concentrations in subsurface soil samples for IA04D. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-118 lists the SOR for IA04D subsurface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Thirteen IA04D subsurface soil samples were analyzed for ^{226}Ra. Four of the six GFPC results and four of the eight offsite gamma spectroscopy results for IA04D subsurface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A04DSL-031-03 contained the greatest ^{226}Ra concentrations for IA04D subsurface soil samples, (2.2 ± 0.4) pCi/g, which is about twice the ^{226}Ra background concentration and about the same as the ^{226}Ra screening level plus background concentration.

Thirteen IA04D subsurface soil samples were analyzed for ^{228}Ra. Two of the six GFPC results and none of the eight offsite gamma spectroscopy results for IA04D subsurface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A04DSL-320-05 contained the greatest ^{228}Ra concentration for IA04D subsurface soil samples, (1.9 ± 0.4) pCi/g, which is about 2.6 times the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Twelve IA04D subsurface soil samples were analyzed for ^{228}Th. Eight of the 12 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A04DSL-008-05 contained the greatest ^{228}Th concentration for IA04D subsurface soil samples, (1.9 ± 0.3) pCi/g, which is more than twice the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Twelve IA04D subsurface soil samples were analyzed for ^{230}Th. Seven of the 12 alpha spectroscopy results were greater than the ^{230}Th background concentration. All of the ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A04DSL-031-03 contained the greatest ^{230}Th concentrations for IA04D subsurface soil samples, (2.3 ± 0.5) pCi/g, which is about 2.6 times the ^{230}Th background concentration and about 1.3 times the ^{230}Th screening level plus background concentration.

All 95 IA04D subsurface soil samples were analyzed for ^{232}Th. Eight of the 12 alpha spectroscopy results, none of the eight offsite gamma spectroscopy results, and 58 of the 95 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A04DSL-031-03 contained the greatest ^{232}Th subsurface soil concentrations, (2.1 ± 0.3) pCi/g, which is more than three times the ^{232}Th background concentration and about 1.2 times the ^{232}Th screening level plus background concentration.

Twelve IA04D subsurface soil samples were analyzed for ^{234}U. Eleven of the 12 alpha spectroscopy results for IA04D subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A04DSL-023-03 and sample A04DSL-031-03 contained the greatest ^{234}U concentrations, each at (3.2 ± 0.3) pCi/g, which is about 5 times the ^{234}U background concentration and less than the ^{234}U screening level plus background concentration.

Nineteen IA04D subsurface soil samples were analyzed for ^{235}U. One of the 12 alpha spectroscopy results and none of the eight offsite gamma spectroscopy results for IA04D subsurface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Samples A04DSL-214-02 and A04DSL-223-02 contained the greatest ^{235}U concentrations,

(0.3 ± 0.4) pCi/g and (0.3 ± 0.3) pCi/g, respectively, which are about 4 times the ^{235}U background concentration and are less than the ^{235}U screening level plus background concentration.

All 95 IA04D subsurface soil samples were analyzed for ^{238}U. Eight of the 12 alpha spectroscopy results and 61 of the 95 onsite gamma spectroscopy results for IA04D subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A04DSL-326-03 contained the greatest ^{238}U concentration, (5.6 ± 0.7) pCi/g, which is about 7 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

Table 4-118 shows 17 samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Fifteen samples have SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Twenty-one samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 42 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-117, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The area east of Ohio Street was formerly used for employee parking when the Building 48 gate was in use. Soil boring IA04DSL-326 was performed as a discretionary boring to address a few small areas of elevated GWS readings in IA04D on the side of Ohio Street opposite the Guterl Site. These readings are essentially consistent with the surface soil concentration results.

4.8.3 Surface Water (Native)

Based on historical information, the occurrence of native surface water in IA04D was not anticipated and therefore no native surface water samples were planned for IA04D. Native surface water was not observed within IA04D during the RI, and no surface water samples were collected.

4.8.4 Sediment (Site Utilities)

Data Evaluation

Based on historical information, the occurrence of native sediment in IA04D was not anticipated and therefore no native sediment samples were planned for IA04D. Native sediment was not observed within IA04D during the RI, and no native sediment samples were collected.

Table 4-119 lists radiological COPC concentrations in two non-native sediment samples collected in IA04D.[30] The samples were collected from sewer manholes. Table 3-58 describes the locations where these samples were taken. Figure 4-29 shows where the samples were taken.

Table 4-120 lists the SOR for IA04D non-native sediment samples. SOR are presented in graphical format in Figure 4-1 through Figure 4-6.

Both IA04D non-native sediment samples were analyzed for ^{226}Ra. None of the two GFPC and two offsite gamma spectroscopy results for IA04D non-native sediment samples was greater than the ^{226}Ra

[30] These same two samples are also discussed in Section 4.3.4 and listed in Table 4-80 and Table 4-81. The discussion is repeated here for the convenience of the reader.

background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A08-A01-SD-001R and sample A08-A01-SD-005 contained the greatest ^{226}Ra concentrations for IA04D non-native sediment samples, (0.31 ± 0.11) pCi/g and (0.31 ± 0.14) pCi/g, respectively, which is less than the ^{226}Ra background concentration and is less than the ^{226}Ra screening level plus background concentration.

Both IA04D non-native sediment samples were analyzed for ^{228}Ra. None of the two GFPC and two offsite gamma spectroscopy results for IA04D non-native sediment samples was greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A08-A01-SD-005 contained the greatest ^{228}Ra concentration for IA04D non-native sediment samples, (0.6 ± 0.5) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Both IA04D non-native sediment samples were analyzed for ^{228}Th. Neither alpha spectroscopy result was greater than the ^{228}Th background concentration. Both samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A08-A01-SD-005 contained the greater ^{228}Th concentration for IA04D non-native sediment samples, (0.35 ± 0.14) pCi/g, which is less than the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Both IA04D non-native sediment samples were analyzed for ^{230}Th. Neither alpha spectroscopy result was greater than the ^{230}Th background concentration. Both ^{230}Th alpha spectroscopy results indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A08-A01-SD-001R contained the greater ^{230}Th concentration for IA04D non-native sediment samples, (0.40 ± 0.10) pCi/g, which is less than the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

Both IA04D non-native sediment samples were analyzed for ^{232}Th. Neither of the alpha spectroscopy results and neither of the offsite gamma spectroscopy results indicated that ^{232}Th was present in non-native sediment samples at a concentration greater than the ^{232}Th background concentration. Sample A08-A01-SD-005 contained the greatest ^{232}Th non-native sediment concentration, (0.26 ± 0.11) pCi/g, which is less than the ^{232}Th background concentration and is less than the ^{232}Th screening level plus background concentration.

Both IA04D non-native sediment samples were analyzed for ^{234}U. Both alpha spectroscopy results for IA04D non-native sediment samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and both were in secular equilibrium with the ^{238}U precursor. Sample A08-A01-SD-001R contained the greater ^{234}U concentration, (6.2 ± 0.6) pCi/g, which is about 8.5 times the ^{234}U background concentration and is less than the ^{234}U screening level plus background concentration.

Both IA04D non-native sediment samples were analyzed for ^{235}U. One of the two alpha spectroscopy results but neither of the offsite gamma spectroscopy results for IA04D non-native sediment samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A08-A01-SD-001R contained the greatest ^{235}U concentration, (0.31 ± 0.09) pCi/g, which is much greater than the ^{235}U background concentration but is less than the ^{235}U screening level plus background concentration.

Both IA04D non-native sediment samples were analyzed for ^{238}U. Both alpha spectroscopy results for IA04D non-native sediment samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A08-A01-SD-001R contained the greater ^{238}U concentration, (6.7

± 0.7) pCi/g, which is about 11 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

Table 4-120 shows that both samples have an SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-119, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.8.5 Groundwater

No overburden groundwater monitoring wells exist within IA04D.

One new shallow bedrock monitoring well (MW-604D) was installed within IA04D during this RI; refer to Section 3.8 for discussion of installation, development, and slug testing.

Groundwater samples for radiological parameters were collected from two shallow bedrock monitoring wells (MW-24 and MW-604D) located within IA04D; refer to Figure 3-13 for monitoring well locations. Groundwater samples were collected during July-August 2007 and November 2007. A filtered sample and an unfiltered sample were collected at each location during each round. Groundwater samples were analyzed for radiological COPCs by alpha spectroscopy (uranium and thorium), GFPC (radium), gross alpha and gross beta; the unfiltered sample was also analyzed for TSS.

Data Evaluation

Groundwater analytical results for the July-August 2007 and November 2007 rounds of sampling are presented on Figures 4-47 and 4-48, respectively. Table 4-121 lists weighted average analytical results for groundwater samples collected in IA04D. Table 4-122 shows the radium and uranium concentrations in Table 4-121 converted to concentrations suitable for comparison with USEPA drinking water MCLs.

Of the two wells located in IA04D, sample MW604D exhibited the greater concentration of ^{238}U. MW-604D is not located in an area of suspected or observed elevated ^{238}U concentrations in soil. However, MW604D is located directly down-gradient of the line of MW-13D, MW-18, MW-605D and MW-26 monitoring wells that also displayed elevated ^{238}U groundwater concentrations.

Summary

The radium and thorium concentrations in all the samples appear to be at background levels. However, location MW-604D shows uranium concentrations that clearly exceed the USEPA drinking water MCL for total uranium (^{234}U, ^{235}U, and ^{238}U).

The occurrence of elevated uranium levels in the IA04D shallow bedrock groundwater samples is postulated to be related to downgradient migration of groundwater affected by source term areas identified in IA03 and western IA04A.

4.9 IA05A

4.9.1 Surface Soils

Data Evaluation

Forty-nine surface soil samples were collected in IA05A. Table 3-42 lists the surface soil samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Table 3-19 lists the surface soil samples (the -01 samples) analyzed by ICP-MS for uranium isotopes. Surface soil sample locations are shown on Figure 3-10.

Table 4-123 lists analytical results for radiological COPC concentrations in surface soil samples for IA05A. COPC concentrations relative to average Guterl Site background concentrations are presented in graphical format in Figures 4-7 through 4-28.

Table 4-124 lists the SOR for IA05A surface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Sample A05ASL-301-01, as discussed in the following Summary section, appears to be anomalously contaminated relative to the surrounding area. For the purpose of isolating this apparent anomaly for separate discussion, results for this sample are not discussed or counted in the paragraphs following immediately in this Data Evaluation section but instead are discussed in the following Summary section.

Table 4-125 lists the results for the surface soil sample analyzed by ICP-MS.

Fourteen IA05A surface soil samples were analyzed for ^{226}Ra. Four of the 14 GFPC results and two of the four offsite gamma spectroscopy results for IA05A surface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A05ASL-211-01, sample A05ASL-219-01, and sample A05ASL-308-01 contained the greatest ^{226}Ra concentrations for IA05A surface soil samples, (1.5 ± 0.3) pCi/g each, which is about 1.5 times the ^{226}Ra background concentration and marginally less than the ^{226}Ra screening level plus background concentration.

Fourteen IA05A surface soil samples were analyzed for ^{228}Ra. Two of the 14 GFPC results and two of the four offsite gamma spectroscopy results for IA05A surface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A05ASL-308-01 contained the greatest ^{228}Ra concentration for IA05A surface soil samples, (1.5 ± 0.4) pCi/g, which is about twice the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Twenty-eight IA05A surface soil samples were analyzed for ^{228}Th. Four of the 28 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A05ASL-305-01 contained the greatest ^{228}Th concentration for IA05A surface soil samples, (1.6 ± 0.4) pCi/g, which is about twice the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Twenty-eight IA05A surface soil samples were analyzed for ^{230}Th. Three of the 28 alpha spectroscopy results were greater than the ^{230}Th background concentration. All of the ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U

concentrations). Sample A05ASL-304-01 contained the greatest ^{230}Th concentration for IA05A surface soil samples, (1.6 ± 0.4) pCi/g, which is about 1.8 times the ^{230}Th background concentration and about the same as the ^{230}Th screening level plus background concentration.

All 49 IA05A surface soil samples were analyzed for ^{232}Th. Two of the 28 alpha spectroscopy results, one of the four offsite gamma spectroscopy results, and 15 of the 48 onsite gamma spectroscopy results indicated that ^{232}Th was present in surface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A05ASL-219-01 contained the greatest ^{232}Th surface soil concentrations, (1.8 ± 0.3) pCi/g, which is almost three times the ^{232}Th background concentration and about the same as the ^{232}Th screening level plus background concentration.

Twenty-eight IA05A surface soil samples were analyzed for ^{234}U. Eleven of the 28 alpha spectroscopy results for IA05A surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all but one (sample A05ASL-019-01) were in secular equilibrium with the ^{238}U precursor. Sample A05ASL-303-01 contained the greatest ^{234}U concentration, (10.7 ± 1.1) pCi/g, which is about 16 times the ^{234}U background concentration and less than the ^{234}U screening level plus background concentration.

Twenty-eight IA05A surface soil samples were analyzed for ^{235}U. Five of the 28 alpha spectroscopy results and none of the four offsite gamma spectroscopy results for IA05A surface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A05ASL-303-01 contained the greatest ^{235}U concentration, (0.63 ± 0.18) pCi/g, which is more than 20 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 49 IA05A surface soil samples were analyzed for ^{238}U. Thirteen of the 28 alpha spectroscopy results and 21 of the 49 onsite gamma spectroscopy results for IA05A surface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A05ASL-303-01 contained the greatest ^{238}U concentration, (12.0 ± 1.2) pCi/g, which is about 16 times the ^{238}U background concentration and less than as the ^{238}U screening level plus background concentration.

Summary

Table 4-124 shows six samples (including the anomalous sample discussed below in this section) with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

One sample has an SOR that, more likely than not, is greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

Two samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 40 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

The results for the surface soil sample analyzed by ICP-MS imply that the sample may contain a blend of natural and depleted uranium.

^{226}Ra and ^{228}Ra, shown in Table 4-123, occur at concentrations similar to or less than the concentrations of their immediate precursors with one exception. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The exception is sample ID A05ASL-301-01. Results in Table 4-123 clearly show elevated concentrations of ^{226}Ra and ^{228}Ra, along with similarly elevated concentrations for their respective precursors, ^{230}Th and

^{232}Th, and greatly elevated concentrations for the uranium isotopes.[31] The ^{230}Th is not near secular equilibrium with ^{234}U-^{238}U as it should be for naturally occurring uranium and as it appears elsewhere on the Guterl Site when the uranium is at background concentrations. Neither is the ^{230}Th concentration at background levels. Additionally, according to ICP-MS results, this sample contains a trace concentration of ^{236}U (that is, the least relative mass abundance for ^{236}U of the three detected concentrations shown in Table 3-19). These results suggest that the contamination may be due in part to recycled uranium.

The GWS (Figure 3-9) identified several areas of elevated gamma count rates in IA05A, including the location of the anomalous contamination, which is essentially consistent with the surface soil concentration results.

The 1999 USRADS survey performed by the New York State Department of Conservation (USRADS, 1999) also indentified several areas of elevated gamma count rates and elevated uranium and thorium concentrations. The 1999 surveyors reported finding "small pieces of thorium metal, soil-like matrix containing mixtures of uranium and thorium, one location of identifiable small flakes containing uranium and thorium, slag, and fire brick."

The 1999 survey report lists several soil samples containing ^{238}U much greater than 12 pCi/g, which is the greatest concentration found in the current IA05A survey area except for the suspected anomalous IA05A samples. The highest reported concentration reported by NYSDEC (1999) was (30,300 ± 1,200) pCi/g, with several other concentrations of thousands of picocuries per gram. The greatest ^{238}U concentration found in the current survey was (4,357 ± 605) pCi/g for the anomalous area. This value is comparable to the greatest ^{238}U concentrations reported in the 1999 survey.

4.9.2 Subsurface Soils

Data Evaluation

Sixty-nine subsurface soil samples were analyzed for COPCs in IA05A. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-5.

Table 4-126 lists analytical results for radiological COPC concentrations in subsurface soil samples for IA05A. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-127 lists the SOR for IA05A subsurface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Sample A05ASL-301-02 and sample A05ASL-301-06, as discussed in the following Summary section, appear to be anomalously contaminated. For the purpose of isolating this apparent anomaly for separate discussion, results for these samples are not discussed or counted in the paragraphs following immediately in this Data Evaluation section but instead are discussed in the following Summary section.

[31] The results in Table 4.9.1-1 show that the elevated concentration of ^{228}Ra is adequately accounted in the onsite-gamma SOR calculation by the assumption that it is in secular equilibrium with ^{232}Th (that is, ^{232}Th is a surrogate for ^{228}Ra). The alpha SOR calculation includes a direct (rather than a surrogate) term for ^{228}Ra. However, the elevated ^{226}Ra concentration is not accounted for in both the alpha and onsite-gamma SOR calculations because both calculations assume that the ^{226}Ra concentration above background is zero. Similarly, the ^{230}Th concentration contributes a direct term to the alpha SOR calculation but contributes zero to the onsite-gamma SOR calculation. With the GFPC ^{226}Ra concentration result as a guide, the true SOR results for this sample should be higher by about 14 for the alpha SOR calculation and by about 29 for the onsite gamma SOR calculation. Neither correction has a significant impact on the interpretation of the SOR results; that is, with or without the corrections, both SOR are well above 700.

Thirteen IA05A subsurface soil samples were analyzed for ^{226}Ra. One of the 13 GFPC results and neither of the two offsite gamma spectroscopy results for IA05A subsurface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A05ASL-303-14 contained the greatest ^{226}Ra concentration for IA05A subsurface soil samples, (2.0 ± 0.3) pCi/g, which is about twice the ^{226}Ra background concentration and is about the same as the ^{226}Ra screening level plus background concentration.

Thirteen IA05A subsurface soil samples were analyzed for ^{228}Ra. None of the 13 GFPC results and neither of the two offsite gamma spectroscopy results for IA05A subsurface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A05ASL-304-02 contained the greatest ^{228}Ra concentration for IA05A subsurface soil samples, (1.2 ± 0.4) pCi/g, which is about 1.5 times the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Twenty-nine IA05A subsurface soil samples were analyzed for ^{228}Th. Three of the 29 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A05ASL-018-02, sample A05ASL-023-03, and sample A05ASL-303-14 contained the greatest ^{228}Th concentrations for IA05A subsurface soil samples, (1.30 ± 0.20) pCi/g, (1.3 ± 0.3) pCi/g, and (1.3 ± 0.3) pCi/g, respectively which is about 1.6 times the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Twenty-nine IA05A subsurface soil samples were analyzed for ^{230}Th. Five of the 29 alpha spectroscopy results were greater than the ^{230}Th background concentration. All of the ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor except for samples with ^{234}U concentrations greater than the ^{234}U background concentration. The presence of MED/AEC uranium is implied in the remaining samples (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A05ASL-303-13 and sample A05ASL-303-14 contained the greatest ^{230}Th concentrations for IA05A subsurface soil samples, (1.9 ± 0.4) pCi/g and (1.9 ± 0.3) pCi/g, respectively, which is about 2.2 times the ^{230}Th background concentration and about the same as the ^{230}Th screening level plus background concentration.

All 67 IA05A subsurface soil samples were analyzed for ^{232}Th. One of the 29 alpha spectroscopy results, one of the two offsite gamma spectroscopy results, and 21 of the 67 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A05ASL-018-02 contained the greatest ^{232}Th subsurface soil concentrations, (1.25 ± 0.19) pCi/g, which is about 1.6 times the ^{232}Th background concentration and is less than the ^{232}Th screening level plus background concentration.

Twenty-nine IA05A subsurface soil samples were analyzed for ^{234}U. Eight of the 29 alpha spectroscopy results for IA05A subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A05ASL-304-02 contained the greatest ^{234}U concentration, (6.8 ± 0.8) pCi/g, which is about 10 times the ^{234}U background concentration and less than the ^{234}U screening level plus background concentration.

Twenty-nine IA05A subsurface soil samples were analyzed for ^{235}U. Three of the 29 alpha spectroscopy results and neither of the two offsite gamma spectroscopy results for IA05A subsurface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A05ASL-304-02 contained the greatest ^{235}U concentration, (0.28 ± 0.11) pCi/g, which is more than 10 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 67 IA05A subsurface soil samples were analyzed for ^{238}U. Seven of the 29 alpha spectroscopy results and 27 of the 67 onsite gamma spectroscopy results for IA05A subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A05ASL-304-02 contained the greatest ^{238}U concentration, (8.5 ± 1.5) pCi/g, which is about 10 times the ^{238}U background concentration and less than as the ^{238}U screening level plus background concentration.

Summary

Table 4-127 shows the two anomalous samples (discussed below in this section) with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Four samples have SOR that, more likely than not, are less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 63 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-126, occur at concentrations similar to or less than the concentrations of their immediate precursors with two exceptions at one location (the same location discussed in the previous section). This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

The exceptions are sample ID A05ASL-301-02 and sample ID A05ASL-301-06. Results in Table 4-126 clearly show elevated concentrations of ^{226}Ra and ^{228}Ra, along with similarly elevated concentrations for their respective precursors, ^{230}Th and ^{232}Th, and greatly elevated concentrations for the uranium isotopes.[32] The ^{230}Th is not in secular equilibrium with ^{234}U-^{238}U as it should be for naturally occurring uranium and as it appears elsewhere on the Guterl Site when the uranium is at background concentrations (if none of the uranium present was due to MED/AEC support operations, then ^{230}Th likely would be in secular equilibrium with its ^{234}U and ^{238}U parents). Neither is the ^{230}Th concentration at background levels. This reason for this anomalous contamination was not able to be determined as part of this RI. It is also noted that, together with the concentrations measured for sample ID A05ASL-301-01, the concentrations consistently decrease with depth, possibly suggesting a historical surface spill.

The GWS (Figure 3-9) identified several areas of elevated gamma count rates in IA05A, including the location of the anomalous contamination, which is essentially consistent with the surface soil concentration results. The GWS results and the 1999 NYSDEC USRADS survey were used to determine the location (A05ASL-301) for subsurface exploration of the surface anomaly.

4.9.3 Surface Water (Native)

Based on historical information, the occurrence of native surface water in IA05A was not anticipated and therefore no native surface water samples were planned for IA05A. Native surface water was not observed within IA05A during the RI, and no native surface water samples were collected.

4.9.4 Sediment (Native)

Based on historical information, the occurrence of native sediment in IA05A was not anticipated and therefore no native sediment samples were planned for IA05A. Native sediment was not observed within IA05A during the RI, and no native sediment samples were collected.

[32] Similar to the previous footnote, the true SOR for sample ID A05ASL-301-02 should be higher by about 2.5 and 5 for the alpha and onsite-gamma SOR, respectively, and, for sample ID A05ASL-301-06, 0.1 and 0.2. Making these corrections or not should have no significant impact on decisions involving these sample IDs.

4.9.5 Groundwater

No groundwater monitoring wells exist within IA05A; therefore, no groundwater samples were collected for IA05A.

Based on an assessment of historical groundwater elevation data, IA05A was expected to be on the upgradient side of the Guterl Site. Preliminary groundwater elevation data collected during the RI confirmed the prior data. Given that IA05A was formerly used as a railroad right-of-way, was not actively involved in MED/AEC-related activity, historical aerial photography did not indicate areas of disposal, and that the property was upgradient of the Guterl Site, no new groundwater monitoring wells were installed in IA05A.

Given that data collected during this RI confirmed that the direction of groundwater flow is from northwest to southeast in the area of IA05A, groundwater data collected in IA05B (MW-600D), the northwestern portion of IA04A (MW-21), and the northeastern perimeter of IA03 (MW-17) are considered representative of groundwater conditions within IA05A. Based on these data, groundwater within IA05A is not considered to have been impacted by MED/AEC-related activity.

4.10 IA05B

4.10.1 Surface Soils

Data Evaluation

Eleven surface soil samples were collected in IA05B. Table 3-42 lists the surface soil samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Surface soil sample locations are shown on Figure 3-10.

Table 4-128 lists analytical results for radiological COPC concentrations in surface soil samples for IA05B. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-129 lists the SOR for IA05B surface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Six IA05B surface soil samples were analyzed for ^{226}Ra. None of the six GFPC and two offsite gamma spectroscopy results for IA05B surface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A05BSL-007-01 contained the greatest ^{226}Ra concentration for IA05B surface soil samples, (1.2 ± 0.3) pCi/g, which is about the same as the ^{226}Ra background concentration and is less than the ^{226}Ra screening level plus background concentration.

Six IA05B surface soil samples were analyzed for ^{228}Ra. None of the six GFPC and two offsite gamma spectroscopy results for IA05B surface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A05BSL-005-01 and sample A05BSL-009-01 contained the greatest ^{228}Ra concentrations for IA05B surface soil samples, (1.1 ± 0.3) pCi/g and (1.13 ± 0.18) pCi/g, respectively, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Ten IA05B surface soil samples were analyzed for ^{228}Th. None of the ten alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A05BSL-009-01 contained the greatest ^{228}Th concentration for IA05B surface soil samples, (1.2 ± 0.3) pCi/g, which is

about the same as the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Ten IA05B surface soil samples were analyzed for ^{230}Th. All ten alpha spectroscopy results were greater than the ^{230}Th background concentration. All ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor, which implies that none of the uranium in these samples was due to MED/AEC support operations. Sample A05BSL-005-01 and sample A05BSL-009-01 contained the greatest ^{230}Th concentrations for IA05B surface soil samples, both (1.1 ± 0.3) pCi/g, which are about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All 11 IA05B surface soil samples were analyzed for ^{232}Th. None of the ten alpha spectroscopy results, neither of the offsite gamma spectroscopy results, and four of the onsite gamma spectroscopy results indicated that ^{232}Th was present in surface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A05BSL-005-01 contained the greatest ^{232}Th surface soil concentration, (1.5 ± 0.2) pCi/g, which is about 2.3 times the ^{232}Th background concentration and is less than the ^{232}Th screening level plus background concentration.

Ten IA05B surface soil samples were analyzed for ^{234}U. None of the ten alpha spectroscopy results for IA05B surface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A05BSL-006-01 contained the greatest ^{234}U concentration, (0.89 ± 0.20) pCi/g, which is about the same as the ^{234}U background concentration and is less than the ^{234}U screening level plus background concentration.

Ten IA05B surface soil samples were analyzed for ^{235}U. None of the ten alpha spectroscopy results and neither of the offsite gamma spectroscopy results for IA05B surface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A05BSL-005-01 contained the greatest ^{235}U concentration, (0.2 ± 0.4) pCi/g, which is about the same as the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 11 IA05B surface soil samples were analyzed for ^{238}U. None of the 10 alpha spectroscopy results and four of the 11 onsite gamma spectroscopy results for IA05B surface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A05BSL-009-01 contained the greatest ^{238}U concentration, (1.9 ± 0.8) pCi/g, which is about 2.3 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

Table 4-129 shows that all 11 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-128, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.10.2 Subsurface Soils

Data Evaluation

Twenty-eight subsurface soil samples were analyzed for COPCs in IA05B. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-5.

Table 4-130 lists analytical results for radiological COPC concentrations in subsurface soil samples for IA05B. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-131 lists the SOR for IA05B subsurface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Seven IA05B subsurface soil samples were analyzed for ^{226}Ra. None of the five GFPC and neither of the offsite gamma spectroscopy results for IA05B subsurface soil samples were greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A05BSL-011-03 contained the greatest ^{226}Ra concentration for IA05B subsurface soil samples, (1.1 ± 0.2) pCi/g, which is about the same as the ^{226}Ra background concentration and is less than the ^{226}Ra screening level plus background concentration.

Six IA05B subsurface soil samples were analyzed for ^{228}Ra. Three of the five GFPC and neither of the offsite gamma spectroscopy results for IA05B subsurface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A05BSL-005-03 contained the greatest ^{228}Ra concentration for IA05B subsurface soil samples, (1.4 ± 0.3) pCi/g, which is about twice the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

Thirteen IA05B subsurface soil samples were analyzed for ^{228}Th. None of the 13 alpha spectroscopy results was greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A05BSL-011-03 contained the greatest ^{228}Th concentration for IA05B subsurface soil samples, (1.2 ± 0.3) pCi/g, which is about the same as the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Thirteen IA05B subsurface soil samples were analyzed for ^{230}Th. None of the 13 alpha spectroscopy results were greater than the ^{230}Th background concentration. All ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor, which implies that none of the uranium in these samples was due to MED/AEC support operations. Sample A05BSL-002-11 contained the greatest ^{230}Th concentration for IA05B subsurface soil samples, (1.3 ± 0.4) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

Twenty-seven IA05B subsurface soil samples were analyzed for ^{232}Th. None of the 13 alpha spectroscopy results, neither of the offsite gamma spectroscopy results, and eight of the 26 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A05BSL-003-03 contained the greatest ^{232}Th subsurface soil concentration, (1.2 ± 0.2) pCi/g, which is about two times the ^{232}Th background concentration and is less than the ^{232}Th screening level plus background concentration.

Thirteen IA05B subsurface soil samples were analyzed for ^{234}U. None of the 13 alpha spectroscopy results for IA05B subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A05BSL-008-02 contained the greatest ^{234}U concentration, (0.9 ± 0.3) pCi/g, which is about the same as the ^{234}U background concentration and is less than the ^{234}U screening level plus background concentration.

Thirteen IA05B subsurface soil samples were analyzed for ^{235}U. None of the 13 alpha spectroscopy results and neither of the offsite gamma spectroscopy results for IA05B subsurface soil samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration.

Sample A05BSL-001-13 and sample A05BSL-002-11 contained the greatest ^{235}U concentration, (0.1 ± 0.3) pCi/g and (0.1 ± 0.2) pCi/g, respectively, which is about the same as the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

Twenty-six IA05B subsurface soil samples were analyzed for ^{238}U. None of the 13 alpha spectroscopy results and nine of the 26 onsite gamma spectroscopy results for IA05B subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A05BSL-010-04 contained the greatest ^{238}U concentration, (1.9 ± 0.6) pCi/g, which is about 2.3 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

Twenty-six samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

The remaining sample had insufficient data for calculating an SOR; the only measurement result was an offsite gamma spectroscopy result for ^{226}Ra.

^{226}Ra and ^{228}Ra, shown in Table 4-130, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.10.3 Surface Water (Native)

Based on historical information, the occurrence of native surface water in IA05B was not anticipated and therefore no native surface water samples were planned for IA05B. However, native surface water was observed within IA05B during the RI in the form of small, local areas of ephemeral standing water. No native surface water samples were collected because the source of the surface water was atmospheric and it is not likely that the surface water will flow offsite given the dense vegetation and local topography.

4.10.4 Sediment (Native)

Based on historical information, the occurrence of native sediment in IA05B was not anticipated and therefore no native sediment samples were planned for IA05B. However, native surface water was observed within IA05B during the RI in the form of small, local areas of ephemeral standing water. No sediment samples were collected because of the ephemeral nature of the surface water. The seasonally submerged soil is addressed in section 4.10.1.

4.10.5 Groundwater

One new overburden monitoring well (MW-600S) and one new shallow bedrock monitoring well (MW-600D) were installed within IA05B during this RI; refer to Section 3.8 for discussion of installation, development, and slug testing. Monitoring well locations are shown on Figure 3-13.

Overburden groundwater samples were not collected from IA05B during this RI because MW-600S was found to be dry during each round of sampling.

Groundwater samples for radiological parameters were collected from MW-600D during July-August 2007 and November 2007. A filtered sample and an unfiltered sample were collected during each round. Groundwater samples were analyzed for radiological COPCs by alpha spectroscopy (uranium and thorium), GFPC (radium), gross alpha and gross beta; the unfiltered sample was also analyzed for TSS.

Data Evaluation

Groundwater analytical results for the July-August 2007 and November 2007 rounds of sampling are presented on Figures 4-47 and 4-48, respectively. Table 4-132 lists weighted average analytical results for groundwater samples collected in IA05B. Table 4-133 shows the radium and uranium concentrations in Table 4-132 converted to concentrations suitable for comparison with USEPA drinking water MCLs.

Combined radium did not exceed USEPA drinking water MCLs, however combined radium was detected at greater concentrations in MW-600D than at other unimpacted shallow bedrock wells during this investigation. The exact reason for this is not known, although upgradient anthropogenic activity is likely responsible. Possible sources of naturally occurring radium include barium sulfate, a minor component of sodium chloride salt (possible artifact of road salt use at adjacent NYSDOT maintenance yard), and gypsum derived from quarrying and use of local Lockport Dolomite at nearby concrete batch plants.

Summary

The radiological COPC concentrations in both samples appear to be at background levels. The radium and uranium concentrations in both samples appear to be less than the USEPA drinking water MCLs.

4.11 IA06 Offsite Northeast Properties

As noted in Section 1.2.3, IA06 was identified as potentially impacted during the initial phase of the data gap analysis because these offsite lands were at one time owned by Simonds. However, during the data gap analysis it was determined that these offsite lands had been sold by Simonds prior to the period of MED/AEC support operations. As a result, IA06 was dropped from further consideration and is presented solely as a placeholder on the IA list.

Therefore, no surface soil, subsurface soil, surface water, sediment, or groundwater samples for IA06 were collected.

4.12 IA07 Groundwater

One new overburden monitoring well (MW-600S) and nine new shallow bedrock monitoring wells (MW-600D through MW-607D and MW-606DR) were installed and developed during this RI. The new monitoring wells were installed to improve the overall distribution of groundwater monitoring points used to assess water quality and flow direction in the overburden and shallow bedrock units. The locations of the new monitoring wells are shown on Figure 3-13. Table 3-50 presents a construction summary for monitoring wells installed during 1997, 2006, and 2007 (wells installed prior to 1997 are not considered reliable due to age and construction methods). No existing monitoring wells were abandoned or replaced during this RI.

Overburden groundwater samples were not collected during this RI because four of five pre-existing overburden wells were determined to be in poor condition (i.e., sample quality would not meet project DQOs), and the two acceptable wells (MW-13S and MW-600S) were found to be dry during each round of sampling.

Groundwater samples for radiological parameters were collected from 29 shallow bedrock monitoring wells during July-August 2007 and 30 shallow bedrock monitoring wells during November 2007. A field-filtered and an unfiltered sample were collected at each well during each round. The field-filtered and unfiltered samples were analyzed for radiological COPCs by alpha spectroscopy (uranium and thorium), GFPC (radium), gross alpha and gross beta; the unfiltered sample was also analyzed for TSS.

Data Evaluation

Figure 4-47 and Figure 4-48 present a summary of detections for the July-August 2007 and November 2007 groundwater sampling rounds. Table 4-134 lists weighted average analytical results for all groundwater samples collected. Table 4-135 shows the radium and uranium concentrations in Table 4-134 converted to concentrations suitable for comparison with USEPA drinking water MCLs.

Field parameters for water quality parameters were collected during RI groundwater sampling (refer to Section 3.8.3). Table 4-136 summarizes shallow bedrock groundwater field parameters from the two shallow bedrock groundwater sampling events (July-August 2007 and November 2007) as well as from measurements taken by the USACE in March and May, 2008, and by MACTEC in June, 2008.

Data in Table 4-136 indicate that shallow bedrock groundwater level fluctuations of 2 to 4 feet or more occur at numerous locations. These fluctuations may influence the groundwater conditions by introducing oxygen or soluble constituents. For example, field measurements of dissolved oxygen and oxidation reduction potential (ORP) both increased at wells MW-6, MW-18, MW-19, MW-602D, and MW-604D, and specific conductivity increased substantially at wells MW-1, MW-2, MW-3, MW-24, and MW-26 when shallow bedrock groundwater levels were shallowest. These changes may affect transport of contaminants because wetting and drying soil cycles can cause corrosion of metal due to cycling between oxidizing and reducing conditions.

Tables 4-137 and 4-138 list concentrations of metals, including major cations, and anions in groundwater samples collected by the USACE in March 2008. Major cation and anion concentrations (as milliequivalents) were used to construct Stiff diagrams. These diagrams are posted on Figure 4-50 and can be used to evaluate groundwater flow paths. The size of the Stiff diagrams increases with increasing total dissolved solids (TDS) and the diagram shape corresponds to the ion composition.

In a typical, alluvial aquifer, the Stiff diagrams would reflect a relatively uniform major ion composition of groundwater with gradual size increases downgradient reflecting the equilibrating process between groundwater and the aquifer material. However, at the Guterl Site the Stiff diagrams illustrate the presence of different water types and divergent flow paths. For example, shallow bedrock groundwater at well MW-600D is sodium-chloride type with relatively elevated total dissolved solids (TDS). This may be explained by seasonal stockpiling of road salt at the New York State Department of Transportation maintenance yard immediately north (upgradient) of MW-600D. The only other well with sodium-chloride type water and similar TDS is MW-25. This may indicate that these wells are located on the same fracture or bedding plane in the dolostone bedrock. Alternatively, the two locations may be impacted by separate sources with similar compositions, such as might occur with application of road salt to different areas.

Considering the composition of the bedrock, calcium-bicarbonate type water would be expected to dominate. This water type occurs at wells MW-602D, MW-603D, and MW-4. For three wells near the Erie Canal (MW-2, MW-08, and MW-604D), groundwater is calcium-sodium-chloride, calcium-chloride or sodium-chloride type, respectively. TDS at these wells and other Guterl Site wells is considerably less than at wells MW-600D and MW-25. Therefore, there may be a separate source of chloride affected groundwater near the Erie Canal. The variability in water type and TDS, particularly within the relatively small area of the Guterl Site, indicate that groundwater flows by separate paths that may not intersect.

Summary

Results of groundwater analyses are also summarized in the sections above for the investigative areas in which the samples were taken.

The radium and thorium concentrations in all shallow bedrock groundwater samples appear to be at background levels. However, seven shallow bedrock wells (MW-4, MW-13D, MW-18, MW-26, MW-602D, MW604D, and MW-605D) show uranium concentrations that exceed the USEPA drinking water MCL for

total uranium (^{234}U, ^{235}U, plus ^{238}U). The occurrence of elevated uranium in shallow bedrock groundwater is observed:

- in the immediate vicinity of overburden soil with elevated uranium
    - MW-4 is located in the immediate area of the Building 6/8 loading dock used during the period of MED/AEC support operations as discussed in Section 2.1.2
    - MW-13D and MW-18 are located in the immediate area of elevated uranium in soil in IA03
    - MW-602D is located in the immediate area of elevated uranium in soil in IA04A
- downgradient of areas with elevated uranium in soil
    - Although overburden soil is not observed to contain elevated uranium activity in IA04C and IA04D, MW-605D, MW-26, and MW604D are aligned downgradient of observed elevated uranium in soil in IA03 and IA04A, and along regional fracture trend discussed in Section 2.2.4.1
    - MW-22D is located downgradient of elevated soil activity in IA04A.

Figure 4-51 presents the relationship of the key conditions that are postulated to lead to elevated uranium in shallow bedrock groundwater: presence of source term material in seasonally saturated zone; presence of oxidizing conditions in groundwater zone; and, location within downgradient projection of two prior conditions.

Based on this evaluation, two potential data gaps for groundwater exist when considering the occurrence of elevated uranium in shallow bedrock monitoring wells. The first data gap is vertical delineation of uranium in bedrock groundwater greater than 15 feet below top of bedrock because shallow bedrock wells monitor the upper 15 feet of bedrock and seven to eight wells show elevated uranium activity – the vertical delineation at these points is unknown. The second data gap is delineation of groundwater quality at the western and southern perimeter of the Guterl Site; i.e., southwest of MW-18, southwest of the line of MW-26 and MW-604D, and southeast of MW-604D. As part of this latter concern, it should be determined whether the shallow bedrock groundwater discharges to the Erie Canal.

4.13 IA08 Utilities

Investigative Area IA08 was created during FSP development to manage data associated with potentially contaminated materials located in site-wide utilities such as floor drains, pits, sewers, and oil/water separators. The materials in these features are not considered to be available to the environment in their present location and condition; i.e., the materials are contained in concrete lined or other contained systems. A secondary purpose for evaluating site-wide utilities as a dedicated IA was to evaluate the potential for offsite migration of contaminants via the utilities (e.g., water recirculation system) or via the trenches or bedding materials (e.g., groundwater discharge and migration pathways). Therefore, the term “non-native” is emphasized for IA08 surface water and sediment samples to distinguish these materials from naturally occurring, environmentally-available surface water and sediment (e.g., IA09 Erie Canal).

The results discussed below are also presented in the surface water and sediment subsections for each IA01 building (where present) and for each outdoor IA (where present). The following subsections present a summary of previous discussions.

4.13.1 Sediments

Data Evaluation

Figure 4-30 presents the locations and analytical data for IA08 non-native sediment sample locations.

Table 4-139 lists analytical results for radiological COPC concentrations in non-native sediment samples for IA08.

Table 4-140 lists the SOR for IA08 non-native sediment samples.

In general, elevated IA08 activity occurs in the same general areas as elevated soil activity. That is, the occurrence of elevated IA08 sample data can be attributed to migration of local materials to the local utility feature. The data do not support an offsite transport mechanism.

Summary

Table 4-140 shows 30 samples with SOR clearly greater than 1 [that is, $(S - 2\sigma) > 1$].

Two samples have an SOR that, more likely than not, are greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

One sample has an SOR that, more likely than not, is less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 22 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-139, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.13.2 Surface Water (Site Utilities)

Data Evaluation

Figure 4-29 presents the locations and analytical data for IA08 non-native surface water sample locations.

Table 4-141 lists radiological COPC concentrations in non-native surface water samples collected in IA08. Table 4-142 shows the radium and uranium concentrations in Table 4-141 converted to concentrations suitable for comparison with USEPA drinking water MCLs.

In general, elevated IA08 activity occurs in the same general areas as elevated soil activity. That is, the occurrence of elevated IA08 sample data can be attributed to migration of local materials to the local utility feature. The data do not support an offsite transport mechanism.

Summary

Sixteen of the 34 samples show elevated concentrations of ^{234}U, ^{235}U, and ^{238}U that exceed the USEPA drinking water MCL for total uranium (^{234}U, ^{235}U, plus ^{238}U). Since the ^{230}Th concentrations for these samples are at background levels, it appears that these samples are contaminated with MED/AEC uranium. It is important to note that these are not environmental locations. These are isolated, contained bodies of water that will not be used for human purposes, such as drinking, watering, or irrigation.

4.14 IA09 Erie Canal

Section 2.2.4.3 describes the physical setting for the Erie Canal relative to the Guterl Site. Section 2.2.4.3 also provides a description of the former industrial water intake system located on the northwest bank of the Erie Canal. The system included an oil/water separator that allowed overflow to return to the Erie Canal. The potential for MED/AEC-related constituents to have been transported from the then-active facility to the Erie Canal via the oil/water separator overflow is the primary basis for the sampling program discussed below. Other potential sources of impacts to the Erie Canal include bedrock groundwater

discharge via exfiltration along the bedrock floor and walls of the Canal, as well as the permitted bedrock dewatering discharge from the dolostone quarry located upgradient of the Guterl Site.

4.14.1 Surface Soils

IA09 is located approximately 300 feet southeast of the Guterl Site and is a surface water body with sheer, cut-bedrock banks. In addition, there was no historical information suggesting the potential for overland migration of Guterl Site soils to the immediate area of the Erie Canal. Therefore, no surface soil samples for IA09 were planned or collected.

4.14.2 Subsurface Soils

No subsurface soil samples for IA09 were planned or collected.

4.14.3 Surface Water (Native)

Data Evaluation

A total of 12 surface water samples were collected from the Erie Canal. Surface water samples were collected from the mid-point of the water column from three equally-spaced sample points located along four transects as shown on Figure 3-17. The transects were located upgradient of the Guterl Site near the Rt. 93 bridge (background conditions), immediately upgradient and down gradient of the former industrial intake reservoir overflow outfall, and several hundred feet downgradient of the former outfall (Guterl Site boundary conditions).

Surface water samples were analyzed by alpha spectroscopy (uranium and thorium COPCs), and GFPC (radium COPCs). Figure 4-52 presents the sample locations and associated analytical data for IA09 surface water samples.

Table 4-143 lists radiological COPC concentrations in surface water samples collected in IA09. Table 4-144 shows the radium and uranium concentrations in Table 4-143 converted to concentrations suitable for comparison with USEPA drinking water MCLs.

Summary

All samples appear to have only background concentrations of the radiological COPCs and appear to meet USEPA drinking water MCL for radium and for uranium.

4.14.4 Sediment (Native)

Data Evaluation

Twelve sediment samples were collected from the Erie Canal. The sediment samples were co-located with the surface water samples described in Section 4.14.3.

Sediment samples were analyzed by offsite gamma spectroscopy (uranium, thorium, and radium COPCs), alpha spectroscopy (uranium and thorium COPCs), and GFPC (radium COPCs). Figure 4-53 presents the sample locations and analytical data for IA09 sediment samples.

Table 4-145 lists analytical results for radiological COPC concentrations in sediment for IA09. Table 4-146 lists the SOR for IA09 sediment samples.

All 12 IA09 sediment samples were analyzed for ^{226}Ra. None of the six GFPC and none of the 12 offsite gamma spectroscopy results for IA09 sediment samples were greater than the ^{226}Ra background

concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A09-SD-009 contained the greatest ^{226}Ra concentration for IA09 sediment samples, (1.2 ± 0.3) pCi/g, which is about the same as the ^{226}Ra background concentration and is less than the ^{226}Ra screening level plus background concentration.

All 12 IA09 sediment samples were analyzed for ^{228}Ra. None of the six GFPC results and none of the 12 offsite gamma spectroscopy results for IA09 sediment samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A09-SD-008 contained the greatest ^{228}Ra concentration for IA09 sediment samples, (0.9 ± 0.3) pCi/g, which is about the same as the ^{228}Ra background concentration and less than the ^{228}Ra screening level plus background concentration.

All 12 IA09 sediment samples were analyzed for ^{228}Th. None of the 12 alpha spectroscopy results was greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A09-SD-009 contained the greatest ^{228}Th concentration for IA09 sediment samples, (1.1 ± 0.3) pCi/g, which is about the same as the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

All 12 IA09 sediment samples were analyzed for ^{230}Th. None of the 12 alpha spectroscopy results were greater than the ^{230}Th background concentration. All ^{230}Th alpha spectroscopy results indicated that ^{230}Th was in secular equilibrium with its ^{234}U precursor, which implies that none of the uranium in the samples was due to MED/AEC support operations. Sample A09-SD-007 and sample A09-SD-009 contained the greatest ^{230}Th concentration for IA09 sediment samples, (1.0 ± 0.3) pCi/g, which is about the same as the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All 12 IA09 sediment samples were analyzed for ^{232}Th. None of the 12 alpha spectroscopy results and one of the 12 offsite gamma spectroscopy results indicated that ^{232}Th was present in sediment samples at a concentration greater than the ^{232}Th background concentration. Sample A09-SD-009 contained the greatest ^{232}Th sediment concentration, (1.1 ± 0.3) pCi/g, which is about 1.6 times the ^{232}Th background concentration and is less than the ^{232}Th screening level plus background concentration.

All 12 IA09 sediment samples were analyzed for ^{234}U. None of the 12 alpha spectroscopy results for IA09 sediment samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A09-SD-009 contained the greatest ^{234}U concentration, (0.9 ± 0.2) pCi/g, which is about the same as the ^{234}U background concentration and is less than the ^{234}U screening level plus background concentration.

All 12 IA09 sediment samples were analyzed for ^{235}U. None of the 11 alpha spectroscopy results and none of the 12 offsite gamma spectroscopy results for IA09 sediment samples indicated that ^{235}U was present at concentrations statistically greater than the ^{235}U background concentration. Sample A09-SD-004 and sample A09-SD-007 contained the greatest ^{235}U concentration, (0.2 ± 0.4) pCi/g and (0.2 ± 0.3) pCi/g, respectively, which is about the same as the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 12 IA09 sediment samples were analyzed for ^{238}U. None of the 12 alpha spectroscopy results for IA09 sediment samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A09-SD-009 contained the greatest ^{238}U concentration, (0.77 ± 0.20) pCi/g, which is about the same as the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

All twelve sediment samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-145, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.14.5 Groundwater

IA09 is a surface water body; therefore, no groundwater samples for IA09 were collected. Although groundwater may be discharging to the Erie Canal via bedrock fractures, surface water data did not indicate groundwater-discharge impact attributable to MED/AEC-related constituents.

4.15 IA10 Lot 7.1

At the time of the RI, IA10 was in active use as a concrete batch plant. Access to the entire 1.76-acre footprint of the property was not possible due to the presence of interference from an office/equipment maintenance building, concrete delivery trucks, concrete batching equipment, and sand and gravel stockpiles.

4.15.1 Surface Soils

All areas outside of the building were paved with concrete or were inaccessible due to the presence of concrete batch plant equipment and ancillary materials. As a result, no surface soil samples for IA10 were collected with the exception of one surface soil sample at delineation boring A10SL-303. Boring location A10-013, located in close proximity to the eastern property line for IA10, had an SOR > 1 so delineation boring locations A10SL-301, A10SL-302, and A10SL-303 were performed. In order to achieve the required offset from boring location A10SL-013, boring location A10SL-303 fell just east of the eastern property line of IA10 (i.e., just within the limits of A05A). Because A10SL-303 was a delineation boring for A10SL-013, the decision was made to keep the A10SL-303 soil data associated with IA10.

Data Evaluation

Two surface soil samples were collected in IA10. Table 3-42 lists the surface soil samples analyzed by onsite gamma spectroscopy. Table 3-43 lists the surface soil samples analyzed at the offsite laboratory. Surface soil sample locations are shown on Figure 3-10.

Table 4-147 lists analytical results for radiological COPC concentrations in the IA10 surface soil samples. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-148 lists the SOR for the IA10 surface soil samples. The SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Both IA10 surface soil samples were analyzed for ^{226}Ra. The results for the IA10 surface soil sample was not greater than the ^{226}Ra background concentration. The GFPC result, (0.65 ± 0.19) pCi/g, indicated that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. The ^{226}Ra concentrations for the IA10 surface soil samples are about the same as the ^{226}Ra background concentration and are less than the ^{226}Ra screening level plus background concentration.

Both IA10 surface soil samples were analyzed for ^{228}Ra. The results for the IA10 surface soil samples were not greater than the ^{228}Ra background concentration. The GFPC result, (0.5 ± 0.3) pCi/g, indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. The ^{228}Ra concentrations for the IA10 surface soil sample are about the same as the ^{228}Ra background concentration and are less than the ^{228}Ra screening level plus background concentration.

One IA10 surface soil samples was analyzed for ^{228}Th. The result was not greater than the ^{228}Th background concentration. The alpha spectroscopy result indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. The ^{228}Th concentration for the IA10 surface soil sample, (0.55 ± 0.17) pCi/g, is about the same as the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

One IA10 surface soil sample was analyzed for ^{230}Th. The alpha spectroscopy result was not greater than the ^{230}Th background concentration. The ^{230}Th alpha spectroscopy result indicated that ^{230}Th was not in secular equilibrium with its ^{234}U precursor, which implies that some of the uranium in this sample was due to MED/AEC support operations. The ^{230}Th concentrations for the IA10 surface soil sample, (0.47 ± 0.16) pCi/g, is about the same as the ^{230}Th background concentration and is less than the ^{230}Th screening level plus background concentration.

Both IA10 surface soil samples were analyzed for ^{232}Th. None of the results indicated that ^{232}Th was present in the surface soil samples at a concentration greater than the ^{232}Th background concentration. The greater ^{232}Th surface soil result, (0.61 ± 0.18) pCi/g, is about the same as the ^{232}Th background concentration and is less than the ^{232}Th screening level plus background concentration.

One IA10 surface soil sample was analyzed for ^{234}U. The alpha spectroscopy result for A10SL-303-01 indicated that ^{234}U was present at a concentration greater than the ^{234}U background concentration and was in secular equilibrium with its ^{238}U precursor. The ^{234}U concentration, (1.5 ± 0.3) pCi/g, is about 2.5 times greater than the ^{234}U background concentration and is less than the ^{234}U screening level plus background concentration. The ^{234}U concentration in sample A10SL-302-01 was at background levels.

Both IA10 surface soil samples were analyzed for ^{235}U. The alpha spectroscopy result for A10SL-303-01 indicated that ^{235}U was present at a concentration greater than the ^{235}U background concentration. The ^{235}U concentration, (0.11 ± 0.07) pCi/g, is about 3.7 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration. The ^{235}U concentration in sample A10SL-302-01 was at background levels.

Both IA10 surface soil samples were analyzed for ^{238}U. The alpha spectroscopy result for A10SL-303-01 indicated that ^{238}U was present at a concentration greater than the ^{238}U background concentration. The ^{238}U concentration by alpha spectroscopy, (1.6 ± 0.3) pCi/g, is about 2.0 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration. The ^{238}U concentration in sample A10SL-302-01 was at background levels.

Summary

Table 4-148 shows that both IA10 samples have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-147, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.15.2 Subsurface Soils

Data Evaluation

Thirty-two subsurface soil samples were analyzed for COPCs in IA10. Table 3-44 lists the subsurface soil samples analyzed by onsite gamma spectroscopy. Table 3-45 lists the subsurface soil samples analyzed at the offsite laboratory. Soil boring locations are shown on Figure 3-5.

Table 4-149 lists analytical results for radiological COPC concentrations in subsurface soil samples for IA10. COPC concentrations relative to average Guterl Site background are presented in graphical format in Figures 4-7 through 4-28.

Table 4-150 lists the SOR for IA10 subsurface soil samples. SOR are presented in graphical format in Figure 4-2, Figure 4-4, and Figure 4-6.

Eleven IA10 subsurface soil samples were analyzed for ^{226}Ra. One of the 11 GFPC results but not the single offsite gamma spectroscopy result for IA10 subsurface soil samples was greater than the ^{226}Ra background concentration. The results for all samples for which data were available for comparison indicate that ^{226}Ra was in secular equilibrium with its ^{230}Th precursor. Sample A10SL-006-01 contained the greatest ^{226}Ra concentration for IA10 subsurface soil samples, (1.4 ± 0.3) pCi/g, which is about 1.4 times the ^{226}Ra background concentration and is less than the ^{226}Ra screening level plus background concentration.

Eleven IA10 subsurface soil samples were analyzed for ^{228}Ra. Two of the 11 GFPC results but not the offsite gamma spectroscopy result for IA10 subsurface soil samples were greater than the ^{228}Ra background concentration. The results for all samples for which data were available for comparison indicated that ^{228}Ra was in secular equilibrium with its ^{232}Th precursor. Sample A10SL-013-02 contained the greatest ^{228}Ra concentration for IA10 subsurface soil samples, (1.7 ± 0.3) pCi/g, which is about 2.4 times the ^{228}Ra background concentration and about the same as the ^{228}Ra screening level plus background concentration.

Twenty-three IA10 subsurface soil samples were analyzed for ^{228}Th. Two of the 23 alpha spectroscopy results were greater than the ^{228}Th background concentration. All samples for which data were available for comparison indicated that ^{228}Th was in secular equilibrium with its ^{228}Ra precursor. Sample A10SL-013-01 contained the greatest ^{228}Th concentration for IA10 subsurface soil samples, (1.5 ± 0.3) pCi/g, which is about 1.8 times the ^{228}Th background concentration and is less than the ^{228}Th screening level plus background concentration.

Twenty-three IA10 subsurface soil samples were analyzed for ^{230}Th. Three of the 23 alpha spectroscopy results were greater than the ^{230}Th background concentration. The alpha spectroscopy results for five of the 24 alpha spectroscopy samples indicated that the ^{230}Th in each of these samples was not in secular equilibrium with all of the ^{234}U in the sample, which implies the presence of MED/AEC uranium (if none of the uranium present was due to MED/AEC support operations, then the ^{230}Th concentration likely would be about the same as the ^{234}U and ^{238}U concentrations). Sample A10SL-007-01 contained the greatest ^{230}Th concentration for IA10 subsurface soil samples, (1.6 ± 0.3) pCi/g, which is about 1.8 times the ^{230}Th background concentration and less than the ^{230}Th screening level plus background concentration.

All 32 IA10 subsurface soil samples were analyzed for ^{232}Th. Two of the 23 alpha spectroscopy results, neither of the offsite gamma spectroscopy results, and nine of the 34 onsite gamma spectroscopy results indicated that ^{232}Th was present in subsurface soil samples at a concentration greater than the ^{232}Th background concentration. Sample A10SL-013-01 and sample A10SL-013-02 contained the greatest ^{232}Th subsurface soil concentration, (3.9 ± 0.4) pCi/g and (3.9 ± 0.5) pCi/g, respectively, which is about 6 times the ^{232}Th background concentration and is more than twice the ^{232}Th screening level plus background concentration.

Twenty-three IA10 subsurface soil samples were analyzed for ^{234}U. Eleven of the 23 alpha spectroscopy results for IA10 subsurface soil samples indicated that ^{234}U was present at concentrations greater than the ^{234}U background concentration, and all were in secular equilibrium with the ^{238}U precursor. Sample A10SL-013-02 contained the greatest ^{234}U concentration, (4.4 ± 0.6) pCi/g, which is more than 6 times the ^{234}U background concentration and is less than the ^{234}U screening level plus background concentration.

Twenty-three IA10 subsurface soil samples were analyzed for ^{235}U. One of the 23 alpha spectroscopy results but not the offsite gamma spectroscopy result for IA10 subsurface soil samples indicated that ^{235}U

was present at concentrations statistically greater than the ^{235}U background concentration. Sample A10SL-301-01 contained the greatest ^{235}U concentration, (0.23 ± 0.11) pCi/g, which is more than 7 times the ^{235}U background concentration and is less than the ^{235}U screening level plus background concentration.

All 32 IA10 subsurface soil samples were analyzed for ^{238}U. Twelve of the 23 alpha spectroscopy results and 22 of the 32 onsite gamma spectroscopy for IA10 subsurface soil samples indicated that ^{238}U was present at concentrations greater than the ^{238}U background concentration. Sample A10SL-013-02 and sample A10SL-301-01 contained the greatest ^{238}U concentrations, (5.2 ± 1.5) pCi/g and (5.2 ± 1.2) pCi/g, respectively, which is more than 6 times the ^{238}U background concentration and less than the ^{238}U screening level plus background concentration.

Summary

Table 4-150 shows one sample with an SOR that, more likely than not, is greater than 1 [that is, $S > 1$ and $(S - 2\sigma) < 1$].

One location has an SOR that, more likely than not, is less than 1 [that is, $S < 1$; $(S + 2\sigma) > 1$].

The remaining 30 locations have SOR clearly less than 1 [that is, $(S + 2\sigma) < 1$)].

^{226}Ra and ^{228}Ra, shown in Table 4-149, occur at concentrations similar to or less than the concentrations of their immediate precursors. This suggests that the radium concentrations are in secular equilibrium with their immediate precursors in their respective decay chains.

4.15.3 Surface Water (Native)

Based on historical information, the occurrence of native surface water in IA10 was not anticipated and therefore no native surface water samples were planned for IA10. Native surface water was not observed within IA10 during the RI, and no native surface water samples were collected.

4.15.4 Sediment (Native)

Based on historical information, the occurrence of native sediment in IA04A was not anticipated and therefore no native sediment samples were planned for IA04A. Native sediment was not observed within IA04A during the RI, and no native sediment samples were collected.

4.15.5 Groundwater

Based on an assessment of historical groundwater elevation data, IA10 was expected to be on the upgradient side of the Guterl Site. Preliminary groundwater elevation data collected during the RI confirmed the prior data. Given that the IA10 property was not owned or used by Simonds during the period of MED/AEC support operations, and that the property was upgradient of the Guterl Site, no groundwater monitoring wells were installed and no groundwater samples were collected within IA10.

Given that the direction of groundwater flow is from northwest to southeast in the area of IA10, groundwater data collected in IA05B and the northern perimeter of IA03 are considered representative of groundwater conditions at IA10. Based on these data, and the absence of subsurface soil contamination within the footprint of IA10, groundwater at IA10 is not considered to have been impacted by MED/AEC support operations.

5.0 CONTAMINANT FATE AND TRANSPORT

An evaluation of the fate and transport of constituents at the Guterl Site was performed to identify the mechanisms and pathways by which radionuclides present at the Guterl Site could be released from their current locations, move through environmental media, and potentially impact human and ecological receptors. This evaluation is based on the current Guterl Site configuration, past and present Guterl Site activities, and other information provided in the first four sections of this RI Report, the FSP (USACE, 2007a), and documents from other Guterl Site investigations. As introduced in Section 2.4 and shown on Figure 2-14, a CSM that illustrates potential transport paths has been developed for the Guterl Site. Offsite migration of COPCs has not been documented but is considered possible due to elevated activities in shallow bedrock groundwater near the Guterl Site boundary (e.g., uranium at MW-604D). That is, if offsite migration of COPCs is occurring, shallow bedrock groundwater flow is the most likely transport mechanism. This section describes the physical and chemical processes that affect the migration of COPCs at the Guterl Site. The two primary factors that influence constituent release and migration are:

- Physical and chemical properties of the contaminants, and
- Physical characteristics of the Guterl Site including topography, vegetative cover, geology, hydrology, and climate.

These two factors are addressed in the following subsections and represent important input parameters in the identification of exposure pathways for potential human and ecological receptors in the BRA. The HHRA is presented in Section 6 and the SLERA is presented in Section 7.

5.1 Introduction – Site-Related Constituents

The initial list of COPCs was presented in the DGAR (USACE, 2006a; Section 2.4) and consisted of ^{234}U, ^{235}U, ^{238}U, and ^{232}Th. During the development and review of project plans, additional site-specific COPCs were identified and are addressed within this RI Report. These additional radiological isotopes are thorium isotopes ^{228}Th and ^{230}Th and radium isotopes ^{226}Ra and ^{228}Ra. These isotopes were added to the COPC list as key daughter products of the initial COPC list and as potential impurities in the raw materials processed at the Guterl Site to fulfill risk assessment needs. Therefore, for this RI, the COPC list consists of:

Uranium isotopes (^{234}U, ^{235}U, and ^{238}U)
Thorium isotopes (^{228}Th, ^{230}Th, and ^{232}Th)
Radium isotopes (^{226}Ra and ^{228}Ra).

In addition to being identified as COPCs, each of these isotopes is a naturally occurring radioisotope in the environment. As a result, each COPC was detected at some level in Guterl Site surface soil, subsurface soil, groundwater, surface water, sediment, and building materials. Elevated levels of uranium and thorium attributable to historical operations involving MED/AEC-related COPCs were detected in Guterl Site surface soil, subsurface soil, non-native surface water and sediment, groundwater, and building materials; elevated levels of radium were found only where parent radionuclides were present at elevated levels. Elevated levels of MED/AEC-related COPCs were not noted in native surface water or sediment.

5.2 Potential Sources and Routes of Migration

The original source of radionuclides at the Guterl Site was the rolling mill operations. Historical Site operations are discussed in Section 2.1. The dust and debris generated by these operations directly impacted the building surfaces and surface soil, which are considered the source media. From these source media, COPCs may be dispersed and migrate to nearby surface soil, subsurface soil, groundwater, and surface water/sediment. Building materials are stationary parts of buildings and

typically would only be transported as part of demolition work. Migration pathways for other media are discussed below.

5.2.1 Soil Migration Pathway

Migration pathways for soil include: land disposal/disturbance; wind erosion/deposition; surface water runoff and transport through storm sewers; infiltration of water through surface and/or subsurface soil to groundwater and contaminant leaching; and, sediment transport.

Land disposal/disturbance was likely an important migration pathway during past operations. Through this mechanism, surface and subsurface soil came into contact with waste products containing COPCs. The upper soil layer within the operational area of the Guterl Site is designated as fill, which attests to the land disposal and disturbance that occurred. As described in Section 2.2.3.2.2, where present the fill material ranges from 0.2 to 9.25 ft in thickness except for the Landfill, where thicknesses of up to 15.6 ft occur. The fill material is reported to consist predominantly of production and miscellaneous plant wastes containing coal, ash, coke, and brick.

Land disposal/disturbance would result in exposure of underlying native soil to COPCs. Where the native soil was thin or nonexistent, the bedrock surface and bedrock groundwater may have been exposed, as well (see Figure 2-2, Section 2.2.3.2.2, and cross-section Figures 2-4 through 2-9). Groundwater could also be exposed by leaching of radionuclides from surface soil through subsurface soil (see Section 2.2.4.2 and Figure 4-15).

Land disturbance would remove vegetation thereby promoting wind erosion/deposition and loose soil could be more easily transported by surface water runoff. Eroded soil could move to other areas of the Guterl Site, enter storm sewers, or be deposited in surface water as sediment. Sediment in the Erie Canal may be periodically dredged and transported to a disposal location. When sampled, the sediment in the Erie Canal was only a few inches thick and mean values were below applicable standards. Currently, the relatively flat nature of the Guterl Site coupled with a protective covering of asphalt, concrete, and vegetation greatly diminishes possible radionuclide transport through soil erosion.

5.2.2 Water Migration Pathway

Groundwater concentrations of COPCs, while small in most cases, indicate these constituents have been transported from source materials to groundwater. Transport of COPCs via groundwater is greatly affected by geochemical conditions, as described in the following sections. Under some conditions, COPC transport by groundwater is minimized due to adsorption and precipitation (discussed in Section 5.4).

As described in Section 2.2.4.2, groundwater at the Guterl Site occurs in the fractured dolostone bedrock. Observations of groundwater levels from previous investigations and those discussed in Section 2.2.4.2 indicate groundwater flow is mainly toward the Erie Canal with a component of flow to the southwest due to dewatering associated with a dolostone quarrying operation. Water pumped from the quarry is discharged to the Erie Canal, which is the main surface water feature associated with the Guterl Site.

The Guterl Site is not located in a 100-year or 500-year floodplain and no New York State or federal regulated wetlands have been identified at the Guterl Site (see Figure 2-11). The Guterl Site does not contain any ponds or streams and has no visible natural connection to other surface water bodies, including the Erie Canal located south-southeast of the Guterl Site. However, historic documents indicate that a cooling water intake and an oil/water separator were located in close proximity to the Erie Canal, and overflows from the oil/water separator may have reached the Erie Canal.

Surface water has been observed to occur at the Guterl Site as stormwater runoff or as standing water resulting from undeveloped stormwater drainage patterns. Areas of standing water are subject to

evaporation or infiltration. There are several low-lying areas in undeveloped or abandoned portions of the Guterl Site that may be classified as localized and/or ephemeral wetlands as described in more detail in Section 2.2.6.2. Briefly, the low-lying area south-southwest of the Landfill (IA03) is occasionally wet and dominated by common reed. The central portion of IA04 contains several linear wetland areas associated with drainage swales that are present between buildings. Also, several small ephemeral wetlands are located within IA05.

Stormwater runoff in the area of the operating facility is directed to a network of combined storm and sanitary sewers via surface swales and catch basins. Figure 2-12 presents a summary of known stormwater catch basins and storm sewer locations as determined through interviews with plant personnel and RI inspections. Storm water that falls within the buildings of the Excised Area is not considered to be subject to runoff but can evaporate or infiltrate within and around the building footprints, depending on roof and floor conditions.

5.2.3 Air Migration Pathway

Uranium dust was generated by historical operations. This dust may have been dispersed through the ventilation systems (USACE, 2006a) and may exist as particles in surface soil. This section discusses the expected subsequent air migration pathway.

The potential for displacement of constituents by the wind (fugitive dust emissions), with subsequent transport in the air as particulate material, is present where soils are directly exposed to the wind. The particulate size, moisture content, degree of vegetative cover, degree of soil disturbance, and other factors, as well as wind speed, direction and persistence determine the rate of dust emissions (Singh, 1999). Fugitive dust emission potentials are highest in hot and dry conditions and may be persistent or short term during intrusive activities such as construction or other activities involving vehicles (e.g., trucks and dirt bikes).

Prevailing winds in the area are from the west or southwest (NOAA, 2008a). Niagara County has an August low of 9.7 miles per hour (mph) and a January high of 14 mph. Based on the averages of the monthly average wind speed, the average annual wind speed is 11.85 mph. This is slightly higher than the national average. Four tornadoes were reported in Niagara County from 1950 through April 2008; all were category 1 or less. The probability of a severe damaging tornado is extremely low for the Guterl Site. Additional meteorological information on Niagara County is presented in Section 2.2.2.

Wind erosion does not play a significant role with respect to COPC sources within the buildings due to the protection from wind afforded by the buildings. In addition, wind erosion is not considered to be a significant mechanism for contaminant releases from outdoor areas of the Guterl Site for several reasons. Much of the Guterl Site is covered with asphalt or concrete, thus providing a cap to underlying contaminated soils, if present. Unpaved, undeveloped areas of the Guterl Site support at least some degree of vegetation, thus protecting the soil from the shearing effects of the wind and limiting the effect of particle transport by saltation. The duration that surface soils in the area are frozen or covered by snow also limits fugitive dust generation during those periods. The relatively low wind speeds and relatively high humidity during non-winter seasons in this area allows surface soil to stay relatively moist, also limiting the amount of fugitive dust generation.

5.3 Chemical and Physical Characteristics of Radiological Constituents

The COPCs at the Guterl Site are radioactive isotopes of thorium, radium, and uranium. However, the long half-lives of most of these radionuclides (particularly the uranium isotopes and ^{232}Th with half-lives of millions to billions of years) result in insignificant reductions in their concentrations from radioactive decay over an observable period of time.

Transport by groundwater is an important potential migration pathway for the COPCs. The solubility and mobility of uranium, thorium, and radium in groundwater are affected by a number of processes, as summarized below and discussed in Section 5.4.

Thorium. Thorium is a metallic element of the actinide series and exists in several isotopic forms. ^{232}Th comprises 99.99% of the naturally occurring thorium. The isotope ^{230}Th is produced during the decay of naturally occurring ^{238}U; ^{228}Th is produced during the decay of ^{232}Th. Thorium has a single oxidation state (Th^{4+}).

Thorium can occur in a variety of compounds. Water-soluble thorium compounds include chloride, fluoride, nitrate, and sulfate salts. Insoluble thorium compounds include the dioxide, carbonate, hydroxide, oxalate, and phosphate salts. Although specific details associated with the thorium metal rolling process were not located in the data and records search, it is assumed the procedure followed the same steps as the uranium metal rolling process (see Uranium subheading, below). Therefore, the most common forms expected at the Guterl Site are oxides. It is important to note that the mass of thorium steel handled at the Guterl Site was estimated at 30,000 to 40,000 pounds, as compared to 25 million pounds or more of uranium steel. As a result, the occurrence of thorium contamination at the Guterl Site is likely to be proportionately less.

In water, thorium is likely present in suspended matter and sediment; the concentrations of dissolved thorium are typically small. In most cases, thorium remains strongly sorbed to soil and its mobility will be limited. However, leaching into groundwater is possible in some soils with low sorption capacity and the ability to form soluble complexes. The presence of ions or ligands, such as humic matter, that can form soluble complexes with thorium may increase its mobility in soil. The contamination of groundwater through the transport of thorium from soil to groundwater will not occur in most soils, except soils that have low sorption characteristics. Chelating agents produced by certain microorganisms present in soil may enhance the dissolution of thorium in soils (Agency for Toxic Substances and Disease Registry (ATSDR), 1990a).

Radium. Radium is a naturally occurring metal that is almost ubiquitous in low concentrations in the environment. It is constantly being produced by the radioactive decay of its precursors, uranium and thorium. The isotope ^{226}Ra is produced from ^{230}Th during the decay series beginning with naturally occurring ^{238}U; ^{228}Ra is produced during the decay of ^{232}Th. However, the half lives of ^{238}U and ^{232}Th are a billion years or more and the most elevated concentrations of radium occurred in the background groundwater sample (MW-600D). This indicates that radium is likely from an offsite source or naturally occurring.

The valence of radium is 2+ and as an alkaline earth element, it acts similarly to barium. Radium may be readily adsorbed by earth materials and is usually not a mobile constituent in the environment. Radium is degraded through radioactive decay. The half-life of ^{226}Ra is 1,600 years; the half-life of ^{228}Ra is 6.7 years.

Radioactive decay of radium produces radon gas. ^{222}Rn (half-life of 3.8 days) is a decay product of ^{226}Ra, and ^{220}Rn (half-life of 56 seconds) is a decay product of ^{228}Ra. A relatively small percentage of this gas (typically no more than 10 to 20 percent) is released into the spaces between the grains of soil, and can diffuse towards the surface. Soil moisture greatly retards radon diffusion, and essentially all of the radon gas produced in the contaminated soil will undergo radioactive decay prior to reaching the surface. The relatively low concentrations of radium in soil, relatively high moisture content in the soil, and short half-lives of radon isotopes (in particular for ^{220}Rn) would be expected to result in very low releases of radon gas from the Guterl Site.

Uranium. Uranium can occur in a variety of compounds including oxides, fluorides, carbides or carbonates, silicates, vanadates, and phosphates, and its chemical form strongly influences its

abundance in groundwater. Based on the history of the Guterl Site, uranium was originally brought to the plant for processing as uranium metal ingots[33]. The ingots were heated, initially in a gas furnace then later in a lead bath, prior to milling. The heating method was changed to decrease airborne radioactivity caused by the uranium oxide dust generated by gas furnace heating. Heating in the combustion gas atmosphere resulted in a reported 0.5 percent of the uranium billet being converted to an oxide. An attempt to process ingots by forging was discontinued due to the large amount of dust generated.

In the early phases of operation, uranium was lost in the forms of dust, uranium metal shavings, slag, or dross skimmed from the lead bath furnace. As much as 1.5 pounds of radioactive material were discharged into the atmosphere through the ventilation system per work hour. Later, dust control consisted, at various times, of different ventilation systems and filters, broom sweeping, and central vacuum cleaning. The dust from the operations, along with metal scrap, were collected and shipped out for reprocessing (NIOSH, 2005). However, loss of uranium continued throughout the period of uranium milling due to poor housekeeping practices.

A coating of uranium oxide forms readily on uranium metal and oxidation increases during heating as temperature is increased. Uranium oxide is typically present as UO_2 or U_3O_8. UO_2 slowly converts to U_3O_8 at ambient air temperatures (Argonne National Laboratories, undated).

Uranium in UO_2, is present in the reduced, tetravalent (U^{4+}) form. UO_2 has exceedingly low solubility (approximately 1×10^{-26} µg/L at pH 7 [Mullen, 2007]) and therefore, low mobility in water. Hexavalent uranium (U^{6+}), which dissolves more readily than U^{4+}, is capable of reaching concentrations that exceed the groundwater screening level of 30 µg/L. In U_3O_8, uranium is present as the more oxidized species U^{4+}/U^{6+}; in water uranium is present mainly as U^{4+} or U^{6+}. U_3O_8 also has low solubility in water; however, the solubilities of U_3O_8 and UO_2 vary depending on geochemical conditions (redox conditions, pH) and the presence of other constituents, such as calcium, carbonate, humic substances, and other redox-sensitive species (for example, iron and manganese). Carbonate ions, in particular, form complexes with uranium and increases its solubility (see also Section 5.4.2).

5.4 Chemical Partitioning and Attenuation Mechanisms of COPCs

5.4.1 Advection and Dispersion

Advective transport is the movement of solutes, such as thorium, radium, and uranium, by the bulk movement of groundwater. Advection is often the most important process driving dissolved contaminant migration in the subsurface, particularly in aquifers with relatively high hydraulic conductivities. The bedrock aquifer at the Guterl Site is dolostone. The geometric mean of locally measured hydraulic conductivities for the dolostone bedrock is 5×10^{-3} cm/sec; therefore, advection is expected to be an important transport mechanism.

Solute transport by advection alone yields a sharp contaminant concentration front. However, at the Guterl Site, contaminant transport is controlled by fractures, jointing, fissures, and dissolution cavities/channels. Also, there may be several sources of contamination which each result in a plume. For example, elevated uranium measured at soil location A03SL-035 may be a source of elevated groundwater in well MW-18 and elevated uranium measured at soil location A04ASL-031 may be the source of elevated groundwater in well MW-605D.

The advancing plume front spreads due to dispersion and diffusion and is retarded by adsorption, precipitation, or both. The geometric mean hydraulic conductivity for the Guterl Site is 5×10^{-3} cm/sec, which is three orders of magnitude greater than typical dispersivity or diffusion values. Therefore, advection is expected to be orders of magnitude greater than dispersion and diffusion, which usually have rates in the range of 1×10^{-6} cm/sec.

[33] The terms billet and ingot are used interchangeably in this section.

5.4.2 Dissolution and Precipitation

Depending on geochemical conditions, thorium, radium, and uranium may dissolve from a solid (mineral) phase and move into the aqueous phase. Solubility provides an upper limit to the concentration of a constituent that can be present in water.

Thorium has low solubility (Hem, 1989) so little dissolution is expected. At the Guterl Site, the most elevated ^{230}Th activity in a filtered sample was 0.98 ± 0.32 pCi/L (4.7e-5 µg/L mass concentration), which occurred at well MW-26; the corresponding unfiltered sample activity was 0.64 ± 0.26 pCi/L (3.1e-5 µg/L mass concentration). The most elevated ^{232}Th activity, on a weighted average basis[34], occurred at two locations (0.07 ± 0.12 pCi/L at MW-13D and 0.07 ± 0.10 pCi/L at MW-602D); the corresponding mass concentration (without uncertainty) is 0.64 µg/L. These mass concentrations are within the expected thorium solubility range of 0.01 to 1 µg/L in natural fresh water (USEPA, 1999a).

Radium behaves similarly to barium and may precipitate as a carbonate or sulfate. Radium can substitute for calcium in gypsum or calcite or for barium in barite. Radium sulfate, gypsum, and barite have low solubilities under oxidizing conditions but are soluble under sulfate-reducing conditions. However, sulfate-reducing conditions do not exist at the Guterl Site based on groundwater data for sulfate. Calcite is soluble under acidic conditions, but groundwater pH values at the Guterl Site have been observed to be near neutral or above (6.6 or greater). The slightly elevated radium observed in groundwater at upgradient well MW-600D (Table 3-35) may be due to industrial sources, such as limestone (mainly consisting of calcite) at the cement batch plant or road salt (which may contain a small amount of barite) at the nearby New York State Department of Transportation maintenance yard. The groundwater concentration is below the ^{226}Ra-^{228}Ra combined standard of 5 pCi/L.

Uranium mobility is limited under reducing conditions because U^{4+} tends to precipitate (Section 5.3). Under oxidizing conditions, U^{6+} mobility depends on the pH and other constituents present in groundwater. The form, or oxidation state, of uranium can change depending on the geochemical environment, although under ambient soil/groundwater conditions there is more evidence for reduction of U^{6+} to U^{4+} then the reverse reaction (Mullen, 2007). Treatment during heating and milling and possibly exposure to the atmosphere of the uranium oxide dust resulted in oxidization and likely transformation to the more soluble U^{6+}form. However, in settings with substantial organic material (and microbial activity under anaerobic soil conditions), the reduced state may be expected to be reestablished. Reduced forms can precipitate from soil pore water and adhere to soil, thereby limiting migration to groundwater.

Oxidizing conditions in groundwater and the presence of the cation calcium as well as carbonate or other anions increase uranium mobility (Zachara, et al., 2007; and Fox, et al., 2006). Since Guterl Site groundwater occurs in dolostone, carbonate is available to form uranium complexes that migrate readily in groundwater. When the soil is acidic or basic (pH of 4 or less, or 8 or higher), uranium has a higher solubility compared to soils with a pH of 6. At more elevated pH values, such as occur at the Guterl Site, U^{6+} tends to form complexes with carbonates and hydroxides. These complexes increase the presence of dissolved uranium. At acid pH values, uranium mobility may increase due to the lack of adsorption to iron oxyhydroxide minerals, which are unstable at low pH values.

If in contact with soil containing organic material, uranium would likely be less soluble and therefore, less mobile. However, there is evidence that uranium complexes with organic ligands and these complexes are mobile in soil or groundwater (Francis, 2002; Crancon and van der Lee, 2003). TOC in soil at the Guterl Site was measured in 7 surface soil (0 to 6 inch depth) and 6 subsurface soil (variable within 7 to 19 inch depth) samples. Samples were obtained from various soil types across the Guterl Site and TOC results ranged from 0.6 percent to 14.4 percent. Concentrations are greater in the upper 6 inches of soil

[34] A weighted average approach was taken for evaluating the ^{232}Th data to minimize the effects of colloidal interferences commonly seen in highly weathered and fractured bedrock aquifers for unfiltered samples. In addition, for wells that have higher filtered values versus unfiltered values, simple test interferences can be a concern, especially at the low levels for COPCs in groundwater.

or fill and would potentially inhibit dissolution of uranium oxide, if it occurred in contact with the TOC. However, the presence of uranium in groundwater indicates that this mechanism has not effectively inhibited transport of uranium from soil to groundwater. Additionally, U^{6+} in deeper soil or areas without TOC would be more subject to dissolution, particularly if in contact with dolostone fragments.

Field measurements of dissolved oxygen and redox can be used in evaluating whether oxidizing or reducing conditions exist in groundwater. However, instrumentation for these field measurements is difficult to calibrate. Figure 5-1 shows that field measurements of dissolved oxygen and redox do not correlate for the events shown (see Table 4-136). The lack of correlation lessens confidence that the measurements are diagnostic for determining redox conditions. Therefore, additional parameters were evaluated, where available, to evaluate groundwater conditions.

Table 5-1 lists uranium and alkalinity concentrations at the Guterl Site as well as values for indicators of redox conditions. The bacterial removal of oxygen proceeds from the most readily available source (dissolved oxygen) to oxygen bound to constituents in the general order nitrate, manganese (IV), uranium (VI), iron (III), molybdenum (VI), and sulfate (Mullen, 2007). Concentration decreases for dissolved oxygen, nitrate, and sulfate indicate reducing conditions, as do increases in dissolved manganese, iron, and molybdenum. Similar concentrations of unfiltered (total) and filtered (dissolved) metals (manganese, iron, and molybdenum) indicate that the metal is mostly dissolved. If a filtered metal concentration is considerably less than the unfiltered concentration, the excess unfiltered metal concentration is considered to be present as particulates, indicating conditions are likely oxidizing enough for that metal to be present as an oxide, hydroxide, or oxyhydroxide.

As indicated by data in Table 5-1, total and dissolved concentrations of manganese and molybdenum were mostly similar, indicating these constituents dominantly are present as dissolved. There are substantial differences, however, between total and dissolved concentrations of iron in some groundwater samples, indicating iron-reducing conditions have not been sufficiently reached in those areas of the Guterl Site. Sulfate was detected at locations where analyzed, indicating conditions are not sulfate reducing. Therefore, conditions at the Guterl Site appear to vary from oxidizing (nitrate present) to at least nitrate reducing (nitrate not present). Uranium reduction from U^{6+} to U^{4+} occurs after nitrate and manganese (IV) reduction.[35] Therefore, uranium as U^{6+} would be expected in wells with detected nitrate.

As indicated, uranium exceedances of the groundwater standard (30 µg/L) occur at wells with nitrate concentrations of 0.5 milligrams per liter (mg/L) or more. The apparent oxidizing environment, along with the presence of bicarbonate alkalinity, provides geochemical conditions favorable for uranium to be dissolved in groundwater.

Geochemical conditions are indicated spatially on Figure 5-2 based on the data in Table 5-1. However, geochemical conditions of the groundwater may change as groundwater levels fluctuate (refer to Section 4.12 and Table 2-4). Dissolved oxygen and field redox data (ORP) in Table 4-136 indicate that increases in water levels were accompanied by changes in groundwater conditions from reducing to oxidizing. Uranium present as U^{4+} in soil may be oxidized to U^{6+} under such seasonal fluctuations, resulting in more soluble uranium being present and available for transport by groundwater.

Figures 5-3 and 5-4 provide additional information about geochemical conditions. The two graphs compare total iron vs. total uranium (i.e., unfiltered) and dissolved iron vs. dissolved total uranium (filtered). The wells with the highest iron concentrations are the perimeter wells, where nitrate reducing conditions are observed (except MW-16). The lowest iron concentrations are observed where oxidizing conditions are observed (in the center of the Guterl Site, i.e., MW-4, MW-601D, MW-604D, MW-605D, MW-602D, etc). The higher total uranium concentrations are observed at the oxidizing conditions

[35] Note that manganese is more commonly present as Mn(II) or Mn(III) in minerals and groundwater. Therefore, the presence of dissolved manganese is a relatively poor indication of the reductive condition of groundwater and the presence or absence of nitrate is used for this evaluation.

locations, as previously discussed. This is further supported in Figure 5-5, which shows that uranium concentrations were strongly correlated with nitrate concentrations in groundwater.

5.4.3 Sorption

Sorption can be an important mechanism controlling transport of thorium, radium, and uranium. The occurrence of adsorption varies depending on geochemical conditions and decreases under manganese- or iron-reducing conditions as oxide/hydroxide sorbents become unstable.

The K_d can be used to quantify adsorption. The K_d relates the concentration in the soil (solid phase) to that in the soil solution (water in the pore spaces between soil particles). This parameter can indicate the relative mobility of a constituent and the concentration that could eventually be found in groundwater at a given site. The K_d is constituent- and setting-specific and can vary widely depending on geochemical conditions. An elevated K_d value indicates that the constituent is strongly associated with the soil/geologic material and little would be dissolved in groundwater.

Thorium and radium are adsorbed by iron and manganese minerals (ATSDR, 1990a; Smith and Amonette, 2006). Since oxide or hydroxide minerals are important sorbents, reductive conditions which destabilize these minerals will decrease adsorption. Adsorption of thorium is pH dependent. For the pH range of 5 to 8, K_d values ranging from 1,700 to 170,000 milliliters per gram have been reported (USEPA, 1999).

Adsorption of radium is highly dependent on pH and decreases rapidly at pHs of about 6 or less (Denham and others, 2005). For comparison, groundwater pH values at the Guterl Site range from about 6.8 to 9.0 (Table 4-136). Radium is more mobile in groundwater that has a high total dissolved solids content. Total dissolved solids in the Guterl Site groundwater is relatively low, however. K_d values for radium vary with soil type and are greater for silt and clay soils, such as occur at the Guterl Site, than for sand. K_d values ranging from 9,100 to 530,000 milliliters per gram were reported for silt and clay soils (USEPA, 2004). Once adsorbed to soils or sediments, radium may be partially resistant to removal. It is also likely that radium in water does not migrate significantly from the area where it is released or generated through decay (ATSDR, 1990b).

Uranium distribution coefficients reported in literature can vary by as much as four orders of magnitude. This variability is due to the dependence of adsorption on the soil moisture content, organic matter, mineralogy, and particle size, and solution pH, ionic strength, redox conditions, and chemical composition (Serne and others, 2002). Iron-containing minerals readily adsorb uranium and appear to dominant adsorption in soils (Barnett and others, 2000). Adsorption of uranium is also affected by its concentration; adsorption decreases and mobility increases as concentrations increase (Tokunaga and others, 2004).

Although not as important in some settings, uranium also adsorbs to clays and to manganese oxides and hydroxides. Adsorption to clay occurs because the small particles have more surface area than larger size particles. These fine particle are often coated with adsorptive minerals, such as iron oxyhydroxides. As a result, uranium mobility decreases in the presence of clays and surface coatings. Uranium is preferentially associated with the clay fraction rather than sands and can thus be less available in soil solutions where clays are present. Uranium also is less mobile in soils and rock having high TOC.

Changes in redox conditions caused by groundwater levels fluctuations can affect adsorption. Under oxidizing conditions, adsorption by iron and manganese oxides and hydroxides would be favored; however, under reducing conditions, these minerals may become unstable and adsorbed uranium would be released to groundwater where it may be reduced to less soluble U^{4+} or transported as U^{6+}.

Calcium and carbonate have been shown to inhibit adsorption of uranium (Tokunaga and others, 2004). In batch and column tests, U^{6+} adsorption by soils was demonstrated to be greatest between pH 5 and 7 and decrease sharply under lower and higher pH conditions. This affect was attributed to the typical

adsorption edge for cations (low pH range) and increased U^{6+} complexing with carbonate (high pH range) (Barnett ant others, 2000).

Site-specific K_d values were determined for the Guterl Site through laboratory tests of site soil. The K_d values were developed using the Guterl Site samples collected by USACE during April 2008. Native, uncontaminated soil had a uranium K_d of 1356 milliliters per gram (mL/g) based on the average value of three tests. This K_d value was elevated compared to Guterl Site fill material and bedrock samples, which may be caused by the presence of adsorptive iron oxyhydroxide minerals and clay. The tested sample was described as medium brown silty clay and native soil is often described as reddish silty clay or clayey silt. The brown or red coloration is typically indicative of iron oxyhydroxide soil coatings. Contaminated soil/fill had a uranium K_d of 39 mL/g, based on the average value of nine tests. The tested samples were described as medium brown silt with gravel. Therefore, the smaller K_d value may result from the larger grain size of the fill and lack of adsorptive clay and mineral coatings. It may also indicate that the adsorptive capacity of the material has been mostly used.

Bedrock had a uranium K_d of 0.22 mL/g, most likely due to its being dolostone (calcium/magnesium carbonate). As indicated above, the composition of the bedrock, particularly carbonate, would inhibit adsorption due to formation of uranium-carbonate complexes which promote mobility.

5.4.4 Summary of Attenuation Mechanisms at the Guterl Site

Thorium and radium concentrations in groundwater are likely controlled by their low solubilities in groundwater. Uranium solubility is dependent on its oxidation state. Although originally present as uranium metal, historical processing resulted in oxidation to U^{4+}, which has low solubility, and to more soluble U^{6+}. U^{6+} forms complexes with carbonate which can greatly increase uranium solubility in groundwater. While this increases uranium mobility, adsorption of uranium by iron oxyhydroxides and by clay decreases uranium mobility.

At the Guterl Site, the upper soil layer (fill) has relatively small adsorptive capacity but underlying native soil has a larger adsorptive capacity. Therefore, movement of uranium, even as U^{6+}, through the vadose zone to groundwater is limited by adsorption. Adsorption will be less effective under some conditions: where adsorptive capacity is exhausted, where native soil does not occur between fill and bedrock, or where fluctuating water levels result in groundwater movement into soil and especially into fill.

Once U^{6+} has entered groundwater, oxidizing conditions and the presence of carbonate would promote uranium transport by advective flow in the dolostone through fractures and dissolution channels. Where nitrate reducing (or possibly more reducing) conditions are encountered, U^{6+} may be reduced to the less mobile U^{4+} form and precipitate.

5.5 Transport Model

5.5.1 Description of Transport Model

To evaluate transport of uranium in groundwater, the unsaturated (vadose) zone model SESOIL was used. SESOIL was developed as a screening level model that uses less soil, chemical, and meteorological data than other, more complex models. The model uses actual climate data in the hydrological cycle predictions rather than a constant infiltration rate, which is common in other similar models. The SESOIL model can also accept constant evapotranspiration rates. The model output can include time-varying constituent concentrations at different soil depths and removal of the constituent from the soil column by surface runoff, percolation to groundwater, volatilization, and degradation. For this modeling, uranium was distributed between a dissolved, porewater phase and an adsorbed phase based on the assigned solubility and distribution coefficients.

Uranium solubility was determined using MINEQL+ (Schecher and McAvoy, 2003), a menu-driven version of MINTEQA2 which includes the USEPA MINTEQA2 database and additional species, including uranium. This version simplifies data input and generates graphic and other data displays.

The Hydrologic Evaluation of Landfill Performance (HELP) model is mainly used as an aid for design of landfill covers. For this application, HELP was used to generate groundwater recharge estimates. SESOIL also calculates groundwater recharge as part of the vadose zone transport modeling. The recharge results from the HELP model and RESRAD model (discussed in Section 6.3.4) were used to calibrate adjustable parameters in SESOIL to obtain a comparable infiltration rate.

The concentration in leachate, derived from the SESOIL model, is used as input to the saturated zone model, AT123D (Yeh, 1981), to compute a resulting concentration in groundwater beneath the modeled location. The AT123D model is used to predict resulting groundwater concentrations when pore water from the vadose zone mixes with water in the underlying aquifer. AT123D is an analytical groundwater transport model that computes the spatial-temporal concentration distribution of a constituent in the aquifer and predicts the transient spread of a chemical plume through an aquifer using advection, dispersion, adsorption, and decay. Because of the long half-lives for uranium species, only advection, dispersion, and adsorption were utilized.

The SEVIEW© (Schneiker, 2006) program, which links SESOIL and AT123D, was used for modeling. SEVIEW© is a menu-driven, integrated contaminant modeling system that simplifies transport and fate modeling by linking the SESOIL vadose zone model to AT123D.

5.5.2 Input Parameters to Transport Model

SESOIL: Input parameters for SESOIL were derived directly or indirectly from Guterl Site data and SESOIL guidance. Input parameters and their sources are listed in Tables 5-2, 5-3, and 5-4 and described in Appendix U.

For soil properties, Guterl Site data were used along with SESOIL guidance. Bulk density represents the weight of soil materials divided by the soil volume (including pore space) and was compiled from the average reported soil densities for each investigative area as determined from soil samples selected for onsite gamma spectroscopy analyses. The average bulk density for the site was used without sensitivity testing because the data were available and were within the range for silt soil recommended by the model. Also, bulk density is not listed by SESOIL guidance as among the sensitive parameters. Effective porosity is a measure of the connected pore space in soils that transmit water. Although the effective porosity was estimated as 0.0075 based on geotechnical analysis, a value of 0.20 was used for SESOIL based on the silty clay soil type, model guidance (Bonazountas and Wagner 1984), and model calibration (discussed in Section 5.5.3.1). The soil pore disconnected index relates soil permeability to soil moisture content; the value for this parameter is based on values recommended in SESOIL guidance for the soil type and calibration. Data for hydraulic conductivity and geotechnical evaluation indicate a value of approximately 1×10^{-6} cm/sec. This value is converted to intrinsic permeability, used by the SESOIL model, by multiplying by 1×10^{-5}. The intrinsic permeability was further adjusted during calibration so that recharge would more closely match that generated by the HELP and RESRAD models.

Adsorption (distribution) coefficients (K_d) used for modeling were based on laboratory tests of Guterl Site soil. For most SESOIL modeling, the more conservative value of 39 mL/g for contaminated soil (Section 5.4.3) was initially used because modeling focused on areas with impacted soil. However, to obtain movement of uranium to groundwater within the timeframe predicted by RESRAD, the K_d was reduced to 25 mL/g for all soil layers, both contaminated and uncontaminated.

As part of the SEVIEW software, climatic data are provided for a number of stations that collect meteorological data, including Lockport 2NE station. This station is located less than 5 miles east of the Guterl Site and at a similar elevation (518 ft above sea level). The SEVIEW software integrates the

appropriate meteorological data from the climatic data records. The input parameters for the climatic data include for each month: temperature, cloud cover, relative humidity, short wave albedo, evapotranspiration, precipitation, storm length, number of storms, and length of rainy season.

A generalized, three dimensional soil model was developed for the Guterl Site. This model was designed to be conservative and therefore applicable to the entire Guterl Site. The area of contaminated soil used for modeling was defined as 67,000 square meters, which is the approximate area of IA04A. The vadose zone soil was divided into an upper, contaminated zone one meter thick (considered fill) and lower, uncontaminated zone 0.3 meters thick (considered native till soil) based on generalization of data from borings.

MINEQL+: Uranium solubility in water, required as part of the SESOIL chemical input, was determined using MINEQL+. Table 5-5 lists Guterl Site groundwater data used for input, both as mg/L or µg/L and converted to molar concentrations or pe (for field redox measurements). Input parameters are described in Appendix U. Several MINEQL+ trial runs were made to determine factors having the most influence on uranium solubility. Elevated uranium concentrations are associated with oxidizing conditions (Section 5.4.2) and with elevated anion concentrations. For example, uranium concentrations were strongly correlated with nitrate concentrations in groundwater, as shown on Figure 5-5. This relation likely results because the presence of nitrate indicates oxidizing conditions are present, rather than formation of uranium-nitrate complexes. Uranium can form complexes with other anions, particularly carbonate, that increase uranium solubility. Therefore, groundwater at wells MW-602D and MW-605D, that represent these conditions and have elevated uranium, were modeled.

MINEQL+ model results (Table 5-6) indicate a maximum solubility of about 150 mg/L for uranium and this value was used as input for SESOIL modeling. This assumes that uranium is present as U^{6+}. As discussed in Section 5.4.2, uranium present as U^{4+} readily precipitates. This was confirmed for Guterl Site groundwater by modeling with MINEQL+ assuming reducing conditions and uranium present as U^{4+}. The model results were uranium present as a solid and not dissolved in groundwater.

Reducing conditions appear to occur at several wells with detected uranium in filtered groundwater (MW-2, MW-600D, and MW603D). Table 5-7 compares filtered and unfiltered analytical results for ^{238}U. Negative differences between unfiltered and filtered results indicate that activities were greater for filtered samples. This occurred for approximately half the analyses; however, small relative percent differences in most cases indicate variations are not significant. A 0.45 µm filter was used for uranium groundwater samples. Therefore, most ^{238}U detected in groundwater samples is present in the dissolved phase or possibly as particulates smaller than 0.45 µm. Since it does not appear that dissolved uranium is thermodynamically possible under reducing conditions, the detected uranium in filtered samples may represent uranium in small particulate (colloidal) form.

HELP: Input parameters used for the HELP model are listed in Tables 5-8 and 5-9 and described in Appendix U. The fill and native till soil layers were treated as “vertical percolation layers”. The input parameters were set to match those used in RESRAD.

HELP model results are provided in Table 5-9. For the site specific soil characteristics, groundwater recharge averaged 14.5 inches per year (in/yr) or 0.37 meters per year (m/yr). The HELP model results for groundwater recharge are sensitive to runoff (or how much surface is impervious), hydraulic conductivity, and porosity. HELP model sensitivity is discussed in Appendix U.

AT123D: SESOIL models the concentrations in pore water at the bottom of the vadose zone. To determine the concentration in groundwater, AT123D is used. The time-series concentrations developed by SESOIL are input to AT123D through the link in the SEVIEW software. Table 5-10 lists other AT123D model parameters and their sources. The values obtained by AT123D modeling were for a location at the top of the water table and directly centered below the uranium source in soil.

AT123D assumes a homogeneous porous medium. According to NYSDEC (2000b), the upper 10 to 15 ft of the Lockport Dolostone, which forms the bedrock at the Guterl Site, contains numerous horizontal and vertical weathered fractures, vugs and other solution features. Groundwater flow is principally in these vertical and horizontal bedding plane fractures. Therefore, the model assumes that the fracture flow paths act similarly to a homogeneous porous medium. Since the groundwater concentrations are only modeled directly below the source area and not downgradient, this assumption was considered to be acceptable. Additionally, hydraulic conductivity, effective porosity, and gradient were based on Guterl Site data.

5.5.3 Discussion of Modeling Results

The occurrence of uranium in groundwater indicates that uranium has migrated to groundwater. This may have occurred through groundwater recharge due to pore water transport through the vadose zone or by direct contact of contaminated material with groundwater due to soil disturbance and a fluctuating water table. SESOIL modeling and the parameters discussed in Section 5.5.2 were used to evaluate continued transport of uranium through vadose soils to the groundwater. This model was not used to evaluate whether uranium transport was occurring due to direct contact between contaminated soil and fluctuating groundwater.

5.5.3.1 Sensitivity Evaluation and Calibration

Unsaturated zone transport depends on vertical groundwater recharge to the water table from precipitation. Therefore, the initial step in modeling was a sensitivity evaluation of the groundwater recharge portion of the SESOIL model. Table 5-11 lists soil parameters evaluated and their impact on groundwater recharge, soil moisture, and other factors. As shown, a range of values for intrinsic permeability, soil disconnectedness index, effective porosity, soil bulk density, and vadose zone thickness were tested. The following conclusions can be made.

Intrinsic permeability: Groundwater recharge increased and less time was required for uranium in pore water to the reach groundwater when intrinsic permeability was increased. Figure 5-6 illustrates this trend for a range of intrinsic permeabilities and effective porosities. As shown, increasing the intrinsic permeability from 1×10^{-11} cm^2 to 1×10^{-9} cm^2 resulted in groundwater recharge increasing by over 20 in/yr.

Effective porosity: Groundwater recharge increased slightly (Figure 5-7), soil moisture increased (Figure 5-8), and less time was required to reach groundwater when the effective porosity was increased. When much smaller effective porosities (0.010 and 0.025) were modeled, the resulting soil moistures were only about 1 to 2.5 percent, which is considerably less than the average moisture in soil samples of about 15 percent. An effective porosity of 0.20 resulted in soil moistures in the range of 15 percent and therefore, was used to model uranium transport.

Soil disconnectedness index: The soil disconnectedness index relates wetting or drying time-dependent permeability of a soil to its saturated permeability and is a smaller value for clay and silt soils than for sand and loam soils (Schneiker, 2006). Groundwater recharge was negative, indicating more evaporation than infiltration, and highly variable when the soil disconnectedness was 9 or less (Figure 5-9). For an intrinsic permeability of 1×10^{-10} cm^2, groundwater recharge decreased slightly and more time was required to reach the water table when the soil disconnectedness index was increased from 11 to 12. Recharge varied by about 1 in/yr or less for variations in the disconnectedness index of 10 to 12 (recommended for silty clay loam, silt or clay soil).

Unsaturated thickness: For vadose zone thicknesses of about 2.5 feet or less and an intrinsic permeability of $1.0 \times 10^{-11} cm^2$, increasing thickness resulted in less evapotranspiration and more groundwater recharge (Figure 5-10). This is because evapotranspiration may remove groundwater if the capillary zone is near or intersects the ground surface. For greater vadose zone thicknesses or greater

intrinsic permeabilities, increasing vadose zone thickness had little or no impact on groundwater recharge for the range of parameters modeled.

Of the four parameters discussed above, changes in intrinsic permeability resulted in the largest changes in the rate of groundwater recharge, which in turn can impact transport of uranium to groundwater. The recharge rate developed by RESRAD and HELP modeling of about 0.39 and 0.37 m/yr, respectively was best reproduced in SESOIL using an intrinsic permeability of 5.5×10^{-10} cm^2 and soil disconnectedness index of 10. The effective porosity of 0.20 best replicated measured soil moisture content. Soil thickness is based on the generalized site model.

The SESOIL/AT123D assumed a source area of 67,000 m^2 for the generalized site model. The source area size does not affect predicted concentrations in pore water as long as the concentration input to soil remains the same. However, a larger source area causes groundwater concentrations to increase because a larger volume of soil with the same concentration results in contribution of a larger mass of contaminant to groundwater. Therefore, using a large area results in a more conservative model result (higher concentrations) than using a small area.

5.5.3.2 Model Results and Assessment

Table 5-12 lists the results of SESOIL modeling. Soil concentrations were adjusted until the resulting groundwater concentration was equal or close to the screening level of 30 µg/L. The table lists the dilution attenuation factor (DAF), which is calculated as the modeled soil concentration divided by the maximum concentration in groundwater. DAFs reflect the difference between the relatively large flow through the aquifer compared to the small volume of flow through the vadose zone resulting from infiltration.

The resulting permitted soil activity is 0.17 pCi/g. This represents the activity of U^{6+} in soil that would not result in groundwater contamination exceeding the groundwater standard. The model also predicts that a soil activity of less than 1 pCi/g would be sufficient to result in the most elevated observed uranium activity (163 pCi/L). As discussed previously, it is likely that most uranium is present as immobile U^{4+}. Also, the model parameters were specifically calibrated to the observed activities of uranium currently present in groundwater. The SESOIL/AT123D model is not applicable if groundwater contamination results from groundwater table fluctuating into contaminated soil.

Uranium exceedances of the groundwater screening level occurred at eight monitoring wells, based on 2007 data. Concentrations were similar in filtered and unfiltered samples, indicating uranium occurred in the dissolved form (U^{6+}) or as colloidal particulates small enough to pass through a 0.45 µm filter. The original form of uranium was uranium metal that oxidized to uranium dioxide (U^{4+}). Further oxidation to U^{6+} may have occurred or may be occurring presently. Once in groundwater, uranium will tend to migrate along fracture and bedding plane flow paths as long as groundwater conditions remain oxidizing, although limited migration of U^{4+} complexed with organic ligands may also occur. However, the association of uranium exceedances with oxidized groundwater indicates that uranium is mobilized as a U^{6+}-carbonate complex.

5.6 Summary of Fate and Transport

^{238}U is the dominant COPC at the Guterl Site and therefore the focus of this fate and transport evaluation. The original source of the COPCs was dust and debris generated by the Rolling Mill historical operations. Potential migration pathways for the dust and debris include: land disposal/disturbance, wind erosion/deposition, surface water runoff and transport through storm sewers, infiltration of water through surface and/or subsurface soil to groundwater and contaminant leaching, and sediment transport.

Occurrence of radioisotopes at elevated concentrations in soil and groundwater indicates that migration has occurred. The dominant migration pathway appears to be historical land disposal/disturbance

because soil contamination is focused in specific areas and at some locations is found throughout the vadose soil column. Occurrence of contamination at depth in soil is indicative of land disposal practices.

SESOIL modeling was performed to determine the soil concentrations of uranium that could cause groundwater exceedances of the screening level. The modeling indicated that if the uranium source was fully oxidized (entirely U^{6+}), groundwater concentrations will eventually be much higher than currently observed, since the model predicts that soil concentrations greater than 0.17 pCi/g will cause exceedances of the 30 µg/L groundwater standard. This result is based on the modeling assumptions which include the form of uranium present and the source size.

The model assumes the fully oxidized (entirely U^{6+}) form of uranium. However, the source material, uranium metal oxidized during milling, was dominantly uranium dioxide (UO_2) in which uranium is present as immobile U^{4+}. Although the more easily dissolved form of uranium, U^{6+}, may have been produced due to further oxidation during historical milling operations or slow oxidation of UO_2, the actual percent of U^{6+} in the soil is not known. Soil sampling data does not distinguish the actual oxidation state of uranium. Since the percent of U^{6+} is not known and may vary throughout the site and soil column, transport modeling used the conservative approach of assuming a fully oxidized (U^{6+}) source.

The model assumes a uniform concentration over the assumed source volume with a thickness of one meter and an area of 67,000 m^2. This volume and area were used because the purpose was to product a generalized site model. However, increasing the source area results in a larger source contribution to groundwater. As a consequence of this, and the assumption of a fully oxidized uranium source, modeling results are overly conservative.

Historical land disposal and disturbance practices could allow direct contact of contaminated material (containing unoxidized or oxidized uranium) with the dolostone aquifer or with soil that is seasonally in contact with groundwater. Groundwater levels are shallow at the Guterl Site and fluctuate seasonally (refer to Table 2-4, Figure 2-10, and Figure 4-51). These fluctuations appear to result in contact of the water table and soil contaminated with uranium. Changes in redox conditions can be induced by water level fluctuations. Soil and contaminants subject to wetting and drying cycles are more likely to oxidize than if redox conditions are stable. Increases in specific conductivity when groundwater levels increase indicate that soluble constituents are being flushed into groundwater. Therefore, uranium in groundwater may be a result of two sources: 1) uranium that was oxidized during milling operations and leached to groundwater through soil, and 2) ongoing oxidation of uranium in soil, present due to historical disposal and disturbance practices, that is seasonally in contact with groundwater.

6.0 BASELINE HUMAN HEALTH RISK ASSESSMENT

A BRA was performed to evaluate risks to human health and the environment from potential exposure to the radioactive constituents at the Guterl Site in the absence of remedial actions. The BRA includes two components: an HHRA and a SLERA. These assessments are limited to the radioactive constituents at the Guterl Site. Potential risks from exposure to non-radioactive constituents detected at the Guterl Site are being addressed as part of a separate investigation being conducted by NYSDEC. However, the chemical toxic effects of the radioactive constituents are considered in the HHRA and the SLERA, specifically for the chemical toxicity of uranium metal.

The BRA represents the link between the characterization information summarized in the first five chapters of this RI report and the determination of the need for remedial action at the Guterl Site and, if needed, development of risk-based remediation levels. This characterization information included historical data, which formed the basis of the FSP (USACE, 2007a) and the basis of subsequent onsite investigations, and also included data from the recent investigations conducted as part of this RI. The newly collected data were obtained in accordance with approved quality assurance procedure as presented in the QAPP (USACE, 2007b), and have been entered into a relational database. Because the historical data collected by ORISE (1999) and during other studies are of unknown quality, the assessment of risks in this BRA is based on the newly collected data and does not make extensive use of historical information other than to confirm the reasonableness of these current data.

The BRA is presented in two sections. The HHRA is presented in this section and the SLERA is presented in Section 7. For purposes of the BRA, the Guterl Site was divided into several exposure units (EUs) to support the risk assessment processes. These EUs were developed based on environmental conditions, historical uses of specific areas, reasonableness of size in terms of representing receptor behavior, geographical similarity, and contamination potential.

6.1 Human Health Risk Assessment Approach

This HHRA was performed consistent with USEPA guidance for risk assessments conducted under CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), following the basic approach for the HHRA described in Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A), commonly referred to as RAGS (USEPA, 1989). Of particular interest to this HHRA is Chapter 10 of RAGS, Radiation Risk Assessment Guidance. The HHRA also followed USACE guidance “Risk Assessment Handbook - Volume 1: Human Health Evaluation, EM 200-1-4” (USACE, 1999). In addition, the HHRA for radiological constituents will be conducted by utilizing the most recent release of the RESRAD (Residual Radioactivity) computer code, Version 6.4 (ANL, 2007) and the RESRAD-Build computer code, Version 3.4 (ANL, 2007), which is USACE Buffalo District’s preferred method of estimating radiological risk at FUSRAP sites (USACE, 2002).

An assessment of potential risk to human health from radionuclides present at the Guterl Site (i.e., the constituents of potential concern [COPCs]) was performed. As described in RAGS, an HHRA typically consists of four basic steps that can be applied to assess potential risks for human receptors. The first step is to identify those constituents that will be evaluated in the HHRA. This step includes organizing and evaluating data defined in Section 4 (contaminant nature and extent) by EUs. Historical information is considered as part of this step, as is information on the concentration, mobility, persistence, and general toxicity of the constituents present, as discussed in Section 5. COPC identification is provided in Section 6.2.

The next step is the exposure assessment which involves evaluating (1) the potential sources of COPCs, (2) how the COPCs were or can be released from their existing locations to other media or locations, and (3) their environmental fate over time. Hypothetical receptors are then defined who might be exposed to the COPCs now or in the future. Finally, pathway-specific intakes are estimated for each receptor using

EPCs that have been determined from measured or modeled values. The exposure assessment is presented in Section 6.3 and presents the estimated intakes of the COPCs by the hypothetical receptors.

The toxicity assessment, the third step in the HHRA, involves assessing available toxicological data to identify the types of potential adverse effects associated with the COPCs for the evaluated exposures. Standard toxicity values (e.g., cancer risk coefficients, dose conversion factors, slope factors, and reference doses) that have been developed by USEPA and other scientific organizations are compiled, and their underlying basis is described to provide context for the subsequent risk calculations. The toxicity assessment presented in Section 6.4 focuses primarily on the carcinogenic health effects associated with radiation exposure. However, the chemical toxicity of uranium at Guterl is also addressed.

In the fourth step, the results of the exposure and toxicity assessments are combined in the risk characterization to estimate potential human health risks associated with baseline conditions. The cancer risks from radiological exposures are characterized in terms of the increased likelihood of getting cancer if those exposures occurred. The potential for noncancer health effects from exposure to uranium is assessed by comparing the estimated average daily exposure (intake) with a reference level established by USEPA. The HHRA also includes estimates of the radiation doses associated with these exposures. The risk characterization is presented in Section 6.5, and provides estimates of the carcinogenic risks and radiation doses from exposures to radionuclides at Guterl and the noncarcinogenic hazards for uranium.

There are a number of uncertainties associated with the risk assessment process, and an assessment of these uncertainties is important for a proper interpretation of the results. An uncertainty evaluation for the HHRA is provided in Section 6.6 and addresses the uncertainties associated with characterization data, exposure assessment, toxicity information, and risk characterization. The HHRA is summarized in Section 6.7.

6.2 Identification of COPCs

The RI FSP identified eight radionuclides for evaluation during the remedial investigation: ^{226}Ra, ^{228}Ra, ^{228}Th, ^{230}Th, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U (USACE, 2007a). This section describes how the results for these constituents were evaluated and assigned to individual EUs.

6.2.1 Data Assessment for the HHRA

Data collection and evaluation involves the development and analysis of site data relevant to the assessment of risks to human health from the radionuclides present at the Guterl Site. A Preliminary Assessment/Site Inspection Report (USACE, 2001) at Guterl recommended a Remedial Investigation. As a result, a RI FSP (USACE, 2007a) was completed in June 2007 and sampling and data gathering activities were completed in December 2007. These activities are summarized in Section 3 of this RI report.

The radionuclides at the Guterl Site are the likely result of the rolling mill operations conducted between 1948 and 1956. Previous investigations indicated that building surfaces and surface soil were contaminated with radionuclides, which likely migrated to nearby surface soil, subsurface soil, groundwater, and surface water/sediment. During this RI, samples were taken throughout the Guterl Site to determine the nature and extent of COPC contamination as summarized in Section 4. For the HHRA, samples were then grouped into 20 EUs to characterize locations for possible exposure of human receptors. These EUs and their corresponding IAs are identified on Table 6-1 along with the ID of each sample used in this HHRA. EU locations are shown in Figures 6-1 and 6-2, and are listed below with their corresponding IA:

EU1, Building 1 – part of IA01, Excised Area Building Interiors

EU2, Building 2 – part of IA01, Excised Area Building Interiors

EU3, Building 3 – part of IA01, Excised Area Building Interiors

EU4, Building 4/9 – part of IA01, Excised Area Building Interiors

EU5, Building 5 – part of IA01, Excised Area Building Interiors

EU6, Building 6 – part of IA01, Excised Area Building Interiors

EU7, Building 8 – part of IA01, Excised Area Building Interiors

EU8, Building 24 – part of IA01, Excised Area Building Interiors

EU9, Building 35 – part of IA01, Excised Area Building Interiors

EU10, East of Buildings – part of IA02, Excised Area Building Exterior Areas

EU11, Between Buildings – part of IA02, Excised Area Building Exterior Areas

EU12, Landfill – IA03, Landfill Area

EU13, IA04A – part of IA04, Allegheny Ludlum Corporation Property

EU14, IA04B – part of IA04, Allegheny Ludlum Corporation Property

EU15, IA04C – part of IA04, Allegheny Ludlum Corporation Property

EU16, IA04D – part of IA04, Allegheny Ludlum Corporation Property

EU17, IA05A – part of IA05, Railroad Right-of-Way

EU18, IA05B – part of IA05, Railroad Right-of-Way

EU19 – IA09, Erie Barge Canal

EU20 – IA10, Lot 7.1 (“Lombardi Property”)

Each of these 20 EUs were sampled for one or more of the investigative media (i.e., surface and subsurface soil, groundwater, surface water, sediment, and building materials) and represent areas over which receptors are assumed to spend their time while at the Guterl Site. The exposures are averaged over these areas. No EUs are associated with IA06, Off-Site NE Properties, as this area is considered non-impacted and will be designated for No Further Action. Also, no EUs are associated directly with IA07, Groundwater, as data from each monitoring well was evaluated with the other media for the specific EU within which it lies. Finally, no EUs are associated with IA08, Site Utilities, as non-native “sediment” or non-native “surface water” data from each ditch or trench was evaluated with the other media for the specific EU within which it lies. Table 6-1 presents the distribution of samples located within each EU and how they relate to the various IAs.

Preliminary COPCs were developed for the Guterl Site based on Rolling Mill Operations and previous site characterization activities. These preliminary COPCs are discussed in previous sections of this RI and consist of ^{226}Ra, ^{228}Ra, ^{228}Th, ^{230}Th, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U.

As described in the RI FSP and in Section 3 of this RI, a wide variety of radiological data were collected and reported. All data were verified using procedures in the QAPP (USACE, 2007b) and entered into a relational database. In collecting soil samples, cores were scanned with a gamma scintillator and up to

three samples from each core were sent to the onsite laboratory for gamma spectroscopy analysis (see Section 3.3.2.1). These samples typically included the surface sample, the subsurface sample with the highest scan result, and the bounding subsurface sample from beneath the highest reading. Of the soil samples collected for onsite analyses, a limited number were sent to the offsite laboratory for gamma spectroscopy, alpha spectroscopy, and GFPC analyses. The samples sent off site were selected based on the highest gamma activity readings from the onsite gamma spectroscopy laboratory. The offsite laboratory results were used to correlate with the onsite gamma results. Per the FSP, only the alpha spectroscopy results were used in the HHRA because these analyses are more sensitive. In accordance with the FSP, approximately half of the soil samples sent offsite for U and Th analyses by alpha spectroscopy were also analyzed for ^{226}Ra and ^{228}Ra by GFPC.

Many of the COPCs identified in the FSP are members of relatively long decay series, which are not presented here. The COPCs at Guterl are limited to radionuclides with half-lives greater than five years, given that milling activities occurred years ago and any short-lived COPCs will have decayed to insignificant levels. The short-lived decay products associated with the longer-lived COPCs are included in the cancer risk coefficients and dose conversion factors (DCFs) used in the assessment. It is assumed that these short-lived decay products are present in equilibrium with the COPCs, consistent with USEPA guidance (USEPA, 1989) and the manner in which the risk coefficients are reported in the Health Effects Assessment Summary Tables (HEAST) (USEPA, 2001) and the DCFs are reported in the RESRAD computer code.

The data were reviewed to confirm that the reported values were consistent with historical information and that there were not obvious errors, e.g., radionuclides not consistent with previous activities, multiple reporting of individual sample results, and double counting of parent and daughter concentrations. Data were verified as discussed in Section 3.13 and appear to be usable for risk assessment purposes.

For the purposes of the HHRA, surface soil was considered as those samples collected within the 0- to 6-inch depth interval. In general, the surface soils are designated as "-01"in the sampling nomenclature. However, many of the "-01" samples were collected under asphalt or concrete. Although currently located under asphalt or concrete, these sample IDs are listed in Table 6-1 as surface soil samples and are evaluated as such in the HHRA assuming that exposure could occur once the overlying materials are removed.[36] The depth interval for subsurface soil is from 6 inches below ground surface to the maximum depth sampled. For the purposes of this risk assessment, exposure to subsurface soil is considered with surface soil into a combined total soil depth.

The radionuclide results were weight averaged when appropriate. In those cases where both short- and long-count results were reported for a given isotope, or where field and laboratory duplicate results are available, data were averaged using the weighting process described in Section 4.1.1.2. The weighted concentrations were then used to estimate the exposure point concentrations for each COPC in each EU, as discussed in Section 6.3.4.

Background samples were collected for each medium sampled and analyzed for each radionuclide COPC. Although background soil samples were originally slated for collection at offsite Outwater Memorial Park, it was observed that apparent background readings obtained during the gamma walkover survey performed within IA04A were lower than the background readings previously collected at Outwater Memorial Park. Subsequently, the gamma walkover survey data were reviewed and the background reference area was relocated to an area within the overall Guterl Site boundary that was not likely to have been affected by MED/AEC-related constituents (i.e., an undeveloped, undisturbed area in the northern end of IA05B). As a result, background reference area surface and subsurface soil samples were collected from IA05B and analyzed off site for COPCs. No building material background samples were

[36] The approach regarding the uppermost interval of covered soil samples is different for the HHRA and SLERA as compared to the nature and extent assessment; that is, the uppermost interval of a covered soil sample was considered "subsurface" for assessment of nature and extent.

collected outside of the Excised Area because of concerns for damaging useful structures. Rather, background reference samples were collected from Class 3 areas within the Excised Area. The background values used for each medium are the average of the results. The background values used in the HHRA are presented in Table 6-2.

6.2.2 COPCs by Exposure Unit

All COPCs were analyzed in all media sampled at each EU, though as seen in Table 6-1, not all media were sampled in each EU. In some cases, this was due to the absence of a particular media in a particular EU (e.g., building materials present in outdoor EUs), or due to distribution of samples by matrix (e.g., no groundwater wells located inside Excised Area buildings). In accordance with the RI FSP (USACE, 2007a), approximately 50 percent of the soil samples sent to the offsite laboratory for U and Th alpha spectroscopy were also analyzed for ^{226}Ra and ^{228}Ra by GFPC. In addition, two soil samples (A02SL-012-01 and A04ASL -204-01) were analyzed only for ^{226}Ra and ^{228}Ra and not the isotopes of uranium and thorium. However, these two samples were measured on site by gamma spectroscopy so results for ^{232}Th and ^{238}U are available for consideration, if needed.

6.3 Exposure Assessment

An exposure assessment was performed to determine how human receptors could be exposed to the COPCs at the Guterl Site. The components of this exposure assessment included the environmental setting, potential human receptors and exposure pathways, estimated EPCs, and estimated contaminant intakes. The exposure assessment also considered the mobility and bioavailability of the COPCs specific to environmental conditions at the Guterl Site (see Section 5). COPC intakes were estimated for potential receptors under current (baseline) conditions and for hypothetical future receptors under projected land use scenarios.

6.3.1 Exposure Setting and Receptor Populations

The exposure setting for human receptors must be determined to evaluate the possible risk to human receptors from COPCs at the Guterl Site. Because pertinent information concerning the environmental setting and potential fate and transport of radionuclide constituents are described thoroughly in previous sections of this RI report, this information will not be repeated in the HHRA unless necessary to support understanding the various exposure scenarios.

The Guterl Site is located within the city of Lockport, in Niagara County. The 2000 census data for Lockport was 22,279 persons with approximately 10,341 housing units. The 2007 population of Niagara County is estimated at 214,845. Land use near the Guterl Site is mixed, consisting of private residences, small farms, and light industrial. To the north of the Excised Area, along Simonds Street, land use includes light industrial/warehouse operations. To the west of the former railroad right-of-way, land use consists of light industry (concrete batch plant operations and warehousing); to the east of the former railroad right-of-way are private residences. To the west of the operating facility, and west of Route 93 bypass, there is an active dolostone quarry. To the south-southeast of the Guterl Site, the Erie Canal separates the site from private farmlands.

The Guterl Site is currently being operated by Allegheny Ludlum Corporation, which occupies a 52-acre portion of the Guterl Site that is not part of the 9-acre Landfill Area or 9-acre Excised Area (USACE, 2005a). To the west of the Excised Area, Buildings 14 and 37 are used for manufacturing; immediately north of the Excised Area, Building 24 is used for storage. Other buildings in the vicinity are also used for storage, and there are two office buildings located south of the Excised Area in EU16. The Excised Area is surrounded by a fence and is posted with “radiological hazard” signs. The 52 acres operated by Allegheny Ludlum Corporation are also fenced and gated for routine security associated with the active facility.

Under current conditions, possible onsite receptors include juvenile trespassers and onsite workers. The onsite workers fall into two basic categories: those engaged in manufacturing activities in Buildings 14 and 37 and those working in the office buildings or storage buildings. Exposure to both of these onsite workers would likely be similar as they probably spend a majority of their time onsite within the buildings. Juvenile trespassers could trespass anywhere on the Guterl Site, including within the Excised Area as fences and warning signs are not always a deterrent to trespassers. It is doubtful that a juvenile trespasser would blatantly ride motorized vehicles on the Guterl Site, so exposure would likely occur while walking or possibly riding a bicycle.

Future possible receptors at the Guterl Site include the construction worker and a hypothetical onsite resident. The future hypothetical onsite resident could live in homes built anywhere on the Guterl Site. However, in order for residents to live in the Excised Area, the abandoned buildings (EUs 1-9) would need to be decontaminated and torn down. Therefore, future hypothetical residents would not be exposed to the building interiors of EUs 1-9 (including soils, sediment, and surface water) within the Excised Area. Future construction workers could potentially be exposed to COPCs anywhere on site, including the Excised Area if they were decommissioning and demolishing the buildings in preparation for housing construction. It is assumed that there would be no change in the potential exposure patterns for juvenile trespassers or for onsite workers in the future. These receptors and the potential exposure pathways are described in more detail in the following section.

6.3.2 Receptor Scenarios and Potential Exposure Pathways

The HHRA CSM portrayed as Figure 6-3 shows the potential pathways for human exposure to COPCs at the Guterl Site. Receptors included on the CSM are current juvenile trespasser and onsite worker and future construction worker, onsite worker and hypothetical onsite resident. Specific exposure values for each of the following receptors are listed in Section 6.3.4.

Current Juvenile Trespasser: Anticipated exposures of a juvenile trespasser are estimated to characterize possible current exposure to COPCs at the Guterl Site. The juvenile trespasser is modeled as a male between 7 and 16 years of age who visits the site 4 hours per day, one day per week for 6 months of the year (weather permitting) over a ten year period. It is assumed that a juvenile trespasser would be exposed to building surfaces in EUs 1-9 while playing in the buildings, perhaps using the abandoned buildings as a club house. While visiting the buildings, this receptor could also be exposed to any surface soil, surface water (i.e., standing water in trenches or drains), or sediment (i.e., sludge found in trenches or drains). Potential exposure routes could be through incidental ingestion of building materials, soil, surface water, or sediment, inhalation of fugitive dust, and external radiation. Although dermal contact with any of the exposure media are possible, exposure would be insignificant because of the very low absorption rates of the radionuclides found at the Guterl Site.

The current juvenile trespasser could also be exposed to surface soil or sediment in the outdoor EUs (EUs 10–20) at the Guterl Site while walking around or riding a bicycle. The possible exposure routes for this receptor could be through incidental ingestion of soil or sediment, inhalation of fugitive dust, and external radiation. In EU19, a juvenile trespasser could be exposed to surface water or sediment through incidental ingestion while playing in the Erie Canal.

Current Onsite Worker: Possible exposures to current onsite workers are estimated for the Guterl Site. Onsite workers are expected to work on site 5 days a week (i.e., 250 days per year) for 25 years. Because most of the onsite workers work inside buildings outside of the Excised Area, they would likely only be exposed to soils outside of the building for about 1 hour per day, going in and out of the building to go to work, go to lunch, for cigarette breaks, and to go home. Although highly unlikely, an onsite worker could potentially be exposed to the same media as the juvenile trespasser in the Excised Area (EUs 1-9) (i.e., building materials, soil, surface water, and sediments) if a worker spent 1 hour per day on lunch or cigarette breaks walking around or exploring buildings within the Excised Area. Some adults have a curiosity about such things as old buildings and would not be intimidated by signage. Potential exposure

routes could be through incidental ingestion of building materials, soil, surface water, or sediment, inhalation of fugitive dust, and external radiation. Although dermal contact with any of the exposure media are possible, exposure would be insignificant because of the very low absorption rates of the radionuclides found at the Guterl Site.

The current onsite office worker could also be exposed to surface soil or sediment in the outdoor EUs (EUs 10–20) at the Guterl Site while walking around. The possible exposure routes for this receptor could be through incidental ingestion of soil or sediment, inhalation of fugitive dust, and external radiation.

Future Construction Worker: There are no current construction projects planned for the Guterl Site at this time, thus eliminating the construction worker as a current receptor. Exposure is estimated for a future construction worker. The future construction receptor is expected to work on site 5 days a week for one year. It is assumed that a construction worker would be either a supervisor-type worker or would be wearing protective gear while outdoors or in a contaminated building. If the construction worker was working in the Excised Area, he could be exposed to constituents through the incidental ingestion of building materials, soil, surface water, or sediment, inhalation of fugitive dust, and external radiation. Although dermal contact with any of the exposure media are possible, exposure would be insignificant because of the very low absorption rates of the radionuclides found at the Guterl Site.

The future construction worker could also be exposed to surface soil, subsurface soil, or sediment in the outdoor EUs (EUs 10–20) at the Guterl Site while digging around. The possible exposure routes for this receptor could be through incidental ingestion of soil (both surface and subsurface) or sediment, inhalation of fugitive dust, and external radiation. In addition, a construction worker could also be exposed to groundwater through incidental ingestion in those few areas where groundwater is shallow enough to be reached using construction equipment.

Future Juvenile Trespasser: Exposure for the anticipated future juvenile trespasser is assumed to be the same as for the current juvenile trespasser. A future juvenile trespasser may be interpreted as a recreational visitor.

Future Onsite Worker: Exposure for the anticipated future onsite worker is assumed to be the same as for the current onsite worker.

Future Onsite Resident: Exposure for a hypothetical onsite resident was estimated to determine if future exposure to constituents at the Guterl Site would pose unacceptable risks to this receptor. It is assumed that a residential receptor would not be exposed to constituents within the Excised Area (EUs 1-9) because demolition of the buildings would be required before onsite homes could be built in that area. The future onsite resident could be exposed to surface and subsurface soil in the outdoor EUs (EUs 10–20) at Guterl while playing outdoors, walking around or while gardening. Residents are expected to live on site for 30 years. The possible exposure routes for this receptor could be through incidental ingestion of soil, inhalation of fugitive dust, and external radiation from soil. A resident could also be exposed while ingesting groundwater or eating produce grown onsite. In addition, it is assumed that a hypothetical resident could come into contact with Erie Canal surface water and sediment while recreating.

6.3.3 Exposure Point Concentrations

The EPC is an estimate of the concentration of each COPC that a receptor is assumed to come in contact with during the course of an exposure event. Separate EPCs are calculated for each EU to address exposures within that EU. Soil (including sediment in the building EUs 1-9) is the main contaminated environmental medium at the Guterl Site.

Two time periods are considered in this HHRA to support the decision-making process. Current risks are assessed to determine if specific measures should be taken in the near term to reduce risks at the Guterl Site. These measures could include further limiting access to certain contaminated areas by the use of

barriers, fences, or more restrictive administrative controls. Future risks (out to 1,000 years) are evaluated to determine the need for more permanent remedial actions. In both cases, risks are estimated for hypothetical receptors that are assumed to be exposed to Guterl Site constituents within their individual lifetimes.

EPCs were determined for each EU and for each medium using the ProUCL software developed by USEPA (USEPA 2004b, 2009). The estimates involved computing the percent upper confidence limit (UCL) (95 UCL to 99 UCL) on the mean concentration. Where the 95 percent UCL fails to provide adequate coverage, a 97.5 percent or 99 UCL of the mean was selected, per ProUCL recommendation (USEPA, 2007). Input and Output ProUCL spreadsheets for the Guterl Site are presented on the Appendix V CD for each exposure area evaluated in the HHRA.

ProUCL version 4.00.04 has the ability to estimate UCLs of mean concentrations for censored data sets (i.e., data sets with non-detected values). Based on the distribution of the detected values, the model assigns predicted values for these non-detections based on their sample quantitation limit. Except for data sets with only a single detection, ProUCL can accommodate a high percentage of non-detected values.

When data sets are relatively small (less than or equal to 10 samples), there is great uncertainty in calculating a 95 percent UCL; the resulting UCL estimate may exceed the maximum detected concentration. While a UCL that exceeds the maximum detection may be defended statistically, the use of this UCL as the EPC could lead to difficulty in the interpretation of risk and, ultimately, may lead to difficulty in understanding a risk management decision that is based on a concentration that exceeds the maximum detection. For this reason, when the 95 percent UCL exceeds the maximum concentration, the maximum concentration is chosen as the EPC. Alternatively, when the 95 percent UCL is less than the maximum concentration, the 95 percent UCL is chosen as the EPC. For data sets with a single detection, the detection is used as the EPC. In addition, the maximum detected concentration is chosen as the EPC for data sets with fewer than five detections. The summary statistics and EPC selection for each COPC generated by ProUCL are shown on Table 6-3 by EU and by medium. Both the “gross” EPC (without background subtracted) and the “net” EPC (with background subtracted) are presented on Table 6-3.The supporting backup files for the ProUCL calculations are presented on the CD in Appendix V.

With reference to Table 6-3, radionuclides within the same decay chain, such as ^{234}U and ^{238}U are expected to occur in similar concentrations within the same sample and should have similar UCLs within the same EUs. However, this is not always true with the UCL95s presented in Table 6-3. In some cases, a large relative percent difference (RPD) between concentrations of ^{234}U and ^{238}U cannot be explained through statistics. For example, in EU-1 there are only three building material samples, which is an insufficient number to run through ProUCL. The maximum concentrations for both isotopes were detected in the same sample and yet a comparison between these two results yields an RPD of 12 percent. Where a large RPD exists between ^{234}U and ^{238}U UCLs, and sufficient numbers of samples were available to run ProUCL, the ProUCL recommended distribution, method, and UCL95 were evaluated to determine if other results were available that yielded more similar UCLs. In these cases, other ProUCL distributions, methods, and UCLs were selected. It should still be noted that frequently there was a wide disparity between the maximum concentrations of these isotopes though they were detected in the same sample. With regard to sediment, surface water, and groundwater results, it is common for the equilibrium to be upset between ^{234}U and ^{238}U when the uranium dissolves in water (National Council on Radiation Protection & Measurements, 1987).

To calculate the risks and radiation doses associated with site-related constituents, it is necessary to eliminate the contribution associated with the background concentrations of the COPCs. This was done by subtracting the average background concentration for each COPC from either the corresponding maximum concentration or the 95% UCL, producing the EPC shown in Table 6-3. The EPC is the value used in the risk and dose calculations in this HHRA. In many instances the average background value exceeded both the maximum concentration and the calculated 95% UCL; in these cases, the EPC was set to zero. That is, that radionuclide was determined to not be elevated above background

concentrations in that EU. It should be noted that the soil screening levels provided in Table 6-3 were obtained from Table 5-2 of the Guterl FSP (USACE, 2007a). Site-specific PRGs are developed in Section 8.

6.3.4 Estimation of COPC Intakes

COPC intakes are identified from the EPCs combined with scenario-specific intake assumptions. The scenario-specific assumptions include factors such as the age of a potential receptor, and the frequency and duration of exposure to contaminated media. Intake parameters are also specific to the route of exposure, such as ingestion or inhalation rates. Scenario assumptions and intake parameters used to estimate exposures were based primarily on USEPA guidance (USEPA 1989, 1991b, 1997b, 2002) and are considered the reasonable maximum exposure (RME) parameters.[37] In general, the value used for each parameter is the 90th or 95th percentile value, although for some parameters, the 50th percentile value is recommended. Many of the exposure parameters used in estimating carcinogenic risk and dose with RESRAD and with RESRAD-Build are defaults from these programs. Other parameters are site-specific or assumed.

Table 6-4 lists the receptor-specific and scenario-specific parameter values that were entered into RESRAD in estimating risks and doses. Table 6-5 lists the exposure parameters that are EU-specific. Estimated risk and dose from exposure to building materials were obtained using RESRAD-Build. The exposure parameters used in this model are listed in Table 6-6 for the three receptors evaluated for this medium. Table 6-7 presents the building-specific parameters, such as area, that are also used in the RESRAD-Build model. The non-carcinogenic effects of exposure to uranium are not estimated using RESRAD, nor are the risk and dose of the human receptors to COPCs in sediments, surface water, and groundwater; they are estimated using spreadsheets. The exposure assumptions and parameters used in these estimates are presented in Table 6-8 and Table 6-9.

6.3.4.1 COPC Intakes for Carcinogenic Constituents in Soil and Building Materials

RESRAD and RESRAD-Build computer codes were used to estimate the risk and dose from COPCs in soil and building materials, respectively. RESRAD incorporates environmental transport with radioactive decay and was used to estimate risk and dose from exposure to soil radionuclides through external radiation, through inhalation (dust and radon), and through ingestion (plants, water, and soil) pathways. RESRAD-Build incorporates transport within the building with radioactive decay and was used to estimate risk and dose to persons inside structures from radionuclides in or on ceilings, walls, and floors. Both RESRAD codes incorporate radionuclide decay daughter ingrowth and both facilitate the estimation of time-integrated risk and dose at user-specified times. Since the process for estimating risks and doses is an internal function within both RESRAD codes, intake is not easily discernable in the output files; RESRAD derived receptor-specific intakes are not tabulated in this HHRA.

Since environmental characteristics are relatively uniform across the Guterl Site, the linear nature of RESRAD was used to model dose and risk from environmental transport of soil radionuclides at the Guterl Site for all EUs. A Site-wide representative model was developed for each receptor to estimate dose and risk from all COPCs over one thousand years. Dose and risk at year zero (current conditions) along with dose and risk at the year 1000 and at the year of peak overall dose were tracked. In addition, dose and risk at the peak dose for each individual COPC was also determined to be used in later PRG determinations. Tables V1-1 through V1-4 in Appendix V tabulate the overall dose over time for each receptor. As a result of groundwater exposure, overall peak dose for residents and for construction workers occurs at 58 years, the time required for uranium soil contamination to travel to the groundwater. Overall peak dose for the juvenile trespasser and for the onsite worker occur at year zero since the radionuclides are located at their source of peak dose and since radioactive decay continues to occur;

[37] The 90th or 95th percentile is used to establish the RME. The RME is the highest exposure that is reasonably expected to occur at a site. The intent of the RME is to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures.

thus diminishing the concentration of the parent radionuclides. Dose and risk for each EU may then be determined by scaling up the time-integrated dose to source and risk to source ratios for each receptor using the original EPCs.

Receptor-specific models for each EU were developed in RESRAD-Build to estimate dose and risk from exposure to building materials at the nine EUs representing the Excised Area Building Interiors. Unit surface contamination was modeled for juvenile trespasser and onsite worker receptors while unit volume contamination was developed to model the construction worker's intrusive exposure to building materials; buildings were assumed to be removed prior to the occurrence of the hypothetical residential receptor. RESRAD-Build assumes the useable life of the building is 25 years; so models were run to estimate dose and risk at year zero (current conditions) and at 25 years for each receptor. In addition, dose and risk were also evaluated at one year and at the exposure duration for each receptor: ten years for the juvenile trespasser, 25 years for the onsite worker, and one year for the construction worker. Static Beta scans of the building interiors were used to allocate the probable COPC concentrations for each EU which were then used to scale up the dose to source and risk to source ratios from the unit RESRAD-Build runs to produce the dose and risk for each receptor at each EU

Beta Allocation of COPC Concentrations: EU-specific COPC concentrations were generated using static beta scans of the building interiors. ProUCL 4.00.04 was utilized to provide EU-specific 95th UCL gross beta surface activities. Background building contributions were removed using weighted averages from steel. EU-specific concentrations for each COPC were then determined assuming that beta emitting COPC progeny were in equilibrium with their parents and that the relative abundance of COPCs is the same in surface contamination as in soil contamination. The average ^{238}U soil contamination from alpha spectroscopy results, coupled with the natural relative activity of ^{235}U and with the relative activity of ^{232}Th, was then used to populate beta emitting progeny for these three COPCs. Capitalizing on secular equilibrium, the relative contributions of these three COPCs were determined and the net concentration from beta emitting COPC progeny was determined. Since the static beta scans included results from natural beta emitters in addition to results from beta progeny, the fraction from beta emitting progeny was determined. Multiplying this fraction from COPC progeny by the EU-specific 95th UCL, minus building background, provides an EU-specific net concentration from beta emitting COPC progeny. EU-specific COPC concentrations were determined by multiplying the relative contributions of the three parent COPCs by this weighted EU-specific 95th UCL. Based upon natural abundance, COPCs ^{228}Ra and ^{228}Th are allotted the same concentration as ^{232}Th and COPC ^{234}U is allotted the same concentration as ^{238}U for each EU. The beta allocation process is discussed in more detail in Appendix V5.

6.3.4.2 COPC Intakes for Carcinogenic Constituents in Sediment, Surface Water, and Groundwater

The intakes for estimating the carcinogenic risks and doses for potential exposure to radionuclides in sediment, surface water, and groundwater were calculated using the exposure parameters presented in Table 6-9. These intakes were calculated in a spreadsheet rather than modeled with RESRAD, which does not easily estimate risks and doses from the sediment and surface water pathways. The spreadsheet used to estimate these intakes is shown in Table 6-10. This table presents ingestion intakes for each COPC, according to medium within each EU for each receptor. The receptor intakes are then totaled for each EU. The dermal and inhalation pathways are not evaluated because 1) all of the radionuclides present at this site have very low absorption rates and 2) only an oral reference dose is available for uranium and not an inhalation reference dose. In addition, the external gamma radiation pathway was not evaluated because of the shielding effect of the overlying surface water on sediments.

The general intake equation used to estimate the ingestion intakes in pCi in Table 6-10 is as follows:

$$\text{Intake (pCi)} = C \times IR \times CF \times EF \times ED$$

Where

C = the EPC (in pCi/g or pCi/L) from Table 6-3

IR = the ingestion rate (in mg/day or mL/day) for the specific medium from Table 6-9

CF = conversion factor of 0.001 (g/mg for sediment and L/ml for surface water and groundwater)

EF = exposure frequency (days/year)

ED = exposure duration (years)

6.3.4.3 Noncarcinogenic Intakes for Uranium

The noncarcinogenic intakes for uranium metal were estimated using the exposure assumptions and ingestion parameters presented in Table 6-8. These intakes were calculated in a spreadsheet rather than modeled with RESRAD, which does not estimate noncarcinogenic systemic effects. The spreadsheet used to estimate the noncarcinogenic intakes is shown as Table 6-11. This table presents ingestion intakes for each uranium isotope, according to medium within each EU for each receptor. The receptor intakes were then totaled for each EU. The dermal and inhalation pathways were not evaluated because 1) all of the radionuclides present at this site have very low absorption rates and 2) only an oral reference dose was available for uranium and not an inhalation reference dose.

The general intake equation used to estimate the ingestion intakes in pCi in Table 6-11 is as follows:

Intake (pCi) = C x IR x CF x FI x EF x ED

Where

C = the EPC (in pCi/g or pCi/L) from Table 6-3

IR = the ingestion rate (in mg/day or L/day) for the specific medium from Table 6-8

CF = conversion factor of 0.001 (g/mg for soil, sediment, building materials, and produce)

FI = fraction of contaminated soil or produce ingested (unitless)

EF = exposure frequency (days/year)

ED = exposure duration (years)

The oral intake of uranium was determined using the ingestion intakes in Table 6-11 for the three uranium isotopes, and multiplying these activities (in pCi) by the following factors to obtain the mass (in mg): ^{234}U, 1.60×10^{-7}; ^{235}U, 4.62×10^{-4}; and ^{238}U, 2.98×10^{-3} (International Atomic Energy Agency, 2009). These factors are the reciprocals of the standard specific activities for these three uranium isotopes (Ci/g), divided by 1 billion to get the conversion factors into the correct unit of mg/pCi. The intakes (in mg) for the three uranium isotopes were then summed for the whole EU to obtain the total oral intake of uranium for each of the receptors.

6.4 Toxicity Assessment

The toxicity of the Guterl Site COPCs was evaluated to determine the possible effects to human receptors. The principle adverse biological effects from radionuclides in the environment are carcinogenicity, mutagenicity, and teratogenicity. Carcinogenicity, the ability to produce cancer, may be used to assess human health risks from Guterl Site radionuclides since the probability of cancer is much greater than the probability of mutagenicity, genetic mutation, and since it is comparable to the probability of teratogenicity, the induction of birth defects, which also requires exposure during the nine month gestation period (USEPA, 1989, RAGS Chapter 10). The Guterl Site was therefore characterized by evaluating the cancer risk from inhalation and ingestion of contaminated media along with external gamma radiation dose from contaminated media. In addition, noncarcinogenic hazards from ingestion of uranium metal were evaluated, since uranium is the only radionuclide with known noncarcinogenic systemic effects.

USEPA has developed standard cancer slope factors for radionuclides to estimate the cancer risks from inhalation, ingestion, and external exposure to radionuclides. Radionuclide slope factors represent the probability of cancer from exposure to a given radionuclide averaged over a lifetime. Cancer risk is calculated by weighting the estimated lifetime intake through inhalation and ingestion along with the external exposure to a radionuclide with the radionuclide/pathway specific slope factor.

USEPA has also developed exhaustive dose conversion factors (DCF) to present the amount of absorbed radiation per unit intake or exposure. Radioactive decay of radionuclides may occur through the emission of alpha particles, beta particles, or gamma rays each with its own characteristic energy and behavior. The dose equivalent, measured in rem, is the amount of biological damage to tissue from ionizing radiation. Since specific biological tissues absorb different types of radiation and develop cancer at varied rates, dose conversion factors are specific to the type of ionizing radiation, the pathway of exposure, and the tissue affected.

Cancer risk coefficients and DCFs for inhalation and ingestion intake and for external exposure to radionuclides are presented in Table 6-12 for COPCs at the Guterl Site and are discussed in the following sections. These cancer risk coefficients represent the lifetime risk of developing cancer from exposure to Guterl Site COPCs. The DCFs represent the effective dose to an adult.

6.4.1 Derivation of Toxicity Values Used in HHRA

Toxicity values for the Guterl Site COPCs were obtained using USEPA guidance for sites with radioactive substances.

Since milling activities at the Guterl Site have ceased and since milled materials were distributed offsite, the radioactive contamination at the Guterl Site can generally be characterized as low-level ionizing radiation. Since only low-level radiation is present at the Guterl Site, radiation exposures at the Guterl Site are limited to chronic effects (low doses over relatively long time periods) and need not consider acute effects (high doses over short time periods); therefore, no acute effects were considered for the Guterl Site. Dependent upon the type of radiation, exposure, and irradiated tissue, potential health effects include an increase in the probability of cancer induction, mutagenesis, and teratogenesis. Consistent with USEPA guidance, cancer risk is used to evaluate health effects from COPC exposure at the Guterl Site (USEPA, 1989). Potential health effects for low levels of ionizing radiation are considered to have no threshold dose with no dose level providing zero risk and with the probability of cancer incidence increasing with the absorbed dose.

Although ionizing radiation is a known human carcinogen, cancer risk from low-levels of ionizing radiation must be extrapolated from well-characterized high dose cancers. Chronic low-level doses have not been linked directly with cancer incidence, since cancers from chronic exposure are indistinguishable from

cancers resultant of other causes and effects vary widely among individuals with many different processes producing a particular effect in an individual.

The biological damage caused by ionizing radiation may induce cancer. The toxicity values in this HHRA were based upon cancer incidence, including both fatal and non-fatal occurrences. In general, half of all cancers induced by radiation are fatal. The fraction of fatal cancers ranges from approximately 10 percent for thyroid cancer up to essentially 100 percent for liver cancer (USEPA, 1989).

6.4.2 Cancer Risk Coefficients

Following USEPA guidance for conducting risk assessments at radioactively contaminated sites, standard cancer risk coefficients were used in this HHRA (USEPA, 1989). These coefficients are both radionuclide and exposure specific, and represent the estimated lifetime cancer risk per unit intake averaged over all ages and both genders. USEPA has published inhalation, ingestion, and external exposure cancer risk coefficients for hundreds of radionuclides in Federal Guidance Report (FGR) 13 (USEPA, 1999b). USEPA used contemporary dosimetric methods to estimate the absorbed dose from a chronic intake (ingestion or inhalation) or exposure (external gamma irradiation) over a lifetime This absorbed dose was combined with cancer risk factors through a life-table analysis to account for competing risks and thus provide a more realistic estimate of radiologic cancer risk. Competing risks eliminate exposed individuals who die of other causes before they can develop radiation-induced cancer. Although FGR 13 presents cancer risk coefficients for mortality and for morbidity, this assessment uses morbidity, or illness, instead of mortality coefficients to estimate the likelihood of cancer incidence consistent with USEPA guidance. Table 6-12 presents the cancer risk coefficients for the COPCs at the Guterl Site.

Inhalation cancer risk coefficients tabulated in FGR 13 include contributions from the decay chain and are classified by the rate of absorption from the lungs into the blood. Values for Type F, Type M, and Type S particulate aerosols are presented for each radionuclide to characterize fast, medium, and slow absorption to the blood, respectively. The type of inhalation risk coefficient used in this HHRA is based upon the inhalation DCF presented for that isotope in FGR 12 (USEPA, 1993b). Inhalation DCFs are separated into classes by the time required for clearance from the lungs with D, W, and Y corresponding to retention half-times of less than 10 days, between 10 and 100 days, and more than 100 days, respectively. An inhalation slope factor Type M would be used from FGR 13 for an isotope listed in FGR 12 as Class W. Similarly Type F with Class D and Type S with Class Y. For isotopes with multiple inhalation DCFs tabulated in FGR 12, the most conservative (highest) value DCF was used in this assessment.

Ingestion cancer risk coefficients tabulated in FGR 13 include contributions from the decay chain and are presented for tap water and for dietary intake. The morbidity ingestion slope factors for dietary ingestion are used in this HHRA since the dietary values are higher than the tap water ingestion values.

External exposure risk coefficients are presented in FGR 13 for submersion in contaminated air, exposure to contaminated surface soil, and exposure to soil contaminated to an infinite depth. Unlike inhalation and ingestion, the external exposure risk coefficient does not contain any dose contribution from decay chain members that form in the environmental medium. Morbidity external risk coefficients for exposure to soil contaminated to an infinite depth are used in this HHRA.

The radiological risk coefficients used in this assessment are presented in Table 6-12 and are incorporated into the RESRAD computer code to support the evaluation of radiological effects associated with exposures at the Guterl Site, including the development of COPC PRGs for future-use scenarios. RESRAD default toxicity factors are the morbidity values presented in FGR 13 (USEPA, 1999b). RESRAD incorporates radionuclide ingrowth and decay and has been used in radiological risk assessments for many CERCLA projects, including FUSRAP sites.

6.4.3 Dose Conversion Factors

Following USEPA guidance for conducting risk assessments at radioactively contaminated sites, DCFs have been used in this HHRA (USEPA, 1989) to present the amount of absorbed radiation, adjusted for biological effectiveness, per intake. Radioactive decay, the spontaneous transformation of an unstable nucleus into a different element, releases energy in the form of alpha particles, beta particles, or gamma rays. The energy of these particles and waves is sufficient to alter the chemical nature of the atoms and molecules it encounters and is termed ionizing radiation. The absorbed dose of radiation, the amount of ionizing energy absorbed per unit tissue mass, is dependent upon the tissue and radiation type and is measured in Gray (Gy), where Gy = 1 joule of energy per kg tissue. Typical units for absorbed dose in the United States are rad (radiation absorbed dose), where 100 rad = 1Gy. Since the absorbed dose is dependent upon the tissue and radiation type, the dose equivalent, or the amount of biological damage to tissue from ionizing radiation measured in rem, was developed to facilitate comparisons between doses from different types of radiation. Dose equivalents are calculated by multiplying the absorbed dose by radiation weighting factors; since alpha particles damage tissues approximately 20 times more than beta particles or gamma rays, alpha particles have been assigned a weighting factor of 20. The International Commission on Radiological Protection (ICRP) has developed effective dose equivalents (EDE) to reflect different cancer induction rates for different tissues. The EDE, weighted sums of the organ-specific dose equivalents, normalizes radiation dose and effect on a whole body basis and equals the dose equivalent delivered at a whole body rate to produce an equal number of fatal stochastic health effects. Since external radiation exposure only contributes to dose during the time the receptor is within the external radiation field, the DCFs for external radiation exposure are based upon the EDE. In contrast, internal radiation exposure through inhalation and ingestion, places the radiative source within the body; allowing continued dose accumulation for some radionuclides. ICRP developed the committed effective dose equivalent (CEDE) to represent the integrated effective dose equivalent received by an adult male occupational worker during a 50-year period following occupational intake exposure (ICRP 1977, 1979); internal DCFs are based upon the 50-year CEDE. DCFs are both radionuclide and exposure specific and allow comparison with radiation protection standards and dose limits determined through ARARs based upon EDE. USEPA presents DCFs for hundreds of isotopes for inhalation and ingestion intake in FGR 11 (USEPA, 1988a) and for external exposure in FGR 12 (1993b).

USEPA presents inhalation DCFs for hundreds of isotopes in FGR 11. Values are presented for dose equivalents for representative tissues (gonad, breast, lung, bone marrow, bone surface, thyroid, and remainder tissues) and for the weighted sum of tissues or the effective tissue. Inhalation DCFs are separated into classes by the time required for clearance from the lungs with D, W, and Y corresponding to retention half-times of less than 10 days, between 10 and 100 days, and more than 100 days, respectively. In this HHRA, the most conservative (highest) effective DCF was used for each isotope as shown in Table 6-12. These inhalation DCFs were based upon the 50-year CEDE.

USEPA also presents ingestion DCFs for hundreds of isotopes in FGR 11. Values are presented for dose equivalents for representative tissues (gonad, breast, lung, bone marrow, bone surface, thyroid, and remainder tissues) and for the weighted sum of tissues or the effective tissue. Additionally, ingestion DCFs are presented for some isotopes based upon the fractional uptake from the small intestine to the blood. In this HHRA, the most conservative (highest) effective DCF was used for each isotope as shown in Table 6-12. These ingestion DCFs were based upon the 50-year CEDE.

USEPA presents the DCFs for external exposure to radionuclides in air, water, and soil in FGR 12. Like inhalation and ingestion in FGR 11, values are presented for dose equivalents for representative tissues (gonad, breast, lung, bone marrow, bone surface, thyroid, and remainder tissues) and for the weighted sum of tissues or the effective tissue. DCFs for this external exposure include skin as a representative tissue. External DCFs are tabulated for isotopes in air, in water, and in various depths of soil. In this HHRA, the effective DCF for external exposure to soil contaminated to a depth of 15 cm was used for each isotope as shown in Table 6-12. These external exposure DCFs were based upon the EDE.

The DCFs used in this assessment are presented in Table 6-12 and are incorporated into the RESRAD computer code to support the evaluation of radiological effects associated with exposures at the Guterl Site, including the development of COPC PRGs for future-use scenarios. RESRAD default toxicity factors are the morbidity values presented in FGR 13 (USEPA, 1999b).

6.4.4 Toxicity Values for Noncarcinogenic Effects of Uranium

Toxicity values for the noncarcinogenic effects of uranium are used to determine the chemical toxicity of that radionuclide. Although the radiological effects of a radionuclide generally outweigh chemical effects of that isotope, the soluble form of uranium metal is a kidney toxin at concentrations slightly above background levels and the chemical toxicity is comparable to the radiotoxicity. The chemical toxicity from the ingestion of soluble uranium is therefore evaluated in this HHRA.

Noncarcinogenic toxicity values quantify the relationship between exposure to a chemical and the resultant noncarcinogenic health effect. This reference dose (RfD) is a chemical/exposure specific standard toxicity value expressing the highest concentration a human may be exposed to daily without suffering an appreciable risk of deleterious effects during a lifetime (USEPA, 1989). For the oral route, the potential for resultant noncarcinogenic health effects is determined through comparison of ingestion intake with the oral RfD. Reference doses derived to assess oral exposures are given in units of milligrams of chemical per kilogram body weight per day (mg/kg-d). The inhalation and dermal routes of exposure to uranium are not evaluated in this HHRA because this radionuclide represents a noncarcinogenic hazard by the oral route only.

Derivation of an RfD is based on a review of all relevant human and animal studies for a chemical. For each study, either a no-observed-adverse-effect level (NOAEL) or a lowest-observed-adverse-effect level (LOAEL) is determined. The NOAEL corresponds to the dose (in mg/kg-d) that can be administered over a lifetime without inducing observable adverse effects. The LOAEL corresponds to the lowest daily dose administered over a lifetime that induces an observable adverse effect. Because NOAELs and LOAELs are often based on animal studies, both the experimental parameters and the extrapolation of animal data to humans are potential sources of uncertainty. Uncertainty factors are applied to account for several types of uncertainty, such as interspecies extrapolation. Thus, NOAELs and LOAELs are divided by these factors when deriving an RfD. This is done to ensure that the RfD will be protective of human health. Modifying factors between 0 and 10 may also be applied to reflect additional considerations in evaluating the data.

The noncarcinogenic toxicity of soluble uranium metal used in this HHRA is presented in Table 6-12. This oral RfD for uranium was obtained from the Integrated Risk Information System (IRIS), an online database operated by USEPA that contains current health risk information for many chemicals (USEPA, 2008). The oral RfD is 0.003 mg/kg-d with a corresponding critical effect of weight loss and moderate kidney toxicity. The confidence level is medium, the uncertainty factor is 1,000, and the modifying factor is 1.

It should be noted that the oral reference dose for uranium (soluble salts) used in this assessment differs from the oral reference dose used by USEPA in developing the drinking water maximum contaminant level. The USACE follows a hierarchy for toxicity criteria. As an oral reference dose of 0.003 mg/kg-day remains in IRIS, this value was used in the HHRA rather than the provisional reference dose of 0.0006 mg/kg-day, which USEPA used to set the drinking water standard.

6.5 Risk Characterization

The radiological carcinogenic risks for potential exposures at the Guterl Site are expressed in terms of the increased probability that an individual would develop cancer over a lifetime. The USEPA has defined an incremental target for carcinogenic risks associated with contaminants at a site, which is an excess upper bound lifetime cancer risk to an individual of between one in ten thousand (1×10^{-4}) and one in a million

(1×10^{-6}) (USEPA, 1990). The USEPA risk range is referred to herein as the target range and is used as a point of reference for the risks estimated for the hypothetical exposures evaluated for the Guterl Site. The risk estimates presented in this HHRA will be used to support risk management decisions concerning future activities at the Guterl Site.

In addition to carcinogenic risks, the radiation dose (in mrem) is also calculated for exposures to the radioactive constituents, as the cleanup objectives evaluated for this RI are based on limiting the radiation dose for future unrestricted use of the Guterl Site to 25 mrem/yr. This dose limit is in excess of the dose associated with naturally occurring background radiation, which the National Council on Radiation Protection and Measurements (NCRP) estimates to be 300 mrem/yr to an average individual in the United States (NCRP, 1987).

The RESRAD computer code is the USACE's preferred method used in conducting radiological risk assessments for the FUSRAP sites in the Buffalo District (USACE, 2002). RESRAD code was therefore used in estimating carcinogenic risks and radiological doses to hypothetical receptors at the Guterl Site. Pathways for potential exposure to Guterl Site radionuclide COPCs evaluated using RESRAD included ingestion of surface and subsurface soil, groundwater and home-grown produce, inhalation of particulates, and external gamma radiation. RESRAD-Build code was used to assess potential risks/doses to receptors from potential exposure to COPCs within building interiors (EUs 1-9). Standard RAGS risk assessment equations were used to evaluate sediment, surface water, and groundwater pathways because RESRAD was not set up to easily handle sources from these media.

The RESRAD approach to estimating risk and dose is very similar to that of the standard RAGS approach. However, RESRAD includes built-in flexibility to evaluate environmental transport of constituents (e.g., area factors, leaching, etc.) plus radiological decay and ingrowth. Although basic RAGS equations could be modified to include environmental and radiological factors or could be supplemented with additional models, these components are already included in the RESRAD code. Thus, theoretically it is less time consuming to use RESRAD when considering a dynamic relatively complex exposure environment. A full comparison between the RAGS approach and RESRAD is discussed in the White Paper: Using RESRAD in a CERCLA Radiological Risk Assessment (USACE, 2002).

In running the RESRAD and RESRAD-Build codes, several assumptions were made:

- The receptors were placed in the middle of the rooms when evaluating the buildings of the Excised Area.

- For the purposes of the RESRAD-Build estimates, a volume (mass) activity concentration of x pCi/g equates to a surface activity concentration of 10^4 x pCi/m^2 (ANSI N13.12-1999).

- If an EU had more than one room, then a concrete thickness of ½ inch (1.27 cm) was assumed for interior walls between the rooms for area calculations.

- Although run in RESRAD and RESRAD-Build for various times, the receptor doses and risks for all receptors are presented below at the evaluation time of 0 year; estimated doses and risks for selected future times are presented for the future evaluation year providing the maximum for each receptor. The doses and risks for later times may differ due to contaminant transport as well as buildup of progeny radionuclides and/or decay of COPCs. The evaluation time of 0 year was chosen because all COPCs are accounted for individually in their own RESRAD-Build runs and the concentration of each COPC that was used in the runs is in concert with the concentrations of the other seven COPCs, i.e., buildup and decay are built into the input concentrations.

- The northern EUs (EU10, EU12, EU13, EU17, EU18, and EU20) have average total soil depth of about 8 feet and the southern EUs (EU11, EU14, EU15, and EU16) have average total soil depth

of about 3 feet. For the construction worker and residential scenarios for EU10 through EU20, these were assumed to be the total thickness of the surface and subsurface contamination zones taken as a single zone. The concentration in the zone was the average of the surface and subsurface value, weighted by thickness of each subzone.

The potential for chemical, noncarcinogenic health effects from exposure to uranium was also assessed in this HHRA. The quantitative measure of noncarcinogenic health effects is the hazard index (HI). The USEPA has identified an endpoint-specific HI of greater than 1 as a level of potential concern for noncarcinogenic health effects (USEPA, 1989). HIs for exposure to uranium isotopes were estimated using the standard RAGS equations because RESRAD is not intended for this use.

6.5.1 Carcinogenic Radiological Risks

Although exposures to ionizing radiation can result in several detrimental health effects (e.g., genetic defects, cancer induction), the radiological health risks presented in this HHRA are limited to cancer induction. Carcinogenic risks are estimated by multiplying the intake by the appropriate slope factor in 1/pCi. The estimated intakes, risks, and doses from potential exposure to sediment, surface water, and groundwater are presented in Table 6-10. Selected radiological risk from sediment, surface water, and groundwater summed with RESRAD calculated risks and doses for the various receptors in the 20 EUs at various times is presented in Table 6-13. Table 6-13 also includes HIs for each EU. A more detailed summary of the risks and doses for each receptor presented for each EU by individual radionuclides is presented in Tables V1-1 through V1-4 in Appendix V. Tables V1-1a through V1-4a present the percent pathway contribution for each medium within an EU. The RESRAD input and output files used to estimate risk for all pathways except sediment, surface water, and groundwater are located on the CD provided in Appendix V.

Since the nature and extent of contaminants may vary over time as contamination transports and degrades, the HHRA evaluated both current and future risks, doses, and hazards. RESRAD and RESRAD-Build were used to model contaminant fate and transport and to estimate the current and future dose and risk to receptors. Risk was evaluated at year zero (currently sampled conditions) and at several selected years in the future (year 1, year 10, year 25, year 58, and year 1000). The resultant risks for many of the EUs exceed the lower bound of the USEPA (USEPA, 1990) risk range of 1×10^{-6}.

Current Risk

The risk estimates (excluding contributions from background) for each exposure unit are presented below for exposure to currently sampled concentrations (t=0) and includes a brief discussion of the risk drivers and the most “at-risk” potential receptors. Current risk estimates including contributions from background are presented on Table 6-13.

EU1: Potential risks from exposure to COPCs in EU1 (Building 1) ranged from 3×10^{-7} for a juvenile trespasser to 7×10^{-6} for an onsite worker and 5×10^{-5} for a future construction worker. The highest potential risks are from exposure to building materials. The COPCs contributing the highest potential risks are ^{234}U and ^{238}U.

EU2: Potential risks from exposure to COPCs in EU2 (Building 2) ranged from 3×10^{-6} for a juvenile trespasser to 5×10^{-5} for a future construction worker and 1×10^{-4} for an onsite worker. The highest potential risks are from exposure to surface soil with COPCs ^{226}Ra, ^{228}Ra, and ^{232}Th contributing the highest potential risk.

EU3: Potential risks from exposure to COPCs in EU3 (Building 3) ranged from 2×10^{-6} for a juvenile trespasser to 1×10^{-5} for a future construction worker and 1×10^{-4} for an onsite worker. The highest potential risks are from exposure to building materials and floor (surface soil) with COPCs ^{234}U, ^{238}U, and ^{226}Ra contributing the highest potential risk.

EU4: Potential risks from exposure to COPCs in EU4 (Buildings 4/9) ranged from 1 x 10^{-6} for a juvenile trespasser to 3 x 10^{-6} for a future construction worker to 6 x 10^{-5} for an onsite worker. The highest potential risks are from exposure to the floor (surface soil) and the COPCs contributing the highest potential risk are ^{226}Ra and ^{232}Th.

EU5: Potential risks from exposure to COPCs in EU5 (Building 5) ranged from 9 x 10^{-9} for a juvenile trespasser to 2 x 10^{-6} for an onsite worker to 3 x 10^{-6} for a future construction worker. Building materials were the only medium sampled at EU5. The COPCs contributing the highest potential risk are ^{234}U, ^{238}U, and ^{228}Th.

EU6: Potential risks from exposure to COPCs in EU6 (Building 6) ranged from 3 x 10^{-5} for a juvenile trespasser to 6 x 10^{-5} for a future construction worker to 1 x 10^{-3} for an onsite worker. Results from static beta scans of EU6 building materials determined that COPC levels of the building materials were less than background; therefore, risk from building materials is zero. Risk evaluation of EU6 soil and sediment determined that potential risks from exposure to the floor (soil) ranged above EPA's upper bound of the risk range 1 x 10^{-4} with COPCs ^{232}Th and ^{228}Ra contributing the highest potential risk

EU7: Potential risks from exposure to COPCs in EU7 (Building 8) ranged from 3 x 10^{-4} for both a juvenile trespasser and for a future construction worker to 1 x 10^{-2} for an onsite worker. The highest potential risks are from exposure to the floor (soil) and the COPCs contributing the highest potential risk are ^{238}U and ^{235}U.

EU8: Potential risks from exposure to COPCs in EU8 (Building 24) ranged from 8 x 10^{-7} for a juvenile trespasser to 5 x 10^{-6} for a future construction worker to 6 x 10^{-5} for an onsite worker. The highest potential risks are from exposure to building materials with COPCs ^{238}U and ^{234}U contributing the highest potential risk.

EU9: Potential risks from exposure to COPCs in EU9 (Building 35) ranged from 1 x 10^{-6} for a juvenile trespasser to 7 x 10^{-6} for a future construction worker to 4 x 10^{-5} for an onsite worker. The highest potential risk is from exposure to surface soil with COPCs ^{228}Ra and ^{232}Th contributing the greatest potential risk.

EU10: Potential risks from exposure to COPCs in EU10 (IA02 east of buildings) ranged from 9 x 10^{-7} for a juvenile trespasser to 4 x 10^{-6} for a future construction worker to 3 x 10^{-5} for an onsite worker to 3 x 10^{-4} for the hypothetical resident. The highest potential risk is from exposure to external radiation from soil with COPC ^{226}Ra contributing the greatest potential risk

EU11: Potential risks from exposure to COPCs in EU11 (IA02 between buildings) ranged from 2 x 10^{-6} for a juvenile trespasser to 3 x 10^{-6} for a future construction worker to 5 x 10^{-5} for an onsite worker to 2 x 10^{-4} for the hypothetical resident. The highest potential risk is from exposure to external radiation from soil with COPCs ^{238}U, ^{228}Ra, ^{232}Th, and ^{226}Ra contributing the greatest potential risk for all receptors and groundwater ingestion of ^{238}U and ^{234}U contributing similarly for the hypothetical resident.

EU12: Potential risks from exposure to COPCs in EU12 (IA03 landfill) ranged from 3 x 10^{-7} for a juvenile trespasser to 2 x 10^{-6} for a future construction worker to 1 x 10^{-5} for an onsite worker to 2 x 10^{-4} for the hypothetical resident. The highest potential risk is from exposure to external radiation from soil with COPCs ^{238}U, ^{232}Th, and ^{226}Ra contributing the greatest potential risk for all receptors and groundwater ingestion of ^{238}U and ^{234}U contributing similarly for the hypothetical resident..

EU13: Potential risks from exposure to COPCs in EU13 (IA04A) ranged from 1 x 10^{-6} for a juvenile trespasser to 4 x 10^{-6} for a future construction worker to 4 x 10^{-5} for an onsite worker to 3 x 10^{-4} for the hypothetical resident. The highest potential risk is from exposure to external radiation from soil with COPCs ^{238}U and ^{232}Th contributing the greatest potential risk for all receptors...

EU14: Potential risks from exposure to COPCs in EU14 (IA04B) ranged from 2 x 10^{-8} for a juvenile trespasser to 6 x 10^{-7} for an onsite worker to 7 x 10^{-7} for a future construction worker to 3 x 10^{-4} for the hypothetical resident. The highest potential risk for the future hypothetical resident and the future construction worker are from ingestion of ^{238}U in groundwater and the highest potential risks for the juvenile trespasser and the onsite worker are from exposure to external radiation from ^{238}U in soil.

EU15: Potential risks from exposure to COPCs in EU15 (IA04C) ranged from 5 x 10^{-7} for a juvenile trespasser to 2 x 10^{-6} for a future construction worker to 1 x 10^{-5} for an onsite worker to 1 x 10^{-4} for the hypothetical resident. The highest potential risk is from exposure to external radiation from soil with COPCs ^{226}Ra, ^{232}Th, and ^{228}Ra contributing the greatest potential risk.

EU16: Potential risks from exposure to COPCs in EU16 (IA04D) ranged from 8 x 10^{-7} for a juvenile trespasser to 3 x 10^{-6} for a future construction worker to 3 x 10^{-5} for an onsite worker to 3 x 10^{-4} for the hypothetical resident. The highest potential risk is from exposure to external radiation from soil ^{232}Th and ^{226}Ra followed closely by ingestion of groundwater ^{238}U and ^{234}U.

EU17: Potential risks from exposure to COPCs in EU17 (IA05A) ranged from 5 x 10^{-5} for a juvenile trespasser to 5 x 10^{-5} for a future construction worker to 2 x 10^{-3} for an onsite worker to 3 x 10^{-3} for the hypothetical resident. The highest potential risk is from exposure to external radiation from soil ^{238}U.

As discussed in Section 4, the highest concentrations of radionuclides occurred in boring A05A-301. Therefore, the high carcinogenic risks estimated for this EU are likely due to the influence of this one boring.

EU18: Potential risks from exposure to COPCs in EU18 (IA05B) ranged from 3 x 10^{-7} for a juvenile trespasser to 7 x 10^{-7} for a future construction worker to 1 x 10^{-5} for an onsite worker to 5 x 10^{-5} for the hypothetical resident. The highest potential risks for the future hypothetical resident are from exposure to external radiation and ingestion of produce; that for the other receptors is external radiation. The COPCs contributing the highest potential risks are ^{228}Ra and ^{232}Th.

EU19: Potential risks from exposure to COPCs in EU19 (IA09 Erie Canal) ranged from 1 x 10^{-8} for a juvenile trespasser to 2 x 10^{-8} for the hypothetical resident. Both risks are well below 1 x 10^{-6}.

EU20: Potential risks from exposure to COPCs in EU20 (IA10) ranged from 6 x 10^{-7} for a juvenile trespasser to 7 x 10^{-7} for a future construction worker to 2 x 10^{-5} for an onsite worker to 5 x 10^{-5} for the hypothetical resident. The highest potential risk is from exposure to external radiation from soil with COPCs ^{228}Ra, ^{226}Ra, and ^{232}Th contributing the greatest potential risk.

Selected Future Risk

As contamination transports and decays, the concentrations of contaminants in each EU may change; resulting in future risks that may be different than risks estimated from currently sampled concentrations. RESRAD and RESRAD-Build incorporate contaminant fate and transport and were used to model future risks for each receptor over selected years. Selected future risks (excluding contributions from background) for each receptor are presented for each EU in the following section with time (t) presented in years. Future risk estimates including contributions from background are presented on Table 6-13.

EU1: Future potential risks from exposure to COPCs in EU1 (Building 1) peak at 1 x 10^{-8} at t =1 (risks fall from the t=0 maximum of 3 x 10^{-7}) for a juvenile trespasser. Similarly, future risks peak at 3 x 10^{-6} at t=1 (falling from the t=0 maximum of 7 x 10^{-6}) for an onsite worker and peak at t=1 remaining unchanged at 5 x 10^{-5} for a future construction worker. Future risks for all receptors at EU1 fall from current t=0 estimates.

EU2: Future potential risks from exposure to COPCs in EU2 (Building 2) peak at 1 x 10^{-6} at t=1000; falling sharply from a maximum 3 x 10^{-6} at t=0 and rising strongly in the distant future for a juvenile trespasser. Similarly, future risks for an onsite worker peak at 4 x 10^{-5} at t=1000; falling sharply from 1 x 10^{-4} at t=0 and rising strongly in the distant future for an onsite worker. Conversely, results for the future construction worker remain relatively steady from a peak at current conditions of 5 x 10^{-5} at t=0 with peak future risk of 4 x 10^{-5} at t=1 falling to only 2 x 10^{-6} at t=1000.

EU3: Future potential risks from exposure to COPCs in EU3 (Building 3) remain relatively steady from a peak of 2 x 10^{-6} at t=0 for a juvenile trespasser, falling to only 4 x 10^{-7} at t=1 and to 3 x 10^{-7} at t=1000. Conversely, risks for an onsite worker fall slowly from a peak of 1 x 10^{-4} at t=0 to 7 x 10^{-5} at t=1 to 1 x 10^{-5} at t=1000. Risks for a future construction worker peak at 3 x 10^{-5} at t=58 (the predicted time of maximum contaminant concentration in groundwater from contaminant leaching from soil); greater than both the t=0 risk of 1 x 10^{-5} and the t=1000 risk of 9 x 10^{-7}.

EU4: Future potential risks from exposure to COPCs in EU4 (Buildings 4/9) fell for a juvenile trespasser from a peak at t=0 of 1 x 10^{-6} to 8 x 10^{-8} at t=1; rising to 5 x 10-7 at t=1000. The onsite worker also peaks at t=0 (6 x 10^{-5}), but then remains steady at 2 x 10^{-5} at t=1 and t=1000. Results for the future construction worker exhibit a steady slump from a peak of 3 x 10^{-6} at t=0 to 1 x 10^{-6} at t=1; remaining steady at 9 x 10^{-7} at t=1000.

EU5: Future potential risks from exposure to COPCs in EU5 (Building 5) fell from 9 x 10^{-9} at t=0 for a juvenile trespasser to 8 x 10^{-9} at t=1 and 9 x 10^{-10} at t=25. Risks for the onsite worker remained steady at to 2 x 10^{-6} for t=0 and t=1; dropping to 2 x 10^{-7} at t=25. Risks for the future construction worker remained relatively steady at 3 x 10^{-6} at both t=0 and t=25 with a slight drop at t=1 (2 x 10^{-6}).

EU6: Future potential risks from exposure to COPCs in EU6 (Building 6) remained relatively unchanged from peaks at t=0 for both the juvenile trespasser and the onsite worker. Predicted risks of 3 x 10^{-5} at both t=0 and t=1000 for a juvenile trespasser and 1 x 10^{-3} at both t=0 and t=1000 for an onsite worker, remained unchanged. Conversely, although predicted risk for the hypothetical construction worker remained at 6 x 10^{-5} for both t=0 and t=58, predicted risk at t=1000 slid to 4 x 10^{-5}. Since EU6 building materials static beta scan results determined COPC levels of building materials that were less than background, risk from EU6 building materials is zero and potential risks result only from EU6 soil and sediment; external risk from soil drives the estimate of potential risk.

EU7: Future potential risks from exposure to COPCs in EU7 (Building 8) peak at 3 x 10^{-4} at t=0 for a juvenile trespasser; plummeting to 3 x 10^{-7} at t=1 and sharply rising to 5 x 10^{-6} at t=1000. Risks for the onsite worker peak at t=0 (1 x 10^{-2}), dropping precipitously to 6 x 10^{-5} at t=1 and resurging sharply to 2 x 10^{-4} at t=1000. Risks for the hypothetical construction worker plummet from 3 x 10^{-4} at t=0 down to 6 x 10^{-6} at t=1, only to peak sharply at 2 x 10^{-3} at t=58; the year RESRAD predicts the maximum groundwater concentration resulting from soil ^{238}U contamination leaching into the groundwater. The construction worker risks steady to 2 x 10^{-5} at t=1000.

EU8: Future potential risks from exposure to COPCs in EU8 (Building 24) are relatively steady for a juvenile trespasser after a peak of 8 x 10^{-7} at t=0 drops to 2 x 10^{-7} at t=1 settles to 3 x 10^{-7} at t=1000. Similarly, predicted risks for the onsite worker drop from a peak of 6 x 10^{-5} at t=0 to 4 x 10^{-5} at t=1 and 1 x 10^{-5} at t=1000. Predicted risks for the future construction worker peak at 5 x 10^{-6} at t=0; remaining relatively steady with 3 x 10^{-6} and 4 x 10^{-6} at t=1 and t=58, respectively, and settling at 1 x 10^{-6} at t=1000.

EU9: Future potential risks from exposure to COPCs in EU9 (Building 35) drop from a peak of 1 x 10^{-6} at t=0 for a juvenile trespasser, down to 3 x 10^{-9} at t=1 and 7 x 10^{-7} at t=1000. Predicted risks for the onsite worker begin with a peak of 4 x 10^{-5} at t=0, only to plummet to 5 x 10^{-7} at t=1 and resurge with 2 x 10^{-5} at t=1000, Although predicted risks for the future construction worker begin at 7 x 10^{-6} and drop to 8 x 10^{-7} at t=0 and t=1, respectively, peak risk is predicted at t=58 when RESRAD predicts the greatest concentration of ^{238}U leaching from soil into groundwater. Construction worker risks then steady with a predicted risk of 4 x 10^{-6} at t=1000.

EU10: Future potential risks from exposure to COPCs in EU10 (IA02 east of buildings) drop from 9×10^{-7} at t=0 to 2×10^{-7} at t=1000 for a juvenile trespasser. Similarly, predicted risks for the onsite worker drop from 3×10^{-5} to 9×10^{-6} for t=0 and t=1000 years, respectively. Rising from 4×10^{-6} at t=0, predicted risks for the construction worker peak at 6×10^{-6} at t=58 and settle to 1×10^{-6} at t=1000. Predicted risks for the hypothetical resident follow a similar pattern, rising from 3×10^{-4} at t=0, peaking at 1×10^{-3} at t=58, and settling at 1×10^{-4} at t=1000. Leaching of ^{238}U from soil to groundwater contributes to the t=58 peak.

EU11: Future potential risks from exposure to COPCs in EU11 (IA02 between buildings) drop from 2×10^{-6} at t=0 to 1×10^{-7} at t=1000 for a juvenile trespasser. Similarly, predicted risks for the onsite worker drop from 5×10^{-5} to 5×10^{-6} for t=0 and t=1000 years, respectively. Rising from 3×10^{-6} at t=0, predicted risks for the construction worker peak at 1×10^{-5} at t=58 and settle to 7×10^{-7} at t=1000. Predicted risks for the hypothetical resident follow a similar pattern, rising from 2×10^{-4} at t=0, peaking at 4×10^{-3} at t=58, and settling at 7×10^{-5} at t=1000. Leaching of ^{238}U from soil to groundwater contributes to the t=58 peak.

EU12: Future potential risks from exposure to COPCs in EU12 (IA03 landfill) drop from 3×10^{-7} at t=0 to 4×10^{-8} at t=1000 for a juvenile trespasser. Similarly, predicted risks for the onsite worker drop from 1×10^{-5} to 2×10^{-6} for t=0 and t=1000 years, respectively. Rising from 2×10^{-6} at t=0, predicted risks for the construction worker peak at 8×10^{-6} at t=58 and settle to 3×10^{-7} at t=1000. Predicted risks for the hypothetical resident follow a similar pattern, rising from 2×10^{-4} at t=0, peaking at 2×10^{-3} at t=58, and settling at 4×10^{-5} at t=1000. Leaching of ^{238}U from soil to groundwater contributes to the t=58 peak.

EU13: Future potential risks from exposure to COPCs in EU13 (IA04A) drop from 1×10^{-6} at t=0 to 9×10^{-7} at t=1000 for a juvenile trespasser. Similarly, predicted risks for the onsite worker drop from 4×10^{-5} to 3×10^{-5} for t=0 and t=1000 years, respectively. Rising from 4×10^{-6} at t=0, predicted risks for the construction worker peak at 2×10^{-5} at t=58 and settle to 1×10^{-6} at t=1000. Predicted risks for the hypothetical resident follow a similar pattern, rising from 3×10^{-4} at t=0, peaking at 6×10^{-3} at t=58, and settling at 1×10^{-4} at t=1000. Leaching of ^{238}U from soil to groundwater contributes to the t=58 peak.

EU14: Future potential risks from exposure to COPCs in EU14 (IA04B) drop from 2×10^{-8} at t=0 to 7×10^{-11} at t=1000 for a juvenile trespasser. Similarly, predicted risks for the onsite worker drop from 6×10^{-7} to 3×10^{-9} for t=0 and t=1000 years, respectively. Rising from 7×10^{-7} at t=0, predicted risks for the construction worker peak at 1×10^{-6} at t=58 and settle to 2×10^{-8} at t=1000. Predicted risks for the hypothetical resident follow a similar pattern, rising from 3×10^{-4} at t=0, peaking at 4×10^{-4} at t=58, and settling at 3×10^{-6} at t=1000. Leaching of ^{238}U from soil to groundwater contributes to the t=58 peak.

EU15: Future potential risks from exposure to COPCs in EU15 (IA04C) drop from 5×10^{-7} at t=0 to 2×10^{-7} at t=1000 for a juvenile trespasser. Similarly, predicted risks for the onsite worker drop from 1×10^{-5} to 8×10^{-6} for t=0 and t=1000 years, respectively. Rising from 2×10^{-6} at t=0, predicted risks for the construction worker peak at 1×10^{-6} at t=58 and settle to 6×10^{-7} at t=1000. Predicted risks for the hypothetical resident follow a similar pattern, rising from 1×10^{-4} at t=0, peaking at 2×10^{-4} at t=58, and settling at 5×10^{-5} at t=1000. Leaching of ^{238}U from soil to groundwater contributes to the t=58 peak.

EU16: Future potential risks from exposure to COPCs in EU16 (IA04D) drop from 8×10^{-7} at t=0 to 6×10^{-7} at t=1000 for a juvenile trespasser. Similarly, predicted risks for the onsite worker drop from 3×10^{-5} to 2×10^{-5} for t=0 and t=1000 years, respectively. Rising from 3×10^{-6} at t=0, predicted risks for the construction worker peak at 4×10^{-6} at t=58 and settle to 2×10^{-6} at t=1000. Predicted risks for the hypothetical resident follow a similar pattern, rising from 3×10^{-4} at t=0, peaking at 8×10^{-4} at t=58, and settling at 1×10^{-4} at t=1000. Leaching of ^{238}U from soil to groundwater contributes to the t=58 peak.

EU17: Future potential risks from exposure to COPCs in EU17 (IA05A) drop from 5×10^{-5} at t=0 to 1×10^{-5} at t=1000 for a juvenile trespasser. Similarly, predicted risks for the onsite worker drop from 2×10^{-3} to 4×10^{-4} for t=0 and t=1000 years, respectively. Rising from 5×10^{-5} at t=0, predicted risks for the construction worker peak at 2×10^{-4} at t=58 and settle to 1×10^{-5} at t=1000. Predicted risks for the hypothetical resident follow a similar pattern, rising from 3×10^{-3} at t=0, peaking at 6×10^{-2} at t=58, and settling at 1×10^{-3} at t=1000. Leaching of ^{238}U from soil to groundwater contributes to the t=58 peak.

As discussed in Section 4, the highest concentrations of radionuclides occurred in boring A05A-301. Therefore, the high carcinogenic risks estimated for this EU are likely due to the influence of this one boring.

EU18: Future potential risks from exposure to COPCs in EU18 (IA05B) drop from 3×10^{-7} at t=0 to 2×10^{-7} at t=1000 for a juvenile trespasser. Similarly, predicted risks for the onsite worker drop from 1×10^{-5} to 6×10^{-6} for t=0 and t=1000 years, respectively. Predicted risks for the construction worker remain steady at 7×10^{-7} at t=0 and t=58; sliding down to 3×10^{-7} at t=1000. Predicted risks for the hypothetical resident rise from 5×10^{-5} at t=0, peak at 2×10^{-4} at t=58, and settle at 3×10^{-5} at t=1000. Leaching of ^{238}U from soil to groundwater contributes to the t=58 peak.

EU19: Future potential risks from exposure to COPCs in EU19 (IA09 Erie Canal) are not evaluated. Contamination as sampled (t=0) at EU19 was evaluated using RAGS equations for the juvenile trespasser and the hypothetical adult resident; both risks are well below 1×10^{-6}.

EU20: Future potential risks from exposure to COPCs in EU20 (IA10) drop from 6×10^{-7} at t=0 to 2×10^{-7} at t=1000 for a juvenile trespasser. Similarly, predicted risks for the onsite worker drop from 2×10^{-5} to 6×10^{-6} for t=0 and t=1000 years, respectively. Rising from 7×10^{-7} at t=0, predicted risks for the construction worker peak at 8×10^{-7} at t=58 and settle to 2×10^{-7} at t=1000. Predicted risks for the hypothetical resident follow a similar pattern, rising from 5×10^{-5} at t=0, peaking at 2×10^{-4} at t=58, and settling at 2×10^{-5} at t=1000. Leaching of ^{238}U from soil to groundwater contributes to the t=58 peak.

6.5.2 Radiological Doses

Radiation doses have been estimated to provide additional information to support the decision-making process and to evaluate compliance with radiation protection standards (USEPA, 1999). Radiation doses are estimated by multiplying the intake by the appropriate dose conversion factor in mrem/pCi. The estimated radiological dose from sediment, surface water, and groundwater coupled with the dose calculated with RESRAD and RESRAD-Build, is presented in Table 6-13 for the various receptors in the 20 EUs. A more detailed summary of the risks and doses for each receptor presented for each EU by individual radionuclides is presented in Tables V1-1 in Appendix V. The RESRAD input and output files used to estimate dose for all pathways except sediment, surface water, and groundwater are located on the CD provided in Appendix V.

Current Dose

The resultant doses (excluding contributions from background) for many of the EUs exceeded the 25 mrem/yr exposure limit. The dose estimates for each exposure unit are presented below for sampled concentrations (t=0). A brief discussion of the COPCs contributing to high dose and the receptors that could potentially receive the highest doses is included. Current dose estimates including contributions from background are presented on Table 6-13.

EU1: Potential annual doses from exposure to COPCs in EU1 (Building 1) ranged from 0.1 mrem/yr for a juvenile trespasser to 12 mrem/yr for an onsite worker to 591 mrem/yr for a future construction worker. The highest potential dose is from inhalation exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU2: Potential annual doses from exposure to COPCs in EU2 (Building 2) ranged from 0.5 mrem/yr for a juvenile trespasser to 14 mrem/yr for an onsite worker to 470 mrem/yr for a future construction worker. The highest potential dose is from inhalation exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU3: Potential annual doses from exposure to COPCs in EU3 (Building 3) ranged from 0.8 mrem/yr for a juvenile trespasser to 56 mrem/yr for a future construction worker to 120 mrem/yr for an onsite worker.

The highest potential dose is from ingestion exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU4: Potential annual doses from exposure to COPCs in EU4 (Buildings 4/9) ranged from 0.3 mrem/yr for a juvenile trespasser to 14 mrem/yr for a future construction worker to 30 mrem/yr for an onsite worker. The highest potential dose is from ingestion exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU5: Potential annual doses from exposure to COPCs in EU5 (Building 5) ranged from 0.02 mrem/yr for a juvenile trespasser to 3 mrem/yr for an onsite worker to 25 mrem/yr for a future construction worker. Building materials were the only medium sampled at EU5. The highest potential dose is from inhalation exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU6: Potential annual doses from exposure to COPCs in EU6 (Building 6) ranged from 3.8 mrem/yr for a juvenile trespasser to 58 mrem/yr for an onsite worker to 84 mrem/yr for a future construction worker. . Results from static Beta scans of EU6 building materials determined that COPC levels of the building materials were less than background; risk from building materials is zero. Dose evaluation of EU6 soil and sediment determined that potential dose from external exposure to the floor (soil) exceeded the 25 mrem/yr exposure limit with COPCs ^{228}Th, ^{228}Ra, and ^{226}Ra contributing the greatest potential dose.

EU7: Potential annual doses from exposure to COPCs in EU7 (Building 8) ranged from 48 mrem/yr for a juvenile trespasser to 556 mrem/yr for a future construction worker to 765 mrem/yr for an onsite worker. The highest potential dose is from external exposure to soil with COPCs ^{238}U and ^{235}U contributing the greatest potential dose.

EU8: Potential annual doses from exposure to COPCs in EU8 (Building 24) ranged from 0.4 mrem/yr for a juvenile trespasser to 19 mrem/yr for a future construction worker to 65 mrem/yr for an onsite worker. The highest potential dose is from ingestion exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU9: Potential annual doses from exposure to COPCs in EU9 (Building 35) ranged from 0.2 mrem/yr for a juvenile trespasser to 4 mrem/yr for an onsite worker to 17 mrem/yr for a future construction worker. The highest potential dose is from inhalation exposure to building materials with COPCs ^{234}U, ^{238}U, and ^{232}Th contributing the greatest potential dose.

EU10: Potential annual doses from exposure to COPCs in EU10 (IA02, east of the buildings) ranged from 0.12 mrem/yr for a juvenile trespasser to 1.8 mrem/yr for an onsite worker to 5.1 mrem/yr for a future construction worker to 14.6 mrem/yr for a future hypothetical resident. The highest potential dose is from exposure to external radiation from soil COPCs ^{226}Ra, ^{228}Ra, ^{228}Th, and ^{238}U.

EU11: Potential annual doses from exposure to COPCs in EU11 (IA02, between the buildings) ranged from 0.25 mrem/yr for a juvenile trespasser to 3.1 mrem/yr for an onsite worker to 5.3 mrem/yr for a future construction worker to 17.6 mrem/yr for a future hypothetical resident. The highest potential dose is from exposure to external radiation from soil COPCs ^{238}U, ^{228}Ra, and ^{228Th} followed closely by ingestion of groundwater ^{234}U and ^{238}U.

EU12: Potential annual doses from exposure to COPCs in EU12 (landfill) ranged from 0.05 mrem/yr for a juvenile trespasser to 0.64 mrem/yr for an onsite worker to 3.3 mrem/yr for a future construction worker to 12.1 mrem/yr for a future hypothetical resident. The highest potential dose is from exposure to external radiation from soil COPCs ^{238}U, ^{226}Ra, and ^{228Th} followed closely by ingestion of groundwater ^{238}U and ^{234}U.

EU13: Potential annual doses from exposure to COPCs in EU13 (IA04A) ranged from 0.12 mrem/yr for a juvenile trespasser to 1.6 mrem/yr for an onsite worker to 6.4 mrem/yr for a future construction worker to

18 mrem/yr for a future hypothetical resident. The highest potential dose is from exposure to external radiation from soil COPCs ^{238}U followed by ingestion of groundwater ^{234}U and ^{238}U.

EU14: Potential annual doses from exposure to COPCs in EU14 (IA04B) ranged from 0.002 mrem/yr for a juvenile trespasser to 0.03 mrem/yr for an onsite worker to 2.2 mrem/yr for a future construction worker to 32.4 mrem/yr for a future hypothetical resident. The highest potential dose is from ingestion of groundwater ^{234}U and ^{238}U.

EU15: Potential annual doses from exposure to COPCs in EU15 (IA04C) ranged from 0.06 mrem/yr for a juvenile trespasser to 0.9 mrem/yr for an onsite worker to 2.3 mrem/yr for a future construction worker to 6.1 mrem/yr for a future hypothetical resident. The highest potential dose is from exposure to external radiation from soil COPCs ^{226}Ra and ^{228}Ra.

EU16: Potential annual doses from exposure to COPCs in EU16 (IA04D) ranged from 0.12 mrem/yr for a juvenile trespasser to 1.7 mrem/yr for an onsite worker to 4.4 mrem/yr for a future construction worker to 22 mrem/yr for a future hypothetical resident. The highest potential dose is from ingestion of groundwater ^{234}U and ^{238}U followed by exposure to external radiation from soil COPCs ^{226}Ra, ^{228}Th, and ^{228}Ra.

EU17: Potential annual doses from exposure to COPCs in EU17 (IA05A) ranged from 7.2 mrem/yr for a juvenile trespasser to 75 mrem/yr for a future construction worker to 104 mrem/yr for an onsite worker to 166 mrem/yr for a future hypothetical resident. The highest potential dose is from exposure to external radiation from soil COPCs ^{238}U, ^{228}Ra, ^{228}Th, and ^{232}Th.

As discussed in Section 4, the high concentrations of radionuclides in boring A05A-301. Therefore, the high radiation dose estimated for this EU is likely due to the influence of this one boring.

EU18: Potential annual doses from exposure to COPCs in EU18 (IA05B) ranged from 0.038 mrem/yr for a juvenile trespasser to 0.57 mrem/yr for an onsite worker to 0.9 mrem/yr for a future construction worker to 2.9 mrem/yr for a future hypothetical resident. The highest potential dose is from exposure to external radiation from soil COPC ^{228}Ra.

EU19: Potential annual doses from exposure to COPCs in EU19 (IA09 Erie Canal) ranged from 0.0007 mrem/yr for a future hypothetical resident to 0.001 mrem/yr for a juvenile trespasser. The highest potential dose is from ingestion of surface water ^{228}Ra; potential dose from ingestion of sediment ^{228}Ra and ^{232}Th is similar.

EU20: Potential annual doses from exposure to COPCs in EU20 (IA10) ranged from 0.08 mrem/yr for a juvenile trespasser to 0.97 mrem/yr for a future construction worker to 1.2 mrem/yr for an onsite worker to 2.7 mrem/yr for a future hypothetical resident. The highest potential dose is from exposure to external radiation from soil COPCs ^{228}Ra and ^{226}Ra.

Selected Future Dose

As contamination transports and decays, the concentrations of contaminants in each EU may change; resulting in future doses that may be different than doses estimated from currently sampled concentrations. RESRAD and RESRAD-Build incorporate contaminant fate and transport and were used to model future doses for each receptor over selected years. The maximum groundwater concentration of ^{238}U leaching from soil contamination was predicted by RESRAD at t=58 and contributes to the potential dose peak exhibited in many of these EUs, Selected future doses (excluding contributions from background) for each receptor are presented for each EU in the following section with time (t) presented in years. Future dose estimates including contributions from background are presented on Table 6-13.

EU1: Predicted annual doses from exposure to COPCs in EU1 (Building 1) diminish over time with 0.1 sliding to .032 mrem/yr at t=0 and t=25, respectively, for a juvenile trespasser. Similarly, predicted dose

for the onsite worker slides from 12 to 8.6 mrem/yr at t=0 and t=25, respectively. Conversely, predicted dose for the hypothetical construction worker remains at 591 mrem/yr for t=0 and t=1 and then plummets to zero mrem/yr at t=25, when building material contamination has eroded away. The highest potential dose is from inhalation exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU2: Predicted annual doses from exposure to COPCs in EU2 (Building 2) diminish over time with juvenile trespasser dose dropping from 0.5 to 0.15 mrem/yr at t=0 and t=1000, respectively. Similarly, predicted doses for the onsite worker drop from 14 to 2.3 mrem/yr at t=0 and t=1000, respectively. Predicted dose for the hypothetical construction worker plummets from 470 to 2.9 mrem/yr at t=0 and t=1000, respectively. Predicted dose for the construction worker also displays a peak small peak of 19 mrem/yr at t=58 years, due to ^{238}U soil contamination leaching to groundwater. The highest potential dose is from inhalation exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU3: Predicted annual doses from exposure to COPCs in EU3 (Building 3) diminish from 0.8 to 0.04 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser. Similarly, predicted doses for the onsite worker diminish from 120 to 0.6 mrem/yr at t=0 and t=1000, respectively. Conversely, while predicted dose for the hypothetical construction worker diminishes from 55 to 1.7 mrem/yr at t=0 and t=1000, respectively, peak dose of 105 mrem/yr occurs at t=58; the time predicted by RESRAD for peak ^{238}U contamination in groundwater from soil leaching.

EU4: Predicted annual doses from exposure to COPCs in EU4 (Buildings 4/9) diminish over time with juvenile trespasser dose dropping from 0.3 to 0.061 mrem/yr at t=0 and t=1000, respectively. Similarly, predicted doses for the onsite worker drop from 30 to0.9 mrem/yr at t=0 and t=1000, respectively. Predicted dose for the hypothetical construction worker drops from 14 to 1.3 mrem/yr at t=0 and t=1000, respectively. Predicted dose for the construction worker also displays a peak small peak of 11 mrem/yr at t=58 years, due to ^{238}U soil contamination leaching to groundwater. The highest potential dose is from ingestion exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU5: Predicted annual doses from exposure to COPCs in EU5 (Building 5) diminished from 0.02 to 0.0026 mrem/yr at t=0 and t=25, respectively, for a juvenile trespasser and from 3 to 0.57 mrem/yr at t=0 and t=25, respectively, for an onsite worker. Predicted dose for the hypothetical construction worker remained steady with 25 mrem/yr at t=0 dropping slightly to 24 mrem/yr at t=25. Building materials were the only medium sampled at EU5. The highest potential dose to construction workers is from inhalation exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU6: Predicted annual doses from exposure to COPCs in EU6 (Building 6) slid from 3.8 to 3.6 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and slid from 58 down to 54 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the hypothetical construction worker rises from 84 mrem/yr at t=0, peaks at 117 mrem/yr at t=58, and settles to 49mrem/yr at t=1000. Results from static Beta scans of EU6 building materials determined that COPC levels of the building materials were less than background; risk from building materials is zero. Potential dose from external exposure to the floor (soil) drove the dose estimate with COPCs ^{228}Th, ^{228}Ra, and ^{226}Ra contributing the greatest potential dose.

EU7: Predicted annual doses from exposure to COPCs in EU7 (Building 8) dropped precipitously from 48 to 0.72 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 765 to 11 mrem/yr at t=0 and t=1000, respectively, for the onsite worker. Potential dose for the construction worker rose from 556 mrem/yr at t=0, peaked at 6481 mrem/yr at t=58, and settled at 55 mrem/yr at t=1000. The highest potential dose is from external exposure to soil with COPCs ^{238}U and ^{235}U contributing the greatest potential dose.

EU8: Predicted annual doses from exposure to COPCs in EU8 (Building 24) dropped from 0.4 to 0.04 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 65 to 0.6 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Similarly, potential dose to the future construction worker dropped from 19 to 10 to 1.7 mrem/yr at t=0, t=58, and t=1000, respectively, Potential dose is primarily from ingestion and inhalation exposure to building materials with COPCs ^{234}U and ^{238}U contributing the greatest potential dose.

EU9: Predicted annual doses from exposure to COPCs in EU9 (Building 35) dropped from 0.2 to 0.09 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 3.7 to 1.3 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the future construction worker dropped from 17 to 15 mrem/yr at t=0 and t=58, respectively, and settled at 5.5 mrem/yr at t=1000. The highest potential dose is from inhalation exposure to building materials with COPCs ^{234}U, ^{238}U, and ^{232}Th contributing the greatest potential dose.

EU10: Predicted annual doses from exposure to COPCs in EU10 (IA02, east of the buildings) dropped from 0.1 to 0.03 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 1.8 to 0.5 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the future construction worker rose from 5.1 mrem/yr at t=0, peaked at 16 mrem/yr at t=58, and settled at 2.1 mrem/yr at t=1000, Similarly, predicted dose for the hypothetical resident rose from 15 mrem/yr at t=0, peaked at 162 mrem/yr at t=58, and settled at 6 mrem/yr at t=1000,

EU11: Predicted annual doses from exposure to COPCs in EU11 (IA02, between the buildings) dropped from 0.3 to 0.02 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 3.1 to 0.3 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the future construction worker rose from 5.3 mrem/yr at t=0, peaked at 38 mrem/yr at t=58, and settled at 1.0 mrem/yr at t=1000, Similarly, predicted dose for the hypothetical resident rose from 18 mrem/yr at t=0, peaked at 436 mrem/yr at t=58, and settled at 5 mrem/yr at t=1000,

EU12: Predicted annual doses from exposure to COPCs in EU12 (landfill) dropped from 0.05 to 0.006 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 0.6 to 0.08 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the future construction worker rose from 3.3 mrem/yr at t=0, peaked at 25 mrem/yr at t=58, and settled at 0.5 mrem/yr at t=1000, Similarly, predicted dose for the hypothetical resident rose from 12 mrem/yr at t=0, peaked at 292 mrem/yr at t=58, and settled at 2.8 mrem/yr at t=1000.

EU13: Predicted annual doses from exposure to COPCs in EU13 (IA04A) remained steady at 0.1 mrem/yr at t=0 and t=1000 for a juvenile trespasser. Similarly, predicted dose for an onsite worker is relatively steady with 1.6 and 1.7 mrem/yr at t=0 and t=1000, respectively. Potential dose to the future construction worker rose from 6.4 mrem/yr at t=0, peaked at 69 mrem/yr at t=58, and settled at 2.1 mrem/yr at t=1000, Similarly, predicted dose for the hypothetical resident rose from 18 mrem/yr at t=0, peaked at 789 mrem/yr at t=58, and settled at 9.8 mrem/yr at t=1000,

EU14: Predicted annual doses from exposure to COPCs in EU14 (IA04B) dropped from 0.002 to 0.00001 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 0.04 to 0.0002 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the future construction worker rose from 2.2 mrem/yr at t=0, peaked at 3.7 mrem/yr at t=58, and settled at 0.04 mrem/yr at t=1000, Similarly, predicted dose for the hypothetical resident rose from 32 mrem/yr at t=0, peaked at 47 mrem/yr at t=58, and settled at 0.3 mrem/yr at t=1000.

EU15: Predicted annual doses from exposure to COPCs in EU15 (IA04C) dropped from 0.06 to 0.03 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 0.9 to 0.4 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the future construction worker rose from 2.2 mrem/yr at t=0, peaked at 2.7 mrem/yr at t=58, and settled at 0.8 mrem/yr at t=1000, Similarly, predicted dose for the hypothetical resident rose from 6.1 mrem/yr at t=0, peaked at 18 mrem/yr at t=58, and settled at 2.2 mrem/yr at t=1000.

EU16: Predicted annual doses from exposure to COPCs in EU16 (IA04D) slid from 0.1 to 0.08 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 1.7 to 1.2 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the future construction worker rose from 4.4 mrem/yr at t=0, peaked at 9.6 mrem/yr at t=58, and settled at 2.2 mrem/yr at t=1000, Similarly, predicted dose for the hypothetical resident rose from 22 mrem/yr at t=0, peaked at 87 mrem/yr at t=58, and settled at 6.2 mrem/yr at t=1000.

EU17: Predicted annual doses from exposure to COPCs in EU17 (IA05A) dropped from 7.1 to 1.4 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 104 to 21 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the future construction worker rose from 75 mrem/yr at t=0, peaked at 653 mrem/yr at t=58, and settled at 22 mrem/yr at t=1000, Similarly, predicted dose for the hypothetical resident rose from 166 mrem/yr at t=0, peaked at 7368 mrem/yr at t=58, and settled at 96 mrem/yr at t=1000.

As discussed in Section 4, the high concentrations of radionuclides in boring A05A-301. Therefore, the high radiation dose estimated for this EU is likely due to the influence of this one boring.

EU18: Predicted annual doses from exposure to COPCs in EU18 (IA05B) dropped from 0.04 to 0.02 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 0.6 to 0.3 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the future construction worker rose from 0.9 mrem/yr at t=0, peaked at 1.6 mrem/yr at t=58, and settled at 0.4 mrem/yr at t=1000, Similarly, predicted dose for the hypothetical resident rose from 2.9 mrem/yr at t=0, peaked at 19 mrem/yr at t=58, and settled at 1.1 mrem/yr at t=1000.

EU19: Predicted annual doses from exposure to COPCs in EU19 (IA09 Erie Canal) are only evaluated using currently sampled concentrations (t=0); future potential dose is not evaluated. Potential dose estimated from RAGS equations was 0.001 mrem/yr for a juvenile trespasser and 0.0007 mrem/yr for a future hypothetical resident at t=0. The highest potential dose is from ingestion of surface water ^{228}Ra; potential dose from ingestion of sediment ^{228}Ra and ^{232}Th is similar.

EU20: Predicted annual doses from exposure to COPCs in EU20 (IA10) dropped from 0.08 to 0.02 mrem/yr at t=0 and t=1000, respectively, for a juvenile trespasser and from 1.2 to 0.3 mrem/yr at t=0 and t=1000, respectively, for an onsite worker. Potential dose to the future construction worker rose from 1.0 mrem/yr at t=0, peaked at 2.1 mrem/yr at t=58, and settled at 0.25 mrem/yr at t=1000, Similarly, predicted dose for the hypothetical resident rose from 2.7 mrem/yr at t=0, peaked at 21 mrem/yr at t=58, and settled at 0.78 mrem/yr at t=1000,

6.5.3 Noncarcinogenic Effects of Uranium

The potential for noncarcinogenic health effects from exposure to uranium was assessed by estimating the hazard index (HI) from oral intakes. An endpoint-specific HI of greater than 1 may indicate a potential for adverse health effects. Conversely, an HI of 1 or less is considered to indicate little potential for the occurrence of adverse health effects.

The estimated HIs (excluding contributions from background) for the five receptors in the 20 EUs are presented in Table 6-14. This table identifies the key information used to calculate the HIs including the uranium intakes, receptor body weight, averaging time, and RfD. The uranium intakes (in mg) were calculated from the activity intakes of the three uranium isotopes at the Guterl Site given in Table 6-11. These activities were converted to mass using the specific activities for these radionuclides (the conversion factors are discussed in Section 6.3.4.3), and the total uranium intake was calculated as the sum of the intakes of the three individual isotopes. The intakes from all of the relevant media at each EU were summed to provide an ingestion intake for each receptor at that EU. The HI for each receptor was then calculated by dividing that receptor-specific intake by product of receptor body weight, averaging time, and RfD.

The estimated HIs for the various receptors range from 7×10^{-7} to 20. Although many of the HIs are much less than 1, several are above 1, which indicates some potential for noncarcinogenic health effects. HIs were estimated based on oral intakes of uranium, and the maximums occur in EUs 7, 8, 13, 14, and 17. The greatest potential contributor to noncarcinogenic effects at the Guterl Site comes from exposure to ^{238}U. At EU7 (Building 8), HIs for the juvenile trespasser, onsite worker, and future construction worker were 3, 9, and 20, respectively, with soil contributing the highest potential hazard. Potential exposure to building materials at EU8 contributed the most to an HI of 9 for the future construction worker. Hypothetical consumption of soil and groundwater are the greatest contributors to an HI of 1 for the future child resident in EU13. An HI of 2 was estimated for both the future adult resident and the future child resident, respectively, from hypothetical consumption of groundwater at EU14. Estimated HIs for the future construction worker and child resident at EU17 are 2 and 8, respectively, from potential exposure to soil.

6.6 Uncertainty Assessment

Uncertainty is introduced by the use of assumptions throughout the risk assessment process. The levels of uncertainty in the evaluation of risks to human health from potential exposures to Guterl Site radioactive contaminants are dependent upon the assumptions in the data assessment, in the exposure assessment, and in the toxicity assessment. Uncertainties involved in these steps are discussed in Sections 6.6.1 through 6.6.3 and summarized in Section 6.6.4.

6.6.1 Uncertainties in Data Assessment

Data were collected, evaluated, and grouped to represent potential radioactive contamination at the Guterl Site. Assumptions inherent in the use of these data introduce uncertainty into data assessment, including assumptions in COPC designation, sample inclusion, sample location, EU designation, and background comparison. These uncertainties are discussed below.

COPCs: The COPC list for this RI was developed from the knowledge of the original source of the Guterl Site radionuclides and results of the historic data (ORISE, 1999); culminating in the 2007 FSP (USACE, 2007a) CSM of the nature and extent of radioactive contamination from previous rolling mill activities. Radon, a disintegration product of radium, was not sampled during this RI because moist soil conditions are expected to reduce indoor air levels below the 4 pCi/L indoor air USEPA guideline. In addition, if present in an area, radon would be expected to build up in areas of poor ventilation. Based on the very poor condition of the Excised Area buildings, high air exchange rates for the buildings likely limit radon accumulation. The detected concentrations of radium support nominal presence of radon. Omitting a Guterl Site radionuclide from analysis could underestimate the risk. Because the COPC list was developed in the FSP in response to technical evaluation of the Guterl Site, this list included only radionuclides with a large probability of impacting human health; thus omitted radionuclides could introduce a small uncertainty.

Omission of Historic Data: Samples included in the data assessment are assumed to be representative of the Guterl Site and therefore dependent upon quality and location. Although historic data (e.g., ORISE 1999) were used to determine the scope of the current investigation, these data were not included in the HHRA data assessment because of their unknown quality. Since the current data set contains a vast number of samples and since inclusion of these questionable historic samples would introduce uncertainty, omission of these samples should have little effect upon the representativeness of the data.

Sample Bias: The location of samples included in the HHRA data set is assumed to adequately portray the distribution of COPCs around the Guterl Site. Since data locations were chosen based upon knowledge of the previous rolling mill operation and since they were biased towards areas with the greatest potential for contamination (USACE, 2007a), samples are assumed to represent higher concentrations of COPCs. This conservative assumption could bias sample results high and produce uncertainty in the data assessment.

EUs were developed to represent potential exposure sites in a geographic area. Because these exposure units were developed to group samples from potentially contaminated areas within an area that might be contacted by potential receptors, this grouping is probably representative of similarly contaminated samples. The 95% UCL developed for each medium in each of these EUs is therefore a conservative approximation of activity that may be encountered in the medium throughout that area of Guterl, and may result in conservatively high EU EPCs, introducing uncertainty in the data assessment.

Background Samples: COPCs are compared with background radioactive levels to help insure risks are determined from Guterl Site related activities. The dataset used to develop the background levels is assumed to be representative of Guterl Site background levels. A biased background level would introduce uncertainty in the data assessment.

One RESRAD model to evaluate all Investigative Areas/Exposure Units: An assessment of site-specific parameters and model sensitivity yielded a streamlined approach to using the RESRAD model to estimate risk and doses. One terrestrial exposure unit was determined to be representative for use in evaluating all terrestrial (non-building interiors) IAs/EUs in this RI – as described below. This terrestrial exposure unit model was used to evaluate receptors and scenarios for the vacant land areas, the areas beneath existing buildings/structures, and the landfill area. Exposure point concentrations were used from each IA/EU by isotope, by medium, as appropriate.

Tables 6-4 and 6-5 present the RESRAD model parameters identified for the IAs/EUs and receptor/scenario combinations. The model parameters (and rationale) used for this one terrestrial exposure unit are found in the last columns of Table 6-4.

Uncertainty is inherent in all assumptions and parameters used in modeling and risk assessment. Sensitivity analysis provides insight into the affect that each assumption and parameter has on risk/dose estimates. Table 6-4 also shows the sensitivity of the model to a particular RESRAD parameter (variable).

Variables such as precipitation, distribution coefficients, time, ingestion rates, etc., would not be expected to change across the EUs. Variables such as density of cover material and contaminated zone erosion rate – as well as other hydrogeological properties could have marked effect on model results – but based on an evaluation of site-specific data, these variables are not expected to vary widely across the site. Parameters that would be expected to change across IAs/EUs and would have influence on RESRAD results would include variables such as (a) area of contaminated zone, (b) thickness of contaminated zone, and (c) cover depth.

The sensitivity evaluation for IA01 (EU1 through EU9) modified the area of contaminated zone to be RESRAD default 10,000 m^2 and the contaminated zone thickness to be 0.6 m for the areas where buildings were assumed to be removed (no cover depth was assumed). The sensitivity evaluation for IA03/EU12, modified the area of contaminated zone to be site-specific 36,500 m^2, and the contaminated zone thickness to be 1.7 m (no cover depth was assumed).The results of this sensitivity analysis are presented in Appendix V2.

The concentration of ^{238}U in groundwater that was estimated using RESRAD peaked at approximately year 58 for all sensitivity evaluations – as well as the one terrestrial unit model used to represent the Guterl Site. Therefore, because all evaluations peaked in the same year, it was assumed that the one terrestrial unit model was suitable to represent conditions at all of the Guterl IAs/EUs. Results from that model, run with a generic 1 pCi/yr, were used to estimate dose to source ratios (DSRs) and risk to source ratios (RSRs) for each radionuclide for each receptor, which in turn were multiplied by the concentrations in each medium to obtained doses and risks for each EU. This process could either overestimate or underestimate the final doses and risks. The amount of over- or underestimation is expected to be minimal.

Static Beta Scan Results: EU-specific COPC concentrations for building materials were generated using static beta scans of the building interiors, removing background building surface activity, and apportioning the net beta surface activity.

Results of static beta scans from radiological building surveys were used to characterize the surface activity in the building interiors. Although both alpha and beta radiation may be used to assess surface activity, alpha measurements are often highly problematic; suffering from highly variable attenuation by rough, porous, and dusty surfaces. Beta measurements typically provide a more accurate assessment of thorium and uranium activity on most building surfaces because surface conditions cause significantly less attenuation of beta particles than of alpha particles. Beta measurements may therefore provide a more accurate determination of surface activity than alpha particles. (MARSSIM, 2000, Revision 1, Chapter 4, pp. 4-6)

The static scans used to characterize the surface activity were performed using multiple instruments, instrument efficiencies were removed from the results, and a 95^{th} UCL surface concentration was determined. Actual building surface activity may be less than or greater than the actual survey results. Individual instrument efficiencies may vary from the amount divided out of the raw count results from the building survey. Radiological surveys of the building interiors provided a large number of scans; thus providing a large distribution for 95^{th} UCL surface activity determination by ProUCL.

The removal of background building beta emissions from the 95^{th} UCL, examined emissions from red brick, concrete, steel, fire brick, and glazed brick and removed the weighted average background for steel. Weighted average background building emissions ranged from 2096 to 5001 dpm/100cm^2 for steel and fire brick, respectively. Since steel is a common building material throughout the Guterl Site, its removal is appropriate. The 95^{th} UCL for EU6 was less than steel background; so EU6 building material beta emissions from COPC activity are zero. However, since steel provides the lowest weighted average background value and since other building materials are on the Guterl Site, removal of a larger building background value would result in other EUs having emissions less than background. Additionally, building background values are also determined from individual instrument beta scans; thus introducing possible variance. Uncertainty in this background building emission factor has a great impact upon the dose and risk determined from building materials.

The COPC fraction of net beta surface activity and the relative abundance of each COPC are then determined assuming that (1) COPCs ^{226}Ra and ^{230}Th occur in the building surface activity at levels less than background conditions, (2) beta emitting progeny are in equilibrium with their parent radionuclides, and (3) the relative abundance of beta COPCs are the same in surface activity as in soil concentrations. Surface activity of COPCs ^{226}Ra and ^{230}Th may be greater than background; skewing subsequent conclusions and resulting in an underestimation of dose and risk. In addition, because the parent radionuclides ^{238}U, ^{235}U, and ^{232}Th are long-lived, they are most probably in secular equilibrium with their beta emitting progeny; so uncertainty due to this assumption is negligible. Finally, soil and surface activity most probably have the same relative abundance of beta emitting COPCs; so variance from this factor is relatively small.

The estimation of the ^{238}U building soil activity is from alpha spectroscopy results and population of ^{235}U and ^{232}Th is based upon relative activities. Uncertainties in the alpha spectroscopy results, the measured ^{238}U soil background level, and measurements of the relative activities all contribute to possible variance in the calculation of net beta emissions from COPC progeny.

The assumption that beta emitting COPC progeny, ^{234}Th and ^{234m}Pa from ^{238}U, ^{231}Th from ^{235}U, and ^{228}Ra and ^{228}Ac from ^{232}Th, are in secular equilibrium with their parent and therefore that the soil concentration of each progeny equals that of the parent introduces little variance into the net beta emissions from COPCs. However, the weighting factor of ten to model the extremely low relative detection efficiency of ^{228}Ra may under or over estimate its contributions to the net concentration of beta emitting COPC progeny, and thus create variance in the individual COPC concentrations and the resultant dose and risk

from surface activity. Variance in this weighted ^{228}Ra concentration also effects the relative contribution from ^{232}Th, thus directly altering the estimated surface concentrations for ^{232}Th, ^{228}Ra, and ^{228}Th.

Individual COPC surface concentrations for each EU are then determined using the fraction of surface activity from beta emitting COPC progeny coupled with the EU-specific ProUCL static beta scan results. Since the 95th UCL contains both naturally occurring beta emissions in addition to the surface activity beta emissions, the fraction of the net beta surface activity from beta emitting COPC progeny must remove the naturally occurring emissions. Variance from the net concentration of natural beta emitters would weight the fraction of net beta surface concentration from COPC progeny and produce variance in the individual COPC surface concentrations and the resultant dose and risk from building materials.

6.6.2 Uncertainties in Exposure Assessment

Uncertainty in the risk assessment also results from assumptions in the exposure assessment. Assumptions necessary to characterize the exposure setting, exposure pathways, and potential receptors coupled with estimations of EPCs and intakes, introduce uncertainty into the exposure assessment for both current and future use.

Current exposure to Guterl Site constituents was modeled for a juvenile trespasser and for an onsite industrial worker. Exposure to COPCs through building surfaces, surface soil, sediment, and surface water were assumed to occur to produce a conservative estimation of exposure. The juvenile trespasser is modeled as a male between 7 and 16 years of age who visits the site 4 hours per day, one day per week for 6 months of the year (weather permitting) over a ten-year period. The industrial worker was assumed to have limited access to Guterl Site constituents and spend most of his 25-years of workday exposure indoors. While chosen to be conservatively realistic of current exposure routes, these assumptions may likely over estimate current potential exposure.

Future exposure to Guterl Site constituents was modeled using a juvenile trespasser, an onsite industrial receptor, an onsite construction worker, and an onsite resident. Since future construction may disturb soils, exposure to subsurface soils and groundwater was included in the models for the construction worker and the hypothetical resident. The future construction worker is conservatively modeled to contact all media, with the exception of the Erie Canal sediment and surface water, over his one year workday exposure. An onsite resident is assumed to live onsite for 30 years and contact surface soil, subsurface soil, groundwater, and Erie Canal sediment and surface water. Omission of an exposure route would bias the exposure low while inclusion of an incomplete exposure route would bias the calculated future exposure high.

The selected EPCs were the lesser of the maximum detected concentration and the 95% UCL and were used to model potential exposure to COPCs for current and future receptors for each medium within each EU. Both current and future contamination is assumed to be uniform enough to allow this estimation. While current COPC EPCs are based upon measured values and contain relatively little uncertainty, future levels utilize radioactive disintegration as modeled by RESRAD to include radioactive decay and daughter product ingrowth. RESRAD was used to project the greatest concentration for each isotope in each medium at each EU within 1000 years using the receptor and the media parameters in Tables 6-4 through 6-7. The media parameters provide a realistic description of the future Guterl Site since they were based upon current Guterl Site parameters and default USEPA and NRC recommended values. Future exposure uncertainty is much greater than current uncertainty levels since RESRAD results are extremely sensitive to site parameters and since many assumptions must be made to model these parameters in addition to the assumptions used for current exposure.

Uncertainty may also be introduced into the exposure assessment with intake assumptions for current and future potential receptors. While conservatively realistic intake assumptions are chosen for current receptors, these assumptions may over or under estimate the current exposure. Projection of current intakes onto predicted future receptors provides even greater uncertainty. Exposure of predicted future

receptors assumes intakes coupled with RESRAD generated concentrations at the center of contamination. Uncertainties in intake directly bias the exposure assessment with future uncertainties surpassing current uncertainties.

The future-use scenarios use cancer risk coefficients and DCFs in RESRAD. Uncertainties in the future-use exposure assessment include the current-use assumptions and the uncertainties from RESRAD assumptions. An important RESRAD assumption is the inclusion of environmental transport to model the interactions of the contaminated medium and the environment. RESRAD incorporates radioactive decay, FGR 11 inhalation, FGR 11 ingestion, and FGR 12 external DCF values, and FGR 13 morbidity values along with many USEPA and NRC recommended values in its determination. The resultant values incorporate a large degree of uncertainty.

Evaluation of adult receptor only for cancer risk assessment using RESRAD: The RESRAD evaluation of residential receptors exposed to radioisotopes included only the adult receptor because the evaluation of the adult receptor is considered protective of all typical age-averaged receptor ("adult/child receptor" in this assessment) used in CERCLA cancer risk assessments. A brief sensitivity analysis of select exposure parameters and a target cleanup goal (or PRG) of a 25 mrem/year annual dose limit - did not yield significantly different soil PRGs. The evaluation radiation cancer risk/dose of the adult resident using RESRAD should be protective of the "adult/child" receptor.

Table 6-4 shows the exposure parameters used in RESRAD for the various receptors and exposure scenarios. Inhalation rates and food consumption rates are greater for adult receptors than for the "adult/child" receptor, as well as a child receptor. Ingestion rates and time spent outdoors are greater for the adult/child receptor than for the adult. Exposure duration was considered to be the same for both the adult and "adult/child" receptor.

The first sensitivity run held constant all parameters save the soil ingestion rate, which was varied from 36.5 grams/year (g/yr) for the adult to 43.8 g/yr for the "adult/child" receptor. The resulting PRGs for ^{238}U ranged from 4.115 pCi/g to 4.117 pCi/g, respectively. Increasing the time spent outdoors from 0.0799 (adult) to 0.109 (adult/child) yielded a PRG of 4.114 pCi/g. See Appendix V3 for RESRAD output that illustrates these results.

The evaluation of only the adult receptor using RESRAD for radiological cancer risk assessment would not likely underestimate risk.

6.6.3 Uncertainties in Toxicity Assessment

Assumptions in the toxicity assessment introduce uncertainty into the risk assessment process. Cancer risk and radioactive dose from internal exposure and from external exposure, along with noncancer hazard from uranium metal ingestion, were determined for Guterl Site COPCs using cancer risk coefficients, DCFs, and the uranium RfD. The selection of these toxicity values (cancer risk coefficients, DCFs, and RfD) involves assumptions, thus introducing uncertainty into the toxicity assessment.

Since milling activities at the Guterl Site have ceased and milled materials were distributed offsite, radioactive contamination was characterized as low-level ionizing radiation; this assumption introduces uncertainty into the HHRA. As a result, this HHRA explored chronic effects (low doses over relatively long time periods) and not acute effects (high doses over short time periods). Omission of acute effects could bias the assessment low; however, high levels of radioactive contamination are improbable at the Guterl Site.

Consistent with USEPA guidance, this HHRA focused upon cancer induction instead of mutagenesis and teratogenesis. The risk of cancer incidence is much greater than the risk of mutagenicity and it is comparable to risk for teratogenicity, which also requires exposure during the nine-month gestational period. The omission of these two effects introduces little uncertainty. Cancers resulting from low dose

radiation are indistinguishable from cancers related to other causes. The risk of cancer from exposure to low levels of ionizing radiation must therefore be extrapolated from high dose data because the relationship between radiation dose and health effects is relatively well characterized for high radiation doses. Because potential health effects for low levels of ionizing radiation are assumed to have no threshold dose (only levels with zero-dose provide zero risk) and the probability of cancer incidence is assumed to increase with the amount of absorbed dose, assumptions involved in extrapolating low dose risk from higher dose health effects studies produce uncertainty in the assessment.

Cancer Risk Coefficients: The inhalation cancer risk coefficients used in this HHRA were chosen from FGR 13 (USEPA, 1999b). FGR 13 presents mortality and morbidity values for fast, medium, and slow absorption into the blood of inhaled radioactive isotopes averaged over all ages and genders and weighted (through life-table analysis) by competing risks. The use of morbidity (illness) values instead of mortality values in this HHRA provides a conservative estimate of risk while adding uncertainty to the toxicity assessment. As detailed in Section 6.4.2, values for fast, medium, or slow absorption are chosen based upon the retention half-time dependent inhalation DCFs from FGR 12. The uncertainty is magnified for this value because the chosen cancer risk coefficient is dependent upon the chosen DCF. In addition, uncertainties are inherent in the values tabulated in FGR 13 by the assumptions used in averaging exposures over all ages and genders and also in the life-table analysis.

The ingestion cancer risk coefficients used in this HHRA were chosen from FGR 13 (USEPA, 1999b). FGR 13 presents mortality and morbidity values for dietary and for tap-water ingestion of radioactive isotopes averaged over all ages and genders and weighted (through life-table analysis) by competing risks. The use of morbidity (illness) values instead of mortality values in this HHRA provides a conservative estimate of risk while adding uncertainty to the toxicity assessment. The use of dietary values instead of the lower tap water risk coefficients provides a more conservative estimation of risk and produces uncertainty in the assessment. In addition, uncertainties are inherent in the values tabulated in FGR 13 by the assumptions used in averaging exposures over all ages and genders and also in the life-table analysis.

Mortality and morbidity external exposure risk coefficients are presented in FGR 13 for submersion in contaminated air, exposure to contaminated surface soil, and exposure to soil contaminated to an infinite depth. Since exposure is assumed to be instantaneous, instead of the prolonged exposure of internal exposure, external exposure risk coefficients presented in FGR 13 do not contain any dose contribution from decay chain members that form in the environmental medium. Exclusion of these radioactive daughters with half-lives less than 6 months produces a small amount of uncertainty in the assessment. Use of external risk coefficients for exposure to soil contaminated to an infinite depth assumes continuous uniform depth and produces conservative risk estimates and uncertainty in the toxicity assessment. Similar to internal cancer coefficients, morbidity external risk coefficients are chosen instead of mortality values; thus introducing further uncertainty.

DCFs: DCFs were used in this HHRA to present the amount of absorbed radiation. DCFs were developed using the dose equivalent of an adult male occupational worker during a 50-year period following exposure. Since the absorbed dose is dependent upon the radiation type and the tissue effected, normalizing the radiation dose and effect with the use of dose equivalents introduces uncertainty. In addition, the use of this hypothetical receptor to model exposure to other ages, genders, and occupations introduces further uncertainty into the toxicity assessment.

Estimates of the radiation dose rate were made using standard DCFs given in FGR 11 (USEPA, 1988a) and FGR 12 (USEPA, 1993b). These DCFs are based on the metabolic and anatomical model of an adult male, the ICRP reference man weighing 70 kg (about 150 pounds). The ICRP selected such a standardized individual for its dosimetry models because the main concern was worker protection and the majority of radiation workers are adult males. Although children are more susceptible to radiation exposure (i.e., the radiation doses are larger for children than adults for the same intake of radioactivity), such effects are only significant for very young children. All of the receptors addressed in the radiation dose assessment were adults except for the juvenile trespasser. The uncertainty associated with using

DCFs developed for an adult for the juvenile trespasser is low, and does not significantly impact the radiation dose rates presented in this HHRA. These DCFs have been used in numerous assessments, and evaluations for exposures to radiation, and the uncertainty associated with their use is considered to be low.

More recently, the ICRP has issued Publication 72, which presents age-dependent DCFs for five ages of children ranging from 3 months to 15 years old (ICRP, 2002). A comparison of these age-dependent DCFs for the five ages used in ICRP 72 to the DCFs from FGR 11 developed for the reference man and used in the RESRAD calculations for the Guterl Site was performed for uranium, the main FUSRAP contaminant on-site. The uranium FGR 11 inhalation DCFs were slightly higher than the DCFs for the five ages of children in ICRP 72, even for the youngest age group (infant). This is due to improvements in the respiratory tract model used in ICRP 72 from that used to develop the values in FGR 11, as discussed in FGR 13 (USEPA, 1999b). The updated model provides for more realistic projections of the radiation dose from inhaled radionuclides (i.e., some of the conservatism inherent in the original model was removed). Use of the inhalation DCFs from FGR 11 is more conservative than using the inhalation DCFs from ICRP 72 for all age groups.

In a similar manner, the ingestion DCFs for children 10 and 15 years old are less than those for the reference man in FGR 11 due to improvements in the approach used to calculate doses from ingestion. Use of the ingestion FGR 11 DCFs for these two age groups (as well as for adults) is conservative and provides higher estimates of the radiation dose than use of the ICRP 72 values. The ICRP 72 age-dependent ingestion DCFs for children ages 5 years, 1 year, and infants, were greater than the FGR 11 ingestion DCFs. However, as discussed in Section 6.6.2, the child receptor was not evaluated using RESRAD (i.e., only the adult and juvenile aged 7 to 16 were evaluated). So the radiation dose over the length of time that an individual would be expected to be exposed to the radioactive isotopes at the Guterl Site is likely overestimated by use of the FGR 11 values for the age groups evaluated, rather than considering the specific ages at which exposure occurs and then summing over the individual's lifetime. The use of FGR 11 DCFs to calculate the annual doses to individuals from ingestion of uranium is considered to be appropriate for purposes of this risk assessment.

Inhalation DCF dose equivalents for representative tissues (gonad, breast, lung, bone marrow, bone surface, thyroid, and remainder tissues) and for the weighted sum of tissues or the effective tissue are presented by USEPA in FGR 11 (USEPA, 1988a). As detailed in Section 6.4.3, inhalation DCFs are further separated into classes based on the time of clearance from the lungs. Based upon the 50-year CEDE, the use of the highest effective DCF for each isotope produces uncertainty in the assessment by using the hypothetical receptor to model all receptors and by using the weighted effective tissue DCFs to represent all tissue responses.

USEPA also presents ingestion DCF dose equivalents for representative tissues (gonad, breast, lung, bone marrow, bone surface, thyroid, and remainder tissues) and for the weighted sum of tissues or the effective tissue in FGR 11. Ingestion DCFs for some isotopes are also presented for various fractional uptakes from the small intestine to the blood (fi). Based upon the 50-year CEDE, the use of the highest effective DCF for each isotope produces uncertainty in the assessment by using the hypothetical receptor to model all receptors and by using the weighted effective tissue DCFs to represent all tissue responses.

DCFs for external exposure to radionuclides in air, water, and various depths of soil are presented by USEPA in FGR 12 for representative tissues (gonad, breast, lung, bone marrow, bone surface, thyroid, skin, and remainder tissues) and for the weighted sum of tissues or the effective tissue. Based upon the EDE, the effective DCF for external exposure to soil contaminated with each isotope to a depth of 15cm was used in this assessment to represent Guterl Site conditions. The use of EDE based values introduces uncertainty with a weighted average to normalize the radiation over the entire body. The specific soil introduces a small amount of uncertainty since tabulated values for other soil depths remain the same order of magnitude.

RfD: Although the radiotoxicological effects typically outweigh the chemical toxicological effects for most radionuclides, soluble uranium is an exception. The chemical effects of uranium are included in this HHRA since the soluble form of uranium metal is a kidney toxin at concentrations slightly above background levels and since uranium chemical toxicity is comparable to its radiotoxicity. The oral RfD obtained from IRIS, 0.003 mg/kg-d, was developed from animal studies demonstrating classic nephrotoxicity from the ingestion of soluble uranium. The uncertainty factor of 1,000 is comprised of a factor of 10 for interspecies variability, 10 for intraspecies variability, and 10 for extrapolation from an animal study LOAEL. Further studies exhibited similar LOAELs and NOAELs from subacute studies compared with acute studies; so no additional factor is required to extrapolate to lifetime exposure. The RfD is given a medium level of confidence by IRIS since the critical study is small, but well defined and since there are adequate studies on the effects of uranium on various species.

Uncertainties related to the chemical toxicity include the omission of the chemical effects from non-uranium radionuclides and use of the oral RfD for uranium. While the omission of chemical effects from non-uranium radionuclides introduces uncertainty into the assessment, the magnitude of these chemical effects is far outweighed by their radiotoxicity, and the resultant degree of change to the HHRA would be very minimal. The oral RfD for uranium may under or over estimate the chemical toxicological effects of soluble uranium and, based upon the confidence expressed in IRIS for this RfD, uncertainty in this value is moderate.

There is uncertainty inherent in the selection of the toxicity criteria for the chemical form of uranium. A hierarchy was used to select the toxicity criteria in the risk assessment. If toxicity criteria exist in IRIS, then those are the toxicity criteria used. In IRIS an oral RfD for uranium soluble salts is given as 0.003 mg/kg-day. The USEPA used a provisional oral RfD for uranium of 0.0006 mg/kg-day in promulgating the maximum contaminant level for community drinking water supplies (USEPA, 2000). The use of the provisional oral RfD for uranium in this risk characterization would result in a greater hazard index from uranium exposure; however, it is not appropriate to use a provisional toxicity criterion when an established one has not yet been withdrawn from IRIS.

The lack of an inhalation RfD for uranium could underestimate risk from exposure to uranium. However, a recent journal article on uranium toxicity did indicate that the target organ for uranium toxicity is the kidney, irrespective of the route of entry (Kathren and Burklin, 2008). In this article, it was also noted that humans as a species seem to have a lower order of sensitivity to the toxic effects of uranium than the other mammalian species that have been studied. There has never been a death attributable to uranium poisoning in humans. Furthermore, the radiological effects of uranium (rather than its chemical toxicity) typically drive the remedial action objectives aimed at protection of human health at most FUSRAP sites.

6.6.4 Summary of Uncertainties

Uncertainties in the evaluation of risks to human health from potential exposures to Guterl Site radioactive constituents result from assumptions in the data, exposure, and toxicity assessments. The data set, exposure assumptions, and toxicity values were chosen to develop a protective rather than a predictive risk assessment. Conservative assumptions used to develop this assessment produce an overestimation of risk and hazard from Guterl Site radionuclides. Presumptive assumptions used to model future receptors coupled with the large volume of receptor and media assumptions needed by RESRAD to determine the probable 1000-year peak dose, produce a much greater uncertainty in the future receptor assessment as compared with the current receptor assessment.

6.7 Summary and Conclusions of HHRA

An HHRA was conducted for the Guterl Site as part of the RI. This HHRA evaluated potential carcinogenic risks, radiation doses, and noncarcinogenic (systemic) effects to both current (juvenile trespasser and onsite worker) and future (construction worker, and hypothetical resident) human receptors from exposure to contaminated building materials within the Excised Area, from exposure to

surface soil, subsurface soil, groundwater, sediment, and surface water within man-made ditches, trenches, etc., and from exposure to sediment and surface water within the Erie Canal. The COPCs evaluated in the HHRA were ^{226}Ra, ^{228}Ra, ^{228}Th, ^{230}Th, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U. The potential routes of exposure are presented in the CSM as shown on 6-3 and include ingestion of all media, inhalation of particulates, exposure to external gamma radiation, and ingestion of produce grown in soil.

The RESRAD code was used to estimate the carcinogenic risk and radiation dose for all receptors and all media except sediment, surface water, and groundwater which were estimated using RAGS equations. The noncarcinogenic effects of the uranium isotopes were also estimated using the RAGS equations because the RESRAD code is not set up to handle these evaluations. The RESRAD-Build code was used to estimate risk and dose for the building interiors.

The Guterl Site was divided into 20 EUs to more easily assess risk to the various receptors. EUs 1-9 are Excised Areas building interiors, while EUs 10-20 are considered the outdoor EUs. EU10 and EU11 are within the Excised Area and all other EUs are outside the Excised Area. The risks, doses, and hazard indices are summarized in Table 6-13 by receptor and exposure unit and discussed in Section 6.5. In Table 6-13, values are bolded when they exceed one of the following screening criteria:

Radiological carcinogenic risk of 1×10^{-4}

Annual dose of 25 mrem/year

Hazard Index of 1.0

To summarize Table 6-13, the EUs that exceed one or more of these screening criteria are discussed below. Values in parentheses are the maximum risks/doses/HIs estimated for a receptor at that EU. For EUs 1-9, the receptor most at risk is the onsite worker exposed to either building materials or in-building soil (flooring), while for EUs 10-20 the most at-risk receptor is a hypothetical resident exposed to either external radiation from soil, ingestion of soil, or ingestion of groundwater.

Modeling current contaminant conditions, several receptors exceeded one or more of the above screening criteria in one or more EUs (values in parentheses are the maximum risks/doses/HIs estimated for a receptor at that EU). For EUs 1-9 (all within IA01), the receptors most at risk are the onsite worker and the construction worker and the primary exposure pathway is in-building soil (flooring). For EUs 10-20 (IA02 through IA05B, IA09, IA10), the most at-risk receptor is a hypothetical resident and the primary exposure pathways are external gamma radiation and consumption of home-grown produce.

<u>EUs with Carcinogenic Risks Exceeding 1×10^{-4} at year zero.</u> The highest estimated risk (excluding contributions from background) was 1×10^{-2} at EU7/Bldg. 8. EUs with risks exceeding 1×10^{-4}, the upper bound of the USEPA risk range, included:EU2/Bldg. 2 (1×10^{-4}), EU3/Bldg. 3 (1×10^{-4}), EU6/Bldg. 6 (1×10^{-3}), EU7/Bldg. 8 (ranging from 3×10^{-4} to 1×10^{-2}), EU10/IA02 East (3×10^{-4}), EU11/IA02 West (2×10^{-4}), EU12/IA03 (2×10^{-4}), EU13/IA04A (3×10^{-4}), EU14/IA04B (3×10^{-4}), EU15/IA04C (1×10^{-4}), EU16/IA04D (3×10^{-4}), and EU17/IA05A (ranging from 2×10^{-3} to 3×10^{-3}),.With the exception of EU19/IA09, the remaining EUs (EU1/Bldg. 1, EU4/Bldg. 4&9, EU5/Bldg. 5, EU8/Bldg. 24, EU9/Bldg. 35, EU18/IA05B, and EU20/IA10) all had maximum risks between 1×10^{-6} and 1×10^{-4}.

<u>EUs with Radiation Doses exceeding 25 mrem/year at year zero.</u> Ten EUs had annual dose estimates (excluding contributions from background) greater than 25 mrem/year: EU1/Bldg. 1 (591 mrem/y), EU2/Bldg. 2 (470 mrem/y), EU3/Bldg. 3 (56 to 120 mrem/y), EU4/Bldg. 4&9 (30 mrem/y), EU6/Bldg. 6 (58 to 84 mrem/y), EU7/Bldg. 8 (48 to 77 mrem/y), EU8/Bldg. 24 (65mrem/y), EU9/Bldg. 35 (107 mrem/y), EU14/IA04B (32 mrem/y), and EU17/IA05A (ranging from 75 to 166 mrem/y).

EUs with Noncarcinogenic HIs exceeding 1.0 at year zero. Only four EUs had HIs (excluding contributions from background) exceeding 1.0: EU7/Bldg. 8 (ranging from 3 to 20), EU8/Bldg. 24 (9), EU13/IA04A (1.1), EU14/IA04B (2), and EU17/IA05A (ranging from 2 to 8).

Future cancer risks and doses estimated by RESRAD and RESRAD-Build revealed several receptors exceeding the screening criteria in one or more EUs (values in parentheses are the maximum risks/doses estimated for a receptor at that EU). As in current conditions, for EUs 1-9 (all within IA01), the receptors most at risk are the onsite worker and the construction worker and the primary exposure pathway is in-building soil (flooring). For EUs 10-20 (IA02 through IA05B, IA09, IA10), the most at-risk receptor is a hypothetical resident and the primary exposure pathways are external gamma radiation and consumption of home-grown produce.

EUs with Risks Exceeding 1 x 10^{-4} in future years: Incorporating contaminant degradation and transport, estimated cancer risks (excluding contributions from background) for twelve EUs/IAs exceeded 1 x 10^{-4}, the upper bound of the NCP risk range. The highest estimated risk was 6 x 10^{-2} at year 58 for EU17/IA05A. EUs with risks exceeding 1 x 10^{-4} included: EU6/Bldg. 6 at year 1000 (1 x 10^{-3}), EU7/Bldg. 8 at year 58 (2 x 10^{-3}), EU7/Bldg. 8 at year 1000 (2 x 10^{-4}),EU10/IA02 East at year 58 (1 x 10^{-3}), EU10/IA02 East at year 1000 (1 x 10^{-4}), EU11/IA02 West at year 58 (4 x 10^{-3}), EU12/IA03 at year 58 (2 x 10^{-3}), EU13/IA04A at year 58 (6 x 10^{-3}), EU13/IA04A at year 1000 (1 x 10^{-4}), EU14/IA04B at year 58 (4 x 10^{-4}), EU15/IA04C at year 58 (2 x 10^{-4}), (EU16/IA04D at year 58 (8 x 10^{-4}), (EU16/IA04D at year 1000 (1 x 10^{-4}), EU17/IA05A at year 58 (6 x 10^{-2}), EU17/IA05A at year 1000 (1 x 10^{-3}), EU18/IA05B at year 58 (2 x 10^{-4}), and EU20/IA10 at year 58 (2 x 10^{-4}).

EUs with Doses Exceeding 25 mrem/year in future years: Fourteen EUs/IAs had annual dose estimates (excluding contributions from background) greater than 25 mrem/year: EU1/Bldg. 1 at year 1 (591 mrem/y), EU2/Bldg. 2 at year 1 (462 mrem/y), EU3/Bldg. 3 at year 1 (113 mrem/y), EU3/Bldg. 3 at year 58 (105 mrem/y), EU4/Bldg. 4/9 at year 1 (26 mrem/y), EU6/Bldg. 6 at year 58 (117 mrem/y), EU6/Bldg. 6 at year 1000 (54 mrem/y), EU7/Bldg. 8 at year 1 (94 mrem/y), EU7/Bldg. 8 at year 58 (6481 mrem/y), EU7/Bldg. 8 at year 1000 (55 mrem/y), EU8/Bldg. 24 at year 1 (61 mrem/y), EU10/IA02 East at year 58 (162 mrem/y), EU11/IA02 Between Buildings at year 58 (436 mrem/y), EU12/IA03 Landfill at year 58 (292 mrem/y), EU13/IA04A at year 58 (789 mrem/y), EU14/IA04B at year 58 (47 mrem/y), (EU16/IA04D at year 58 (87 mrem/y), EU17/IA05A at year 58 (7368 mrem/y), and EU17/IA05A at year 1000 (96 mrem/y).

As discussed in previous sections of this HHRA, the high carcinogenic risks, radiation doses, and noncarcinogenic (systemic) HIs estimated for EU17 are due to the influence of boring location A05A-301.

Evaluation of risk, dose and hazard in this HHRA revealed that, individually, COPCs ^{226}Ra, ^{228}Ra, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U exceeded the carcinogenic risk or radiation dose criterion at least once for a given receptor in a given EU. These constituents were therefore identified as preliminary COCs for at least one location (EU) at the Guterl Site. Some of these constituents, i.e., ^{226}Ra, were only above background in limited areas of the site, and then usually as a result of co-location with elevated uranium.[38] Conversely, COPCs ^{228}Th and ^{230}Th individually exceeded the lower risk threshold of 1 x 10^{-6}, but not the upper screening level; they are not COCs at the Guterl Site. The total risk, total dose, and total hazard for EU19 (Erie Canal) were all below screen; so no individual COPCs exceeded screen criteria and no COCs were identified for EU19 (Erie Canal). The final determination of COCs will be made in the FS and will consider additional background evaluations and comparison to potential ARARs.

[38] ^{226}Ra was not expected to be above background at the Guterl Site and may not be a significant COC. Large exceedances for ^{226}Ra in soil were few (6 out of 380 GFPC results and none of the 250 gamma spectroscopy results were more than three times their corresponding background ^{226}Ra concentrations). The greatest ^{226}Ra soil concentrations, except for the anomalous results in IA05A were (3.6 ± 0.5) pCi/g (Sample ID B06SL-021-01), (3.4 ± 0.3) pCi/g (B06SL-021-05), and (3.2 ± 0.3) pCi/g (A02SL-021-03).

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7.0 SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

7.1 Introduction and Objectives

7.1.1 Introduction

This SLERA evaluates the potential risk to ecological receptors which may inhabit the Guterl Site; the evaluation includes both radiation doses and exposure to uranium in its inorganic form. The most appropriate available guidance and methodologies were used for radiation and uranium exposure, as described below.

Potential risks from radiation doses were screened using RESRAD BIOTA (United States Department of Energy (USDOE), 2004) which follows the methodology outlined in the DOE standard: A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota (USDOE, 2002). This standard provides a dose evaluation approach that meets the requirements for protection of biota in DOE Orders 5400.1, "General Environmental Protection Program" (USDOE, 1990), 5400.5 (USDOE, 1993), and the dose limits for protection of biota developed or discussed by the National Council on Radiation Protection and Measurement (1991) and International Atomic Energy Commission (IAEA, 1992).

Potential risks from exposure to inorganic uranium were evaluated using Steps 1 and 2 of the USEPA Ecological Risk Assessment Guidelines for Superfund (ERAGS) process (USEPA, 1997). ERAGS Step 1 includes a screening-level problem formulation and an ecological-effects evaluation; Step 2 consists of a screening-level exposure estimate utilizing conservative assumptions to estimate exposure point concentrations (EPC) for representative receptors of exposure pathways identified as complete under the exposure pathway evaluation (USEPA, 1997).

At the screening level, ecological risk estimation is limited to a simplified assessment by comparing maximum documented exposure concentrations for each media with the ecotoxicity screening values and through food web modeling to evaluate risks to avian and mammalian receptors. The screening-level assessment serves to identify exposure pathways and constituents of potential ecological concern (COPEC) which would require further evaluation in a baseline ecological risk assessment by eliminating constituents and exposure pathways that pose negligible risks (USEPA, 1997).

A scientific management decision endpoint (SMDP) is presented at the conclusion of this SLERA. This SMDP will help determine if a full baseline ecological risk assessment is required to evaluate potential risks to ecological receptors from exposure to radionuclides and uranium in the environmental media at the Guterl Site. There are three potential outcomes of the SMDP: (a) further information and evaluation are needed to better define potential ecological risks at the Guterl Site (i.e., baseline ecological risk assessment may be warranted), (b) risks may be negligible and no further action is warranted for protection of ecological receptors, or (c) the potential for ecological risk is great enough and sufficient information exists to proceed with a remedial action.

7.1.2 Scope and Objectives

This SLERA evaluates the potential exposure of terrestrial and aquatic biota (receptors) that potentially live and/or forage on the Guterl Site and in the nearby Erie Canal (see Figure 1-2). These receptors potentially receive both external and internal exposure to radionuclides and total uranium from soil, sediment, surface water, and food items that have bioaccumulated site-related contaminants.

As stated in Section 1.0, the strategy for the RI is to address all MED/AEC-related constituents at the Guterl Site (and adjacent properties, if necessary) using the criteria established by CERCLA and the NCP. As further defined in Section 2.5, the goal of the RI is to generate data of known and sufficient quality and quantity, with quantitation levels low enough to meet pertinent standards, ARARs, and remediation goals, with the long-term objective being the selection of a protective remedy that satisfies

CERCLA. The purpose of conducting this SLERA is to satisfy Project DQO No. 19 - Gather sufficient data to complete a Baseline HHRA and a SLERA. The objective of the SLERA is to evaluate whether existing data indicate that site constituents pose negligible risks to ecological receptors, or whether additional evaluation is necessary to determine whether a risk is present or whether there is the potential for adverse effects. The SLERA is part of a stepwise approach and is intentionally conservative. Risk managers can conclude that no further action (e.g., continued investigation, remediation) is required at the Guterl Site if negligible risks are identified.

7.1.3 Problem Formulation

Currently the site management goals do not include management for ecological purposes or the creation of an ecological preserve. However, some habitat exists on both the terrestrial and aquatic areas of the Guterl Site in order for relevant ecological receptors to either reside or use the Guterl Site as a forage base. As per Section 7.2 and Figure 1-3, vegetated areas of the Guterl Site contain herbaceous, scrub/shrub, and woodland habitats. The northern portion of the Guterl Site contains swaths of old (late successional) fields that occupy the areas between buildings (34.5 acres) and the landfill areas which contain construction debris (e.g., concrete, wood, etc.). The southwest portion of the Guterl Site has limited wooded and scrub/shrub area habitats which are 16.1 acres. There are also small areas (averaging 3.8 acres) of old fields located in the eastern portion of the Guterl Site around the abandoned buildings and a rail spur (averaging 7.0 acres). Wetlands are present within the Guterl Site (approximately 3.1 acres) and vary from scrub/shrub and forested wetlands to small, ephemeral wet depressional areas.

The SLERA addresses radiological risk and uranium toxicity risk in parallel sections within the document.

The required five steps of the problem formulation are presented in the SLERA as follows:

- Section 7.2 Description of Site Flora and Fauna
- Section 7.3 Identification of Constituents of Potential Concern
- Section 7.4 Exposure Pathways Analysis
- Section 7.5.1 Effects Evaluation for Radionuclides
- Section 7.6.1 Effects Evaluation for Uranium
- Section 7.5.2 Radiological Assessment and Management Endpoints
- Section 7.6.2 Uranium Assessment and Management Endpoints

7.2 Description of Site Flora and Fauna

A site reconnaissance was performed by a senior field biologist on May 2, 2008 to provide information on the habitat types found on the Guterl Site; examine the presence of potential ecological receptors using visual sitings, tracks, and scat; and finalize the USEPA ERAGS checklist that was partially completed by USACE biologists. The checklist and accompanying photo log from the reconnaissance are found in Appendix W of this RI report.

Vegetated areas of the Guterl Site contain herbaceous, scrub/shrub, and woodland habitats. The northern portion of the Guterl Site contains large swaths of old (late successional) fields that occupy the areas between buildings and the landfill areas which contain construction debris (e.g., concrete, wood, etc.). The southwest portion of the Guterl Site has limited wooded and scrub/shrub area habitats. There are also small areas of old fields located in the eastern portion of the Guterl Site around the abandoned buildings and a rail spur. Wetlands are present within the Guterl Site and vary from scrub/shrub and

forested wetlands to small, ephemeral wet depressional areas. No wetland delineations have been performed; however, a wetland determination was performed by USACE personnel.

The description of site flora is subdivided into those IAs defined in the RI - IA01, IA02, IA03, IA04, IA05, and IA09, and IA10 (see Figure 1-3). Subsection 7.2.1 describes the IAs (parcels) and the habitats found within their boundaries. Subsection 7.2.2 summarizes the fauna.

7.2.1 Site Flora

During a site visit performed by an Earth Tech senior field biologist, in the spring of 2008, a variety of cover types were observed within the Guterl Site. These cover types were the following:

- **Herbaceous (areas absent of woody vegetation**). Terrestrial herbaceous habitats were dominated by dandelion (*Taraxacum officinale*), birdfoot trefoil (*Lotus corniculatus*), red clover (*Trifolium pratense*), thistle (*Cirsium* sp.), and grasses (Gramineae Family). Wetland herbaceous habitats were dominated by common reed (*Phragmites australis*), cattails (*Typha* sp.) and/or horsetail (*Equisetum* sp.).

- **Successional (areas young and old fields)**. Typically the herbaceous vegetation was similar in both young and old fields; however, in young fields, woody species were dominated by seedlings whereas in old fields woody vegetation was dominated with saplings. Dominant vegetation observed within the fields included maple (*Acer* sp.), sumac (*Rhus* sp.), black cherry (*Prunus serotina*), cottonwood (*Populus deltoides*), honeysuckle (*Lonicera* sp.), wild grape (*Vitis* sp.) birdfoot trefoil, dandelion, grasses, milkweed (*Asclepias* sp.), mullein (*Verbascum thapsus*), ragweed (*Ambrosia* sp.), red clover, and wild carrot (*Daucus carota*).

- **Wooded (scrub/shrub and trees).** Dominant vegetation within wooded areas included: black cherry, box elder (*Acer negundo*), cottonwood, hawthorn (*Crataegus* sp.), maple (*Acer* sp.), sumac, and various shrubs (e.g., buckthorn, multifloral rose, etc.).

- **Urban (occupied and abandoned buildings, paved and gravel lots, etc.).** The abandoned buildings are predominately devoid of vegetation, although ferns were noted to exist in limited locations. Sidewalks, loading docks, etc., have become sporadically vegetated with opportunistic species (e.g., ragweed, grasses, dandelion, etc.).

A description of the cover types and dominant vegetation within each parcel in the Guterl Site is as follows.

IA01 and IA02: (Excised Areas, Building Surfaces and Interiors and Building Exteriors). This parcel is largely dominated by abandoned buildings and access ways (Appendix W, Parcels IA01 and IA02, Photo 1). In the parcel's eastern boundary (east of Building 2), early and late successional fields are present (Appendix W, Parcels IA01 and IA02, Photo 2). The early and late successional areas may be considered formerly disturbed habitats as they exist within former parking lots, rail road spurs, and areas associated with the facilities. The habitats are now undergoing vegetative succession.

IA03 (Landfill Area): This parcel is located along the west boundary of Parcel IAO4A. Higher elevations occur in the north, central, and east portions of the parcel and are vegetated with early successional fields (Appendix W, Parcel IA03, Photo 1). The western and southern portions of the parcel are lower in elevation and they contain early successional fields and emergent wetlands dominated by common reed (*Phragmites australis*) (Appendix W, Parcel IA03, Photo 2 and 3). The wetlands continue west of the parcel's boundary. At the time of the site visit early successional fields and the emergent wetlands showed signs of recent mowing. If mowing activities occur during the year, these habitats would be considered disturbed.

IA04 (Niagara County Industrial Development Agency (NCIDA) Property): As discussed in Section 1.2.3, this parcel is subdivided into four separate IAs based on past use and potential for presence of MED/AEC-related constituents. Each IA is discussed in the following paragraphs.

IA04A: Parcel IA04A is primarily undeveloped land. A former railroad bed traverses from Building 24 northwest toward IA05. There is also a limited network of gravel roads within the area. The northwestern portion of the parcel (north and west of Building 37) is dominated by early successional fields. Within the fields there are scattered piles of construction materials and a shed (Appendix W, Parcel IA04, Photo 1). No wetlands or other ecologically sensitive habitats were observed in this portion of the parcel. Vegetated areas north and northeast of Building 24 consist of early successional fields (Appendix W, Parcel IA04, Photo 2). Much of the early successional fields in Parcel IA04A contained building debris (e.g., concrete, metal, etc.). A small saturated depressional area associated with a drainage swale occurs northwest of Building 35 (Appendix W, Parcel IA04, Photo 3). The swale was vegetated with early successional vegetation. Vegetated areas within Parcel IA04A have been previously disturbed though mowing, clearing activities, and placement of construction materials. If mowing activities no longer occur, the habitats would now be considered undergoing vegetative succession.

IA04B: The central portion of IA04B is comprised of active Allegheny Ludlum industrial structures and access roads (Appendix W, Parcel IA04, Photo 4). Vegetated areas that surround the active industrial area consist of fields with herbaceous vegetation and several emergent wetlands associated with drainage swales that are present between buildings (Appendix W, Parcel IA04, Photo 5). The wetlands were vegetated with cattails and horsetail. The wetlands would be considered disturbed due to their setting and that they receive runoff form adjacent industrial buildings.

IA04C: Parcel IA04C makes up the southwestern portion of IA04 (south of the facility security fence and west of the main parking lot), and is occupied by vegetated areas, NY Route 93 Bypass, and the driveway to a bedrock quarry west of NY Route 93 Bypass. East of NY Route 93 Bypass, wooded areas exist within the northern portion of the vegetated area (Appendix W, Parcel IA04, Photo 6). Emergent, scrub/shrub, and forested wetland areas are located in the southwestern portion of the Guterl Site east of NY Route 93 Bypass and west of the Allegheny Ludlum main parking lot (Appendix W, Parcel IA04, Photo 7). Other wetlands within this portion of the parcel include isolated depressional areas near Ohio Street and a long drainage ditch that parallels NY Route 93 Bypass (Appendix W, Parcel IA04, Photo 8). West of the bypass, upland vegetation is limited to maintained grass and early successional fields with a long, narrow drainage ditch abutting NY Route 93 Bypass (Appendix W, Parcel IA04, Photo 9). The western ditch has common reed-dominated emergent wetlands and appears to be hydrologically connected to the eastern ditch by a culvert pipe (Appendix W, Parcel IA04, Photo 10). At the time of the inspection, both the eastern and western ends of the culvert pipe were nearly submerged, making it difficult to determine if the culvert was functioning and in which direction storm water was designed to flow. Areas within the NY Route 93 Bypass Right-of-Way can be considered disturbed due to mowing and landscaping activities. Other areas within the parcel should be considered undisturbed.

IA04D: The portion of IA04D that is within the facility security fence and immediately south of IA02 is dominated by lawns and ornamental tree species (Appendix W, Parcel IA04, Photo 11). South of the facility security fence and west of Ohio Street, the area is occupied by blacktop drives, a paved parking lot, and vegetated areas comprised of lawns and early successional fields along the roadside. East of Ohio Street, planted trees and woody and herbaceous species common to a disturbed environment are present. This area was formerly used as a paved parking lot for plant employees (Appendix W, Parcel IA04, Photo 12). The habitats within this parcel should be considered disturbed.

IA05 (Former Railroad Right-of-Way): This parcel is a long, L-shaped piece of land that occupies the northernmost portion of the Guterl Site. The parcel is bordered to the east by commercial and residential properties and to the west by industrial properties. The parcel is bisected by Park Avenue and West Avenue in the extreme northern locations. The parcel is relatively flat with elevations sloping gently from north to south. The southern portion of the parcel is approximately 450 ft by 450 ft (137 m by 137 m) and is vegetated with a semi-maintained early successional field, and a small stand of wooded vegetation

(Appendix W, Parcel IA05, Photo 1). Within the fields, small wet depressional areas are present that contain isolated wetlands, many of which appear to be ephemeral.

The northern neck of the parcel measures approximately 100 ft by 1,150 ft (30 m by 350 m). This area was a former railroad right-of-way and the remnants of the rail bed can be observed in the extreme northern portion of the parcel. Vegetation consists primarily of opportunistic species common to disturbed and urban environments. Garbage and other refuse are present within this area. Small emergent wetlands dominated by common reed and horsetail are present within the abandoned railroad bed (Appendix W, Parcel IA05, Photo 2). North of Park Avenue, the parcel is vegetated by lawns and ornamental tree species. Vegetated areas within Parcel IA05 have been previously disturbed though mowing, clearing activities, and placement of anthropogenic refuse. If mowing activities no longer occur, the habitats would now be considered undergoing ecological vegetative succession.

IA09 (Erie Canal): The Erie Canal is an open water canal with anthropogenic engineered cut-bedrock banks. Vegetation, such as maple saplings, has colonized interstitial areas of the cut-bedrock banks (Appendix W, Parcel IA09, Photo 1).

IA10 (Lot 7.1): This parcel consists of a concrete plant, parking lots, and small vegetated areas with plant species present that are common in disturbed urban areas.

USACE performed a wetland determination in October 2008 to evaluate the wetland areas (described above) on the Guterl Site. The determination concluded that wetland vegetation is present in most areas noted as wetland or wet areas. Soils in the landfill area, however, are predominantly fill material (0.3 ft to 3.7 ft [0.1 m to 1.1 m] in depth) and do not consist of native soils. There were some indicators of wetland hydrology in a few locations (e.g., cracked soils and small drift lines of vegetation). Most of these wet area sites were in the lowest elevations forming depressions. They were located predominately within the center of the 3.5 acres (1.4 hectares [ha]) and most were approximately 50 ft by 100 ft (15 m by 30 m) in size. Many areas would not be considered wetlands, as they did not meet all three wetland parameters. However, a few locations did meet all three parameters (over 50% dominant hydrophytic vegetation, hydric soils, and wetland hydrology), and these areas combined added up to about 0.5 to 1 acre (0.2 to 0.4 ha) in size.

The wetland regulations for state of New York were also considered and under NYSDEC rules the Guterl Site does not contain any wetlands subject to the Freshwater Wetlands Act (Article 24 of the Environmental Conservation Law), which applies to wetlands larger than 12.4 acres (5 ha) in size, and certain smaller wetlands of unusual local importance.

7.2.2 Site Fauna

The active buildings, maintained lawns, early successional fields (disturbed areas), and abandoned buildings on the Guterl Site are likely to be used by species commonly found in urban environments (e.g., rock doves, small rodents, etc.). In addition, both tracks and scat were found in the building from coyotes and raccoons. Wooded areas in the southwest portion of the Guterl Site and large wetland tracts in the northwest portion of the Guterl Site are likely to be used by medium and large mammalian species (e.g., raccoon, deer, etc.).

7.3 Identification of Constituents of Potential Ecological Concern

The identification of COPECs to be evaluated in this SLERA was based on the COPC list identified in the FSP (USACE, 2007a). No further initial screening of constituents was performed prior to conducting this SLERA to determine which COPECs require further evaluation. Therefore, the COPECs evaluated in the SLERA are the same as the COPCs identified in the FSP: ^{226}Ra, ^{228}Ra, ^{230}Th, ^{232}Th, ^{238}Th, ^{234}U, ^{235}U, ^{238}U, and inorganic uranium.

7.4 Exposure Pathways Analysis

An ecological CSM (Figure 7-1) was developed which identifies the source, media, pathway and route of exposure evaluated in this SLERA. The CSM links the COPEC sources, likely exposure pathways, and potential ecological receptors. It is intended to provide broad linkages from various receptor groups found in and around the Guterl Site to contamination in water, sediments, soils, and food items.

Exposure is contact of a receptor with a constituent. An exposure pathway is a mechanism by which a receptor may be exposed to a constituent at or originating from a source. The three primary routes of exposure are inhalation, ingestion, and dermal contact. Exposure pathways are classified as being complete or incomplete. An exposure pathway is complete when receptors exist that could contact a physical or constituent agent under specified conditions. The pathway is incomplete if there are no receptors or no exposures could occur under the specified conditions.

Potential exposure pathways for ecological receptors at the Guterl Site are discussed in the following sections. Surface soil, subsurface soil, native surface water, and native sediment samples from the RI data collection phase that are used in the SLERA are summarized in Table 6-1.

7.4.1 Soil

Exposures to COPECs in surface soil (0 to 6 inch depth interval) and total soil (combined surface soil and subsurface soil intervals) can occur by direct contact to plants and to burrowing mammals, macroinvertebrates, or through bioaccumulation in the terrestrial food chain and consumption of plants by herbivores and of soil macroinvertebrates by insectivores. Ground foraging birds and small mammals could be exposed to constituents in soils through direct contact, ingestion, or through bioaccumulation in their food. Therefore, the soil exposure pathway is considered complete and will be evaluated further in this SLERA. Table 6-1 lists the surface soil and subsurface soil samples used in this SLERA.

For the purposes of the HHRA and SLERA, surface soil was considered as those samples collected within the 0- to 6-inch depth interval. In general, the surface soils are designated as "-01" in the sampling nomenclature. However, many of the "-01" samples were collected under asphalt or concrete. Although currently located under asphalt or concrete, these sample IDs are listed in Table 6-1 as surface soil samples and are evaluated as such in the HHRA and SLERA assuming that exposure could occur once the overlying materials are removed.[39] The depth interval for subsurface soil is from 6 inches below ground surface to the maximum depth sampled. For the purposes of this risk assessment, exposure to subsurface soil is considered with surface soil into a combined total soil depth.

7.4.2 Surface Water and Sediment

Constituents historically discharged to the Erie Canal through the former industrial intake reservoir system or direct discharge of groundwater result in complete direct contact exposures for benthic macroinvertebrates and fish in the canal. Therefore, the water and sediment direct contact exposure pathways are complete and will be evaluated further in this SLERA. Surface water samples collected in the Erie Canal are used in the food chain models for the aquatic and riparian receptors.

7.4.3 Groundwater

Wildlife inhabiting or utilizing the Guterl Site are not likely to contact groundwater since dens or burrows are not excavated or inhabited below the water table and wildlife food sources either occur above ground or in shallow soil. Therefore, the groundwater pathway is considered incomplete for the Guterl Site.

[39] The approach regarding the uppermost interval of covered soil samples is different for the HHRA and SLERA as compared to the nature and extent assessment; that is, the uppermost interval of a covered soil sample was considered "subsurface" for assessment of nature and extent.

7.4.4 Building Surfaces

Wildlife inhabiting or utilizing the Guterl Site are not likely to directly contact COPECs on building surfaces nor is it likely that plants or small soil invertebrates consumed by site receptors would inhabit vertical surfaces and bioaccumulate COPECs. Therefore, in this SLERA building surfaces form an incomplete exposure pathway for ecological receptors and were not evaluated.

7.4.5 Food Chain

Terrestrial and aquatic species fish and wildlife such as birds, mammals and fish can be exposed to COPECs through ingestion of contaminated food. Bioaccumulation at each level of the food web can increase the constituent exposure concentration to many times the original concentration found in soil, water, and sediments. A complete exposure pathway via bioaccumulation exists for upper-trophic-level species (e.g., piscivorous birds and mammals).

7.5 Evaluation of Radiological Risks

7.5.1 Effects Evaluation for Radionuclides

The screening-level ecological-effects evaluation establishes constituent exposure levels that represent conservative thresholds for adverse ecological effects. For each complete exposure pathway, route, and constituent, a screening ecotoxicity value is selected.

For the evaluation of radiological effects the graded approach calculates conservative acceptable concentrations of radionuclides in environmental media, which are termed "Biota Concentration Guides" or BCGs. Radionuclide concentrations in samples of environmental media (i.e., soil, sediment and water) will be compared with the BCGs using RESRAD BIOTA (USDOE, 2004), a computer code developed by the DOE, to evaluate compliance with biota dose limits. If these limits are exceeded in the screening phase, a more detailed analysis method is employed in a graded fashion that requires more effort, but yields more accurate and site-specific biota dose evaluations.

Radiation dose limits on ecological receptors have been developed by IAEA (1992). The screening step in this SLERA uses BCGs for water and sediment for evaluating aquatic systems, and water and soil BCGs for evaluating a terrestrial system. BCGs are set so that doses received by biota in the field are not expected to exceed the biota dose limits.

Terrestrial Organisms

The IAEA (1992) summarized information about the effects of ionizing radiation on terrestrial organisms and determined that reproduction is likely to be the most limiting endpoint in terms of survival of the population. The report pointed out that lethal doses vary widely among different species, with birds, mammals, and a few tree species being the most sensitive among those considered. Acute doses of 10 rad (100 milligray [mGy][40]) or less are very unlikely to produce persistent and measurable deleterious changes in populations or communities of terrestrial plants or animals. Chronic dose rates of 1 rad/d (10 mGy/d) or less appear unlikely to cause observable changes in terrestrial plant populations, and irradiation at chronic dose rates of 0.1 rad/d (1 mGy/d) or less does not appear likely to cause observable changes in terrestrial animal populations (IAEA, 1992). The threshold for effects in terrestrial animals is less than that for terrestrial plants primarily because some species of mammals are considered to be more radiosensitive.

[40] The Gray (Gy) is the International System unit for the energy absorbed from ionizing radiation, equal to one joule per kilogram.

Aquatic Organisms

IAEA (1992) determined that aquatic organisms are no more sensitive to radiation than other organisms; however, because they are poikilothermic animals, temperature can control the time of expression of radiation effects. More advanced aquatic organisms tend to be more radiosensitive than those lower on the phylogenetic (evolutionary relatedness) scale. The radiosensitivity of many aquatic organisms changes with age, or, in the case of unhatched eggs, with the stage of development. Embryo development in fish and the process of gametogenesis (i.e., the production of sex cells containing half the number of chromosomes) appear to be the most radiosensitive stages of all aquatic organisms tested. Although aquatic plants may bioaccumulate soluble radionuclides they are not evaluated in the radionuclide risk assessment as they are less sensitive than other sensitive aquatic organisms.

Derivation of BCGs

Based on the IAEA evaluation, this SLERA uses the biota dose limits specified below within a graded approach to demonstrate that populations of plants and animals are adequately protected from the effects of ionizing radiation.

Aquatic Animals. The absorbed dose to aquatic animals should not exceed 1 rad/d (10 mGy/d) from exposure to radiation or radioactive material releases into the aquatic environment. This dose limit is specified in DOE Order 5400.5.

Terrestrial Plants. The absorbed dose to terrestrial plants should not exceed 1 rad/d (10 mGy/d) from exposure to radiation or radioactive material releases into the terrestrial environment. This dose limit is specified in DOE Order 5400.5.

Terrestrial Animals. The absorbed dose to terrestrial animals (including riparian species) should not exceed 0.1 rad/d (1 mGy/d) from exposure to radiation or radioactive material releases into the terrestrial environment. This dose limit is specified in DOE Order 5400.5.

The derivation of BCGs (used to demonstrate compliance with the biota dose limits above) is based on the biota dose which is a function of the constituent concentration in the environment and is the sum of internal and external contributions of the radiological material. An estimate of the potential dose rate to an ecological receptor from both internal and external exposures is calculated using a unit concentration (i.e., 1 Bq kg^{-1}) of a radionuclide in soil. The calculated dose rate is compared to the dose rate limit (i.e., a ratio) and the ratio is used to "back calculate" a concentration of the radionuclide in the media that could generate a dose rate at the specified radionuclide biota dose limit.

These dose limits are used to calculate the biota concentration guidelines (Table 7-1).

7.5.2 Radiological Assessment and Management Endpoints

The objective of an assessment endpoint is to evaluate potentially adverse effects on ecological receptors as a result of exposures to site related COPECs. Measurement endpoints are developed for each assessment endpoint. Because of the selection of conservative endpoints there is a high degree of confidence that COPECs that are screened out do not represent a significant threat to terrestrial and aquatic receptors. Currently the site management goals do not include management for ecological purposes or the creation of an ecological preserve. While there is sufficient habitat on the site for ecological receptors to either forage or reside (see Section 7.2) this evaluation is only examining the potential for overall impacts to potential site receptors. The assessment endpoints selected are as follows:

- Sustainability (e.g., survival, growth, and reproduction) of a terrestrial plant community that can serve as a shelter and food source for wildlife.

- Sustainability (e.g., survival, growth, and reproduction) of terrestrial and riparian mammal populations
- Sustainability (e.g., survival, growth, and reproduction) of a benthic invertebrate community that can serve as a food source for local fish and wildlife.
- Sustainability (e.g., survival, growth, and reproduction) of local fish populations.

Measurement endpoints are the measurable changes in an attribute of an assessment endpoint or in response to a constituent/stressor to which a receptor is exposed. Measurement endpoints can include expressions such as toxicity test results, benthic community diversity measures, constituent concentration in exposure media, and field observations. It is common practice to use more than one measurement endpoint to evaluate each assessment endpoint, when possible.

General measurement endpoints to be considered in this SLERA relative to assessment endpoints are:

- Measured or modeled concentrations of COPECs in surface water BCGs based on dose limits specified in DOE Order 5400.5.
- Measured concentrations of COPECs in sediment as compared to BCGs based on dose limits specified in DOE Order 5400.5.
- Measured concentrations of COPECs in soil as compared to BCGs based on dose limits specified in DOE Order 5400.5.

7.5.3 Screening Level Exposure Estimate

The screening-level exposure estimate utilizes conservative assumptions to estimate EPCs for representative receptors of the exposure pathways identified as complete under the exposure pathway evaluation. As a high end screen of direct contact exposures for ecological receptors in site media, maximum concentrations of detected constituents were utilized as hypothetical EPCs. As per DOE-STD-1153-2002 radiation dose rates will be evaluated as net EPCs for comparison to the BCGs for radionuclides. What this means is that the background levels of radionuclides are subtracted out of the total (gross) levels detected to calculate the EPCs when determining compliance of DOE activities with the biota dose limits. This approach ensures that site related dose rates represent an actual increase in exposure. This approach is conservative (i.e., protective) of ecological receptors because it assumes that all food chain exposures are at the maximum COPEC concentration when actual exposures would be expected to be at a spatially weighted average (based on the foraging range of the species) of the observed range of COPEC concentrations. The following sections discuss the receptors chosen to represent exposures through the terrestrial and aquatic food chain and identify conservative life history parameters for each receptor.

7.5.4 Receptors Evaluated for Exposure to Radionuclides

The intent of the graded approach is to protect the most sensitive populations of terrestrial plants, animals and aquatic animals. The RESRAD BIOTA program developed default exposure parameter values based on a range of organisms, which are provided in USDOE (2002). Reference organisms are categorized into terrestrial plants and animals for terrestrial systems, and aquatic animals and riparian animals for aquatic systems. The receptors evaluated in RESRAD BIOTA are the most sensitive terrestrial organisms no matter what trophic level they are in and as such if no potential risk is found during the screening analysis then it is assumed that there would be no potential risk to other ecological receptors on the Guterl Site as well. The receptors that will be evaluated for exposure to radionuclides have adequate habitat to either reside on or use the Guterl Site as a foraging habitat. These receptors are described in the following sections.

7.5.4.1 Terrestrial Plants

Legumes

A legume is a plant in the family Fabaceae (or Leguminosae) and includes peas, beans, peanuts, alfalfa, and clover. Legume plants are noteworthy for their ability to fix atmospheric nitrogen due to a symbiotic relationship with bacteria known as rhizobia found in root nodules of these plants. Legume seed and foliage have comparatively higher protein content than non-legume plant material, probably due to the additional nitrogen that legumes receive through nitrogen-fixation symbiosis.

Table 7-2 lists the default plant uptake factors used in the RESRAD BIOTA program.

7.5.4.2 Terrestrial Animals

The deer mouse life history parameters used in the RESRAD BIOTA program are found in Table 7-3. These parameters are used to calculate both internal and external radiological doses that are compared to the BCGs.

Deer Mouse (*Peromyscus maniculatus*)

The deer mouse is found throughout most of North America. The deer mouse occupies nearly every type of habitat within its range, from forests to grasslands. Deer mice have the most extensive range of any North American rodent (National Museum of Natural History, 2008). Deer mice are primarily seed eaters, but they also feed on fruits, insects and insect larvae, fungi, and green vegetation, as available (USEPA, 1993). They often store quantities of food near their nest sites, particularly in the fall when seeds, nuts, or acorns are abundant.

Deer mice are mostly nocturnal with a home range of 0.03 acre to 0.3 acre (0.01 to 0.13 ha) or larger (USEPA, 1993). A summer population density may reach a high of about 110 mice per acre (46/ ha) (Sullivan, 1979). Deer mice breed during the spring, and fall, and to some extent in midsummer. Deer mice do not burrow, but build their nest from grasses in protected areas above ground beneath debris, in tree cavities, rotting logs, or abandoned burrows. Deer mice are a major food source for almost every bird and mammal predator.

7.5.4.3 *Riparian Receptors*

The default life history exposure parameters for the riparian receptors, raccoon and river otter used in the RESRAD BIOTA program are found in Table 7-4. These life history parameters are used in RESRAD BIOTA to calculate both internal and external radiological doses that are compared to the BCGs. These receptor exposure parameters are used for both the raccoon and river otter in RESRAD BIOTA.

Raccoon (Procyon lotor)

Raccoons are the most abundant medium-sized omnivore in North America (USEPA, 1993). They are commonly found in wooded areas interrupted by fields and water courses and wetlands near human habitation (DeGraaf and Rudis, 1986). Though usually nocturnal, raccoons are sometimes active at daylight to take advantage of available food sources. Their diet varies by season, averaging about 17.3% of invertebrates, 58.7% of plant foods, and 24.7% of vertebrates (Hamilton, 1951).

Shape and sizes of home ranges are variable depending on parameters including gender, age, and habitat. Male adults generally claim areas about twice as large as females, and adult home ranges are larger than juveniles. In the northern parts of their distribution range, raccoons reduce their activity drastically in a winter rest when permanent snow cover makes searching for food impossible.

Raccoons usually mate between late January and mid-March in their northern range and later in their southern ranges (USEPA, 1993).

River Otter (Lutra canadensis)

The river otter is one of the larger members of the Mustelidae family, who specializes in capturing aquatic food items. Their habitat consists of relatively deep clear water. Otters prefer flowing water such as streams and rivers but will utilize ponds, lakes, and occasionally shallow wetlands (Melquist and Hornocker, 1983). River otters feed almost exclusively on fish (Alexander, 1977) but will also consume frogs, crayfish, salamanders, turtles, snakes, small birds, mammals and insects (DeGraaf and Rudis, 1986).

The otter's home range encompasses the area needed for foraging and reproduction. Distinct territories are often maintained within the home ranges for breeding and family feeding areas (Toweill and Tabor, 1982). River otter are active year-round and do not hibernate (Doutt et al., 1977). River otters occupy and defend a resident territory throughout the year and do not migrate with the exception of local territorial movements by adults and dispersal of sub-adults from resident populations, and are therefore considered year-round residents.

7.5.4.4 Aquatic Receptors

The most sensitive default aquatic receptors within RESRAD BIOTA (depending on the COPEC) include fish, mollusks, and amphipods. The most sensitive receptor/receptor group is freshwater *Gammarus* for radium, fish for thorium, and mollusks for uranium. No species-specific information is provided for the general classification of fish or mollusks.

Table 7-5 lists the default aquatic biota uptake factors used in the RESRAD BIOTA program.

7.5.5 Risk Characterization for Radionuclides

Screening level radiological risks to terrestrial and aquatic receptors are presented in Tables 7-6 through 7-9 and Table 7-16.

The summed ratio (soil concentration/BCG) for terrestrial animal exposures to maximum radionuclide concentrations in soil is 2×10^{1} for the 0 to 6 inch soil depth and 2×10^{1} for the total soil depth (Table 7-6 and Table 7-7) - indicating that further evaluation of this direct contact exposure pathway may be required. An elevated concentration of ^{228}Ra in EU17/IA05A combined with elevated ^{238}U and ^{234}U in EU7/Bldg. 8 caused the exceedance of the 1.0×10^{0} threshold; in addition, the ^{234}U and ^{238}U ratios were both greater than 1.0×10^{0} individually.

The summed ratio for terrestrial plants exposure to maximum radionuclide concentrations in soil is 2×10^{0} for the 0 to 6 inch depth and 2×10^{0} for the total soil depth (Table 7-6 and Table 7-7) – indicating that exposure to site-related radionuclides is above the screening level for potential adverse effects. An elevated concentration of ^{238}U in EU7/Bldg. 8 caused the exceedance of the 1.0 x 10 threshold.

Potential risk of radionuclides to aquatic animals from exposure to maximum surface water and sediment radionuclide concentrations are below the level of concern (i.e., ratio of one) at 2×10^{-1} and 2×10^{-4}, respectively (Table 7-8).

Risks to riparian animals from exposure to maximum surface water and sediment radionuclide concentrations are below the level of concern (i.e., ratio of one) at 4×10^{-1} and 3×10^{-2}, respectively (Table 7-9).

7.5.6 Refinement of the Radionuclide Screening Level Ecological Risk Assessment

A graded (or stepwise) approach allows screening level assessment results to lead subsequent site-specific screening steps. The subsequent steps use more realistic site-representative parameters (e.g., bioaccumulation factors) in place of conservative default parameters (or uses mean radionuclide concentrations in place of maximum values and may consider the spatial extent of contamination by evaluating specific exposure units).

The actual exposures of ecological receptors to site radionuclides are likely lower than those calculated using the maximum values based on species being exposed to the range of detected concentrations in each medium from across the Guterl Site. In this refinement the 95 percent UCL for soil for each of the exposure units evaluated in the HHRA were compared to the DOE's BCG for ^{234}U (5.13 x 10^3 pCi/g) and ^{238}U (1.58E+03 x 10^3 pCi/g). Included in this refinement are the soils under the building slabs in the event the slabs are removed allowing for a complete exposure pathway. These EUs were selected to provide an understanding of what areas may require further consideration for risks to ecological receptors vs. human health concerns.

As shown in Table 7-10, using the EPC for ^{234}U and ^{238}U radionuclide concentrations in soil, only soils in EU7/Bldg. 8 (surface and subsurface) exceed the DOE's BCG for ^{234}U and ^{238}U, and soils in EU 17/IA05A (surface only) exceed the DOE's BCG for ^{238}U.

7.6 Evaluation of Uranium Risks

7.6.1 Effects Evaluation for Uranium

The screening-level ecological-effects evaluation establishes constituent exposure levels that represent conservative thresholds for adverse ecological effects. For each complete exposure pathway, route, and constituent, a screening ecotoxicity value is selected.

In the evaluation of inorganic uranium toxicity the most conservative and scientifically defensible effects based constituent exposure concentration (wildlife toxicity value) available for each vertebrate class (e.g., avian, mammal) is used for screening uranium toxicity. Measures of toxicological effects, or toxicity reference values (TRVs), provide a basis for estimating whether exposure to constituents at a site may result in adverse ecological effects. These measures of toxicity are derived from the scientific literature and expressed as the no observable adverse effects level, or NOAEL, to ensure potential ecological risk is not underestimated. The exceedance of the NOAEL in this SLERA is an indication that further evaluation may be required to assess the potential effects of COPEC exposures on ecological receptors.

Toxicological endpoints for both direct contact with soils and chronic exposures in water for uranium are limited in the literature. A screening value for the protection of aquatic life was determined based on work by Cushman et al. (1977) as cited in Suter and Tsao (1996) and a screening value for soils was identified related to phytotoxicity (Efroymson et al., 1997a) as described below and presented in Table 7-11.

The uranium screening value for aquatic life is an estimated value based on a fathead minnow (*Pimephales promelas*) LC50 (i.e., lethal concentration to 50% of the test population) (Cushman et al., 1977).

The screening value used to evaluate the phytotoxicity of uranium is based on laboratory experiments by Sheppard et al. (1983) and Murthy et al. (1984). These studies exposed Swiss chard and soybeans to uranium in soil and determined that uranium reduced root weight (Sheppard et al., 1983) and reduced seedling length (Murthy et al., 1984). The mechanisms of uranium phytotoxicity involve inhibition of enzyme systems and possible binding to nucleic acids (Feldman et al., 1967).

As stated above the wildlife toxicological benchmarks for uranium are literature derived NOAELs for avian and mammalian receptors, when available, to ensure that risk is not underestimated. The primary literature source used to select toxicity values was Sample et al. (1996). For wildlife toxicity values, the most conservative value available for each class (e.g., avian, mammalian) was used.

Sample et al. (1996) shows mammalian toxicity for uranium being derived from a study by Paternain et al. (1989) where mice were exposed to uranyl acetate (61.32% U) concentrations of 5, 10, and 25 milligrams per kilogram per day (mg/kg/d) via oral intubation for 60 days. The period covered began prior to gestation and continued through gestation, delivery, and lactation. Significant differences in reproductive parameters (e.g., number of dead young per litter, size and weight of offspring, etc.) were observed at the 10 and 25 mg/kg/d dose levels, but not at the 5 mg/kg/d level. Because no significant differences were observed at the 5 mg/kg/d level and the study considered exposure throughout a critical life stage, this dose was considered to be a chronic NOAEL.

Toxicity to avian receptors was examined for mortality, body weight, blood chemistry, liver or kidney effects based on a study by Haseltine and Sileo (1983) using depleted metallic uranium given at concentrations of 25, 100, 400, and 1,600 mg/kg to black ducks in their food over a six-week time frame. No effects were observed at any dose level. This study is considered subchronic because it lasted less than 10 weeks and did not consider a critical lifestage (i.e., reproduction). The chronic NOAEL (of 16 mg/kg/day) was estimated by multiplying the subchronic NOAEL of 160 mg/kg/day by a subchronic-chronic uncertainty factor of 0.1.

Table 7-12 contains values used for mammalian and avian screening.

7.6.2 Uranium Assessment and Management Endpoints

The objective of an assessment endpoint is to evaluate potentially adverse effects on ecological receptors as a result of exposures to site related COPECs. Measurement endpoints are developed for each assessment endpoint. Because of the selection of conservative endpoints there is a high degree of confidence that COPECs that are screened out do not represent a significant threat to terrestrial and aquatic receptors. The assessment endpoints selected are as follows:

- Sustainability (e.g., survival, growth, and reproduction) of a terrestrial plant community that can serve as a shelter and food source for local invertebrates and wildlife.
- Sustainability (e.g., survival, growth, and reproduction) of a benthic invertebrate community that can serve as a food source for local fish and wildlife.
- Sustainability (e.g., survival, growth, and reproduction) of local fish populations.
- Sustainability (e.g., survival, growth, and reproduction) of local insectivorous bird populations.
- Sustainability (e.g., survival, growth, and reproduction) of local piscivorous bird populations.
- Sustainability (e.g., survival, growth, and reproduction) of local carnivorous bird populations.
- Sustainability (e.g., survival, growth, and reproduction) of local insectivorous mammal populations.
- Sustainability (e.g., survival, growth, and reproduction) of local piscivorous mammal populations.
- Sustainability (e.g., survival, growth, and reproduction) of local carnivorous mammal populations.

Measurement endpoints are the measurable changes in an attribute of an assessment endpoint or in response to a constituent/stressor to which a receptor is exposed. Measurement endpoints can include expressions such as toxicity test results, benthic community diversity measures, constituent concentration in exposure media, and field observations. It is common practice to use more than one measurement endpoint to evaluate each assessment endpoint, when possible.

General measurement endpoints to be considered in this SLERA relative to assessment endpoints are:

- Measured or modeled concentrations of COPECs in surface water as compared to water quality standards, criteria, and guidance for aquatic life as found in Cushman et al. (1977).
- Measured concentrations of COPECs in soil as compared to screening values in Efroymson et al. (1997a).
- Modeled dietary doses of COPECs, based on measured concentrations of COPECs in media (surface water, sediment, and food items), as compared to TRVs for aquatic food-chain receptors.
- Modeled dietary doses of COPECs, based on measured concentrations of COPECs in site-related constituents (surface water, soils, and food items), as compared to TRVs for terrestrial food-chain receptors.

7.6.3 Screening Level Exposure Estimate

The screening-level exposure estimate and risk calculation comprises the second step of the ERAGS (USEPA, 1997). The screening-level exposure estimate utilizes conservative assumptions to estimate EPCs for representative receptors of the exposure pathways identified as complete under the exposure pathway evaluation. As a high end screen of direct contact exposures for ecological receptors in site media, maximum concentrations of detected constituents were utilized as hypothetical EPCs. Exposures through the terrestrial food chain were evaluated using existing maximum soil concentrations in the diet of representative terrestrial receptors. This approach is conservative (i.e., protective) of ecological receptors because it assumes that all food chain exposures are at the maximum COPEC concentration when actual exposures would be expected to be at a spatially weighted average (based on the foraging range of the species) of the observed range of COPEC concentrations.

The following sections discuss the receptors chosen to represent exposures through the terrestrial and aquatic food chain and identify conservative life history parameters for each receptor.

7.6.4 Receptors Evaluated for Exposure to Inorganic Uranium Toxicity

Conservative life history parameters (e.g., minimum weight, maximum intake) were selected for each receptor based on the literature. Table 7-13 and Table 7-14 summarize life history parameters used for birds and mammals, respectively, and Section 7.6.5 discusses the derivation of food and water ingestion rates for each receptor. The receptors which will be evaluated in this SLERA may either reside on the Guterl Site or use the Guterl Site for foraging; that is, they are considered representative terrestrial and riparian receptors which may actually use the Guterl Site. A sufficient amount of habitat exists on both the terrestrial and aquatic areas of the Guterl Site for the species evaluated that either reside or use the Guterl Site as a forage base. As per Section 7.2 and Figure 1.2.3-1, vegetated areas of the Guterl Site contain herbaceous, scrub/shrub, and woodland habitats. The northern portion of the Guterl Site contains large swaths of old (late successional) fields that occupy the areas between buildings and the landfill areas which contain construction debris (e.g., concrete, wood, etc.). The southwest portion of the Guterl Site has limited wooded and scrub/shrub area habitats. There are also small areas of old fields located in the eastern portion of the Guterl Site around the abandoned buildings and a rail spur. Wetlands are present within the Guterl Site and vary from scrub/shrub and forested wetlands to small, ephemeral wet depressional areas. Based on these types of habitats found on the Guterl site and species life history parameters the following species were selected to be evaluated in this SLERA. Terrestrial Plants

The primary potential for adverse impact to plants or plant communities from a COPEC is related to its potential uptake through the roots. A COPEC must be water-soluble and capable of being transported symplastically across the Casparian strip for uptake to occur. The screening concentrations used are nominal concentrations of a soluble form (i.e., a highly bioavailable form) of the constituent added to soil

taken from Efroymson et al. (1997a). Most metals in natural soils and constituents of waste sites are not in readily bioavailable forms; therefore, risk estimates are considered conservative.

7.6.4.1 Avian Receptors

The estimation of exposures of representative receptors is based on life history characteristics of each species such as food intake, body weight and diet. Table 7-13 provides a summary of the life history information used in the evaluation of risk from uranium exposure to avian receptors.

American Robin (*Turdus migratorius*)

The American robin is found throughout most of the continental United States and Canada during breeding season. The mean body weight of the robin was estimated to be 77 g based on Clench and Leberman (1978; as cited in USEPA 1993). The robin nests in areas that have access to fresh water, protected sites, and productive foraging areas, which has allowed them to adapt to developed regions (USEPA, 1993).

Foraging occurs in a variety of locations: in open ground areas, along the edges of habitats and streams, in aboveground shrubs, and in the lower branches of trees. Nests can be built anywhere from the ground to the treetops provided there is protective cover and support. Clutches containing between three to six eggs are laid between April and July (Terres, 1980). Robins forage by hopping along the ground feeding on invertebrates and among shrubs and on berries and insects among low lying tree branches. During most of the year, the American robin will consume quantities of food in excess of their body weight to achieve their metabolic needs (USEPA, 1993). Fruits common to their diet include plums, dogwood, sumac, hackberries, blackberries, cherries, greenbriars, raspberries, and juniper (USEPA, 1993). Commonly consumed invertebrates include beetles, caterpillars, moths, grasshoppers, spiders, millipedes, and earthworms (USEPA, 1993). For the purposes of the SLERA food chain modeling, the diet of the American robin is assumed to consist of 100 percent soil/terrestrial invertebrates to provide a conservative estimate of risk.

The territory of the American robin in New York is estimated to be between 0.27 to 0.52 acres (0.11 to 0.21 ha) based on Howell (1942; as cited in USEPA, 1993). Based on this range, an area use factor of one was used for the American robin. Incidental soil ingestion was assumed to be 2.4 percent of food consumption based on the range of values provided in Beyer (1994).

Red-Tailed Hawk (*Buteo jamaicensis*)

The red-tailed hawk is one of the most widespread birds of prey in North America, with breeding populations distributed throughout most of the continent (Preston and Beane, 1993). They are highly mobile predators that often inhabit heterogeneous habitats (Preston, 1990). A body weight of 957 g was selected based on Steenhof (1983; as cited in USEPA 1993)

Many red-tailed hawks breeding in northern regions migrate south for the winter. However, some birds remain near their breeding territory year-round even during the harshest winters with extensive snow cover (Preston and Beane, 1993).

The red-tailed hawk is classified as an avian carnivore with a diet consisting primarily of small mammals (about 70 percent), birds (about 18 percent), and reptiles (about 11 percent), with occasional amphibians, fish, and arthropods (Marti and Kochert, 1995). Its diet varies according to food item availability. For the purpose of this SLERA, the potential risk due to exposure to uranium was modeled based on 100 percent small mammal consumption. A soil ingestion rate of one percent was assumed based on professional judgment, because while some soil attached to food items may be ingested, the amount is assumed to be minimal.

The home range of the red-tailed hawk varies depending on topography, food availability, human activity, and season (Preston and Beane, 1993). The average territory for the red-tailed hawk ranges from 148 to 4,374 acres (60 to 1,770 ha) (USEPA, 1993). Sample and Suter (1994) recommend using a home range of 551 acres (233 ha) based on a study in Oregon by Janes (1984), which equals 0.9 square (sq) miles (mi) (2.3 sq kilometers [km]). It was conservatively assumed for this screening that the red-tailed hawk resident population feeds exclusively at the Guterl Site.

Belted Kingfisher (Ceryle alcyon)

The belted kingfisher is found throughout much of North America (Bent, 1940). It is an aquatic feeder and requires clear waters in order to see its food items (Davis, 1982; Salyer and Lagler, 1946). The average body weight of an adult belted kingfisher selected for this assessment was 136 g based on a Pennsylvania population (Brooks and Davis, 1987).

Fish are the predominant food items of the belted kingfisher (Bent, 1940; USEPA, 1993). However, diets can vary with food item availability and kingfishers may supplement their diets with aquatic macroinvertebrates, terrestrial food items, and/or plant material (Alexander, 1977). Fish are assumed to represent 100 percent of the total kingfisher diet in this assessment.

Incidental sediment ingestion during nest building and grooming was assumed to be one percent of total food item intake to account for soil ingestion during nest construction and nesting, as belted kingfishers construct their nests by excavating tunnels in embankments (Levine, 1988). Although the kingfisher hunts almost exclusively within the pelagic zone, both the male and female dig the nesting burrow, using their bills as probes and their feet as shovels (Andrle and Carroll, 1988).

The foraging range of the kingfisher has been reported to average between 0.2 and 1.4 mi (0.4 and 2.2 km) (Davis, 1982; Brooks and Davis, 1987); however, resident kingfishers were considered to rely solely on the Erie Canal as their foraging habitat.

Great Blue Heron (Ardea herodias)

The great blue heron is a wading bird that occurs in a variety of freshwater and marine habitats and breeds throughout much of North America (Bent, 1926). Great blue herons may inhabit lakes, rivers, brackish marshes, lagoons, coastal wetlands, tidal flats, and sandbars, as well as occasional wet meadows and pastures (USEPA, 1993). An average body weight for the female great blue heron of about 2,200 g was selected based on Dunning (1993).

The principal food of the great blue heron is fish of various kinds, but amphibians (e.g., frogs), snakes, small mammals, and aquatic and terrestrial invertebrates are also taken on occasion (Bent, 1926; Palmer, 1962). The great blue heron fishes by still hunting and stalking (Bent, 1926). Great blue herons may also slowly wade in shallow water until it drives a fish out from a hiding place (Environment Canada, 2002). Fish make up 90 to 98 percent of their diet, with the rest consisting of crustaceans, insects, amphibians, reptiles, birds, and small mammals (Alexander 1977; USEPA, 1993). In this analysis, fish were assumed to comprise 100 percent of the dietary intake.

Great blue herons mainly eat fish 1 to 13 inches (in) (3 to 33 centimeters [cm]) in length (Alexander, 1977), but may consume fish as large as 24 in (60 cm) (Eckert and Karalus, 1983). Krebs (1974) found that smaller food items were selected more frequently because of greater abundance and less handling time. Data were not available on incidental sediment ingestion rate, which was assumed to be one percent based on fishing techniques.

The average foraging ranges for the great blue heron in South Dakota ranged from an average of 1.9 mi (3.1 km) to a maximum distance flown of 14 mi (24 km) (Dowd and Flake, 1985). Foraging ranges of herons overlapped with mean densities of 1.4 birds/mi (2.3 birds/km) and 2.2 birds/mi (3.6 birds/km)

observed at two separate locations (Dowd and Flake, 1985). An average home range of 1.9 mi (3.1 km) was assumed for this assessment. It was assumed that the Erie Canal could support a small great blue heron population and a conservative area use factor of 1 is used in this SLERA.

7.6.4.2 Mammalian Receptors

The estimation of exposures to representative receptors is based on life history characteristics of each species such as food intake, body weight, and diet. Table 7-14 provides a summary of the life history information used in the evaluation of risk from uranium exposure to mammalian receptors.

Short-tailed Shrew (*Blarina brevicauda*)

The short-tailed shrew is a small insectivorous mammal that ranges throughout the United States (George et al., 1986). Short-tailed shrews range from about 3.8 to 5.1 in (9.5 to 13 cm) in length and weigh 12.5 to 22.5 g (Guilday, 1957). An average body weight of 15 g was used based on the average shrew weight in New Hampshire (Schlesinger and Potter, 1974).

Shrews are mainly insectivorous and carnivorous, but some eat seeds, nut meats, and probably other plant material (Nowak, 1997). Analyses of stomach contents of New York shrews show that earthworms comprise the majority of the short-tailed shrew diet with slugs, snails, insect and miscellaneous animals contributing most of the remainder (Whitaker and Ferraro, 1963). For this assessment, the diet of the shrew was assumed to consist of 100 percent terrestrial invertebrates and modeled constituent concentrations in earthworms were used to estimate body burdens of constituents in food items. Incidental soil ingestion was assumed to be 13 percent of food consumption (Talmage and Walton, 1993, as cited in Sample and Suter, 1994).

Short-tailed shrews are found in nearly all land habitats (Nowak, 1997). They construct runways in leaves, plant debris, snow, or the ground. Runways are usually in the top 10 cm of soil, but can be as deep as 1.6 ft (50 cm) (USEPA, 1993). Home ranges for New York shrews in the winter average 0.1 acres (0.05 ha), with maximum ranges of 0.2 to 0.5 acres (0.1 to 0.2 ha) (Platt, 1976).

Eastern Cottontail (*Sylvilagus floridanus*)

The eastern cottontail rabbit is a widely distributed herbivore commonly found in the eastern United States and southern Canada. Eastern cottontails do not undergo hibernation or torpor; they are active all year, showing peaks of daily activity at dawn and dusk (Chapman et al., 1980).

The eastern cottontail measures 35 to 43 cm in length and weighs 0.7 to 1.8 kg (Lord, 1963) with females slightly larger than the males (Nowak and Paradiso, 1983). A body weight of 1.24 kg was used based on the average weight of an adult female (Chapman and Morgan 1973).

The cottontail inhabits a large variety of habitats, including woodlands, prairies, and wetlands and typically uses open grassy areas for foraging at night. During the growing season, the diet of the cottontail is comprised of herbaceous plants. In the winter, the rabbit consumes the bark and cambium layer of woody vines, shrubs, and trees. The cottontail is a representative species for herbivorous mammals likely to forage on the Guterl Site. Rabbits are also food items for higher trophic level organisms (e.g., red-tailed hawk and red fox) and are important game species.

Eastern cottontail population density depends on the availability of resources (e.g., food, cover) in an area, and tends to cycle over a period of several years (Chapman and Ceballos, 1990). Usual densities range from 2 to 12 animals per acre (1 to 5 animals per ha), although values as high as 35 per acre (14 per ha) have been reported (Chapman and Ceballos, 1990; Chapman et al., 1982). Based on the size of the Guterl Site and the cottontail population densities an area use factor of 1 was used in the exposure calculations.

For this assessment, the diet of the eastern cottontail was assumed to consist of 100 percent vegetation. Incidental soil ingestion was assumed to be 13 percent of food consumption (Beyer et al., 1994).

Red Fox (*Vulpes fulva*)

The red fox is found throughout the United States and Canada. The fox prefer a mixture of upland habitats within their home range. Home ranges in urban areas tend to be smaller.

The red fox averages 22 to 25 in long and weighs between 4.0 to 4.2 kg (Storm et al. 1976). The male usually outweighs the female by about one kg. A body weight of 4.13 kg was used based on the average weight of an adult female (Storm et al. 1976).

The home ranges of individuals from the same family overlap considerably, constituting a family territory (Sargeant, 1972; Voigt and MacDonald, 1984). Territory sizes range from less than 50 to over 3,000 ha (124 to 7413 acres). Territories in urban areas tend to be smaller than those in rural areas. For this assessment a conservative area use factor of 1 is assumed for the red fox.

Red fox feed on both animals and plants. Common food items include meadow voles, mice, and rabbits. Diet varies with location and season. In some areas, game birds (i.e., ring-necked pheasant, ruffed grouse, and various waterfowl) are seasonally important parts of the diet. During the summer and fall, plant material becomes an important staple as fruits, berries, and nuts become available. The red fox is also known to scavenge carcasses and other refuse (USEPA, 1993). For the purposes of the SLERA food chain modeling, the fox is assumed to ingest a diet consisting of 100 percent small mammals found on the Guterl Site. Incidental soil ingestion was assumed to be 2.8 percent of food consumption (Beyer et al., 1994).

Mink (Mustela vison)

Mink are distributed throughout all of New York and most of the United States and Canada (NYSDEC, 2000a). They occupy wetland habitats including streams, lakes, rivers, and freshwater and saltwater wetlands. They prefer wetlands and riparian habitat with irregular shorelines, good cover (i.e., woods and shrub), and suitable den sites (Linscombe et al., 1982; Allen, 1984). Regardless of the type of habitat used, mink dens are always associated with water and typically are 16 to 328 ft (5 to 100 m) from a water body. Mink are reasonably tolerant of human disturbance/development as long as food items abundance is not affected (Allen, 1984). Therefore, it was assumed in the food-web model that the mink's diet was derived entirely from the Guterl Site for the entire year.

Mink exhibit a pronounced sexual dimorphism in size with males 1.4 to 1.8 times heavier than females (Eagle and Whitman, 1987). An average body weight for mink of 550 g was used based on the average adult female weight provided in Mitchell (1961).

Mink are nocturnal in habit and opportunistic in diet. Mink feed primarily on small aquatic and terrestrial animals, although they can feed upon food items larger than themselves, such as waterfowl and muskrats (Sealander, 1943). Common food items include fish, frogs, crayfish, salamanders, clams, insects, muskrats, voles, and rabbits (USEPA, 1993). Hunting in aquatic habitats occurs in shallow, nearshore areas where aquatic food items are captured and then moved to the shore prior to consumption (Doutt et al., 1977). For this SLERA mink were assumed to consume a diet consisting of 100 percent fish.

Stomach content and scat analyses on mink from New York have shown trace quantities (i.e., less than or equal to one percent of the diet) of sand present (Hamilton, 1940). Based upon this study and the potential for the mink to also ingest sediments during grooming, a one percent incidental ingestion composition in the diet of the mink was applied.

7.6.5 Food Web Modeling

The estimation of exposures to individual sentinel organisms is based on life history characteristics of each species such as food intake, body weight, and diet. Dietary exposure is determined through the application of uptake factors/bioaccumulation factors (BCF). The food item tissue concentrations used in the food web model are summarized for avian and mammalian receptors in Table 7-15.

Fish

The method used to assess potential threats to fish in this SLERA was to compare concentrations of COPECs identified against TRVs selected from the literature for sediment and surface water. Fish may be exposed to constituents via direct uptake from the water column, uptake from sediments, and through feeding.

Vegetation

Plants can uptake certain constituents present in the soil and pore water and translocate them to plant parts that may be consumed by biota. Therefore, in order to conservatively estimate the COPEC concentrations in plants that could be consumed by ecological receptors, constituent-specific plant soil to plant uptake factors were applied to soil concentrations. The following sources were evaluated to identify plant uptake factors for each constituent.

After an appropriate transfer factor was selected, constituent concentrations in terrestrial plant tissue are estimated based on the following equation:

$$\text{Conc plants} = UF_{s-p} \times \text{Conc soil}$$

where:

Conc plants = the concentration of the compound in a plant (mg/kg)

UF_{s-p} = soil-plant uptake factor (unitless)

Conc soil = soil concentration (mg/kg)

Terrestrial Invertebrates

Terrestrial invertebrates such as earthworms, which serve as a dietary food item for receptors such as the shrew and American robin, have the potential to bioaccumulate site-related constituents in their tissue.

The maximum reported UF was selected to model the concentration of a constituent in earthworm tissue. Constituent concentrations in terrestrial invertebrates were estimated based on the following equation:

$$\text{Conc terrestrial invert} = UF_{s-i} \times \text{Conc soil}$$

where:

Conc terrestrial invert = the concentration of the compound in a terrestrial invertebrate (mg/kg)

UF_{s-i} = soil-invertebrate uptake factor (unitless)

Conc soil = soil concentration (mg/kg).

Small Mammals

Small mammals, which serve as a dietary food item for the upper trophic-level predators such as the red fox and red-tailed hawk, have the potential to bioaccumulate site-related constituents in their tissue. Following selection of the UF, constituent concentrations in terrestrial invertebrates were estimated based on the following equation:

Conc small mammals = UF_{s-m} × Conc soil

where:

Conc small mammal = the concentration of the compound in a small mammal (mg/kg)

UF_{s-m} = soil-small mammal uptake factor

Conc soil = soil concentration (mg/kg).

Fish

One transfer factor (water to tissue) was utilized in modeling fish tissue concentrations. Fish tissue concentrations will be modeled using BCFs.

Conc fish = BCF × Conc surface water

Where:

Conc fish = the concentration of the compound in a fish (mg/kg)

BCF = fish bioconcentration factor (L/kg)

Conc surface water = surface water concentration (mg/L).

7.6.6 Estimation of Dietary Exposure

Estimation of dietary exposures to individual organisms to uranium is based on the life history characteristics of each specific receptor, such as body weight, ingestion rate, preferred diet, home range, and COPEC concentrations in the environmental media. Screening-level exposure estimates were calculated for mammalian and avian receptors using the conservative exposure parameters listed in Tables 7-13 and 7-14 and the TRVs selected in Section 7.6.1 (Tables 7-11 and 7-12).

Food ingestion rates (FIR) were calculated in grams dry matter per day using the following equations from Nagy (1987):

FIR (g/day) = 0.648 $Wt.^{0.651}$(g) all birds

FIR (g/day) = 0.235 $Wt.^{0.822}$(g) all mammals

Water ingestion rates (WIR) were calculated using the following equations from Calder and Braun (1983):

WIR (L/day) = 0.059 $Wt.^{0.67}$(g) all birds

WIR (L/day) = 0.099 $Wt.^{0.90}$(kg) all mammals

Sediment ingestion rates (SIR) were based on Beyer et al. (1994), or professional judgment if a value was not available in Beyer for a species.

Food, water, and sediment ingestion rates are provided in Table 7-13 for birds and in Table 7-14 for mammals. All ingestion rates were divided by receptor body weights to provide intake rates per kg of body weight per day.

The general structure of the model used to estimate the exposure rate for a given constituent by a wildlife receptor is as follows:

$$EED = \sum \left(IR_p \times [COC]_p + IR_w \times [COC]_w + IR_s \times [COC]_s \right)$$

where:

EED = estimated environmental dose (mg/kg body weight-day)

IR_p (or FIR) = receptor-specific food item intake rate (kg dry weight/kg body weight-day)

IR_w (or WIR) = receptor-specific water intake rate (L/kg body weight-day)

IR_s (or SIR) = receptor-specific incidental sediment intake rate (kg dry weight/kg body weight-day)

$[COC]_p$ = Constituent of concern (COC) concentration in the receptors' food item (mg/kg dry weight)

$[COC]_w$ = COC concentration in the receptors' drinking water (mg/L)

$[COC]_s$ = COC concentration in incidentally ingested sediments (mg/kg dry weight)

The estimated environmental dose for each COPEC was divided by its TRV to calculate the hazard quotient.

7.6.7 Uranium Risk Characterization

At the screening level, ecological risk estimation is limited to a simplified assessment by comparing maximum documented exposure concentrations for each media with the ecotoxicity screening values and through food web modeling to evaluate risks to avian and mammalian receptors. The screening-level assessment serves to identify exposure pathways and COPECs which would require further evaluation in a baseline ecological risk assessment by eliminating constituents and exposure pathways that pose negligible risks (USEPA, 1997). These estimates ensure that the appropriate COPECs are selected for further evaluation, and identify data gaps for additional sampling or uncertainties to be addressed in the BERA.

7.6.8 Ratios of Constituents to Screening Criteria

The screening evaluation was conducted by comparing the maximum detected concentration for each medium with the minimum (i.e., most conservative) screening criterion available. Screening values were selected based on availability and applicability to the Guterl Site and to the freshwater environment. The data used in the screening evaluations include the analytical results for soil, sediment, and groundwater collected for this RI.

The ratio of maximum soil concentration to the screening criteria (Table 7-11) for plants yields a screening ratio of 10,775 (53,875 mg/kg / 5 mg/kg), above the target ratio of one. Surface water sampled in this RI

had a maximum uranium concentration of 0.8 µg/L. This water concentration yields a screening ratio of 3 x 10^{-1} (0.8 µg/L / 2.6 µg/L).

7.6.9 Food Web Modeling

Screening-level exposure estimates were calculated for avian and mammalian receptors using the conservative exposure parameters listed in Table 7-13 and 7-14, respectively, and the TRVs selected in Section 7.6.1 (Table 7-11 and 7-12, respectively).

Food web modeling results are summarized for avian and mammalian receptors in Table 7-16 which provides a summary of the constituents exceeding hazard quotients for the various media/receptors screened.

Based on the conservative nature of this SLERA and the food web modeling used to evaluate the potential risk to terrestrial receptors, there is the potential for increased risk to receptors that may use the upland portions of the Guterl Site for foraging. The uranium hazard quotient (HQ) for the terrestrial species which may inhabit the Guterl Site exceeded 1.0 for the short-tailed shrew, American robin, eastern cottontail, red fox and red tailed hawk through ingestion of contaminated food. HQ exceedances are based on the use of the maximum uranium concentration in soil (EU7/Bldg. 8) and conservative life history parameters used in this SLERA. This exceedance of an HQ = 1.0 indicates that a potential exists for risk to site plants, birds, and terrestrial mammal species. For plants there is a potential for phytotoxic effects, for avian species effects may include mortality, liver or kidney effects or effects on blood chemistry, and for terrestrial mammals there is a potential for reduced litter size and smaller offspring.

Exposure to the maximum uranium concentration in sediment did not result in any riparian ecological receptors (i.e., mink, belted kingfisher, or great blue heron) exceeding an HQ =1.0. Therefore, there is no potential for increased risk to the riparian receptors that may use the Erie Canal (EU19/IA09) for foraging.

7.6.10 Refinement of the Screening Level Ecological Risk Assessment for Total Uranium

Refinement of the SLERA uranium risk was performed by developing wildlife preliminary remediation goals (PRGs) for soil by back calculating exposure estimates using different soil concentrations and soil-to-biota contaminant uptake models. The soil concentrations were manipulated to produce an exposure estimate equivalent to the wildlife endpoint-specific and contaminant-specific NOAEL, which were obtained from Sample et al. (1996). Uptake models for plants were obtained from Efroymson et al. (1997); those for earthworms, from Sample et al. (1997); and those for small mammals, from Sample et al (1997). Because different diets may dramatically influence exposures and sensitivity to contaminants varies among species, PRGs were developed for only the short-tailed shrew, American robin, eastern cottontail and the red fox whose HQs exceeded 1.0 based on the maximum soil concentration on the Guterl Site. These PRGs were then compared in Table 7-17 to the EPCs in each HHRA exposure unit. Included in this refinement are the soils under the building slabs in the event the slabs are removed allowing for a complete exposure pathway. These EUs were selected to provide an understanding of what areas may require further consideration for risks to ecological receptors vs. human health concerns.

As shown in Table 7-17 using the EPCs for total uranium in soil, surface and total (subsurface) soils in EU2/Bldg. 2, EU3/Bldg. 3, EU4/Bldg. 4&9, EU6/Bldg. 6, EU7/Bldg. 8, EU8/Bldg. 24, EU9/Bldg. 35, EU10/IA02 East, EU11/IA02 Between Buildings, EU12/IA03, EU13/IA04A, EU 14/IA04B, EU15/IA04C, EU16/IA04D, EU17/IA05A, and EU20/IA10 exceed the calculated PRGs for several potential receptors. Soils in EU18/IA05B did not exceed any terrestrial receptor calculated PRGs.

7.7 Uncertainty Assessment

Uncertainty is an inherent component of risk assessments. Elements of uncertainty in this SLERA have been identified and efforts have been made to minimize them. For components in which a moderate

degree of uncertainty is unavoidable (e.g., sampling data), efforts have been made to minimize any systematic bias associated with the data.

There are several sources of uncertainties associated with ecological risk estimates, and uncertainties are present at the various DOE and ERAGS steps, as discussed in this section. Sources of uncertainty in this SLERA include:

- Sampling representativeness and analysis and quantitation error.
- Natural variation and parameter error.
- Food-web model error (Exposure Assessment).
- Toxicological studies used as measures of effect (Effects Assessment).

The following sections identify the strengths and limitations of the various components of this assessment.

7.7.1 Sampling Representativeness and Analysis and Quantitation Error

This section discusses the potential impact of sampling representativeness and analysis and quantitation error on the uncertainty inherent in the SLERA.

The soil samples analyzed were collected through the entire soil overburden and in a systematic pattern across the Guterl Site. The data sets for soil were extensive, providing a low level of uncertainty, and were considered acceptable for use in the SLERA.

Sediment sampling was limited to the immediate vicinity of the Guterl Site and may not represent the full extent of potential contamination. The limited sampling provides a moderate level of uncertainty, but data were considered acceptable for use in the SLERA.

The analysis and quantitation of analytical parameters was minimized by following QA/QC protocols and using USACE requirements. Data were verified as discussed in Section 3.13 prior to being entered in the database.

All data were considered acceptable for use in the SLERA. The level of uncertainty associated with soil sampling frequency and locations is considered low with the sediment sampling providing a moderate level of uncertainty, but were considered acceptable for use in the SLERA.

7.7.2 Conceptual Model Uncertainties

The conceptual model links COPEC sources, likely exposure pathways, and potential ecological receptors. It is intended to provide broad linkages from various receptor groups found in and around the Guterl Site to contamination in water, sediments, soils, and food item. There is considered to be a low level of uncertainty associated with the conceptual model. However, since it is a generalized model, it is not intended to represent specific individuals currently living around the Guterl Site. The actual linkages between the biotic levels depend on the seasonal availability of various food items.

The results of the risk characterization show that the majority of risk is due to exposure to contaminated food items, which is consistent with other studies and bioaccumulation processes. Specific uncertainties in the exposure and food-web modeling are discussed in the following section.

7.7.3 Exposure Assessment

Natural variation represents known variation in parameters based on observed heterogeneity in the characteristics of a particular receptor species. Variability can often be reduced with additional data collection, whereas uncertainty can be reduced directly through the confirmation of applied assumptions

or inferences through direct measurement. Parameter error includes both uncertainty in estimating specific parameters related to exposure or the specific EPCs being applied in the exposure models (e.g., sediment, water, and fish concentrations, etc.) as well as variability (e.g., ingestion rate, body weight, temporal and spatial habitat use, etc.). Some parameters can be both uncertain and variable.

Body Mass

Body mass plays a quantitative role in the water, dietary, and incidental sediment ingestion pathways as part of the average daily dosage term for each pathway on a per-kg body weight basis. Body masses of adult birds and mammals were generally the lowest mean body weights found for a North American population.

On a cumulative dosage basis, a lower body mass estimate results in a higher average daily dosage estimate. Since it is not known if typical body masses for Guterl Site populations are indicative of either extreme in the range of body masses, a high systematic bias is associated with these estimates.

Food Ingestion Rates

Use of allometric scaling incorporates some degree of uncertainty in the absence of field verification. To reduce this uncertainty, diet-normalized metabolic rates and the metabolizable energy contents of specific foods consumed were used. Ingestion rates were calculated as the quotient of the species-specific normalized metabolic rate and the average metabolizable energy content of the diet. Estimation of the average gross energy content in wildlife foods is limited to a number of select broad phylogenic groups and is rarely available for species-level evaluations of food items included in the diet. Reliance upon the gross energy estimates for representative taxa groups introduces some uncertainty in derivation of the ingestion rates, as it is assumed that the gross energy content and assimilative efficiency of select groups of invertebrates and fish taxa are equivalent to other freshwater benthic invertebrate and fish taxa. This assumption in the energy content of the diet can influence the ingestion rate estimate, if under- or overestimated. An overestimate of the average metabolizable energy in the diet will decrease the ingestion rate (i.e., the actual metabolic average is lower than estimated), while an underestimate of the metabolic average results in an overestimate of the ingestion rate. There was no systematic bias inherent in the food ingestion rates used in this SLERA.

Water Ingestion Rates

Water ingestion rates for avian and mammalian riparian receptors were estimated based upon allometric relationships developed for mammals and birds by Calder and Braun (1983). The Erie Canal was considered to be the exclusive drinking water source. The dosage estimate for water ingestion did not account for metabolic- or dietary-derived sources of water for the individual receptors. Consequently, the allometric methods assumed that hydration demands in the receptors are solely accounted for by direct ingestion of surface water. This assumption may result in a slight overestimate of surface water-derived COPEC exposure through the drinking water pathway by exclusion of metabolic and dietary sources.

Incidental Soil and Sediment Ingestion Rates

Of the receptors evaluated, only the short-tailed shrew has published estimates for ingestion of soil/sediment. The value of 13 percent for the short-tailed shrew (Talmage and Walton, 1993) is a quantified estimate and considered reliable for application to Guterl Site populations.

Estimates of incidental sediment/soil ingestion for all other receptors were made based upon feeding behavior used for food item capture and consumption and nesting/resting habitats of each species.

The great blue heron and belted kingfisher were characterized as primarily piscivorous in diet. Both receptor species visually follow their food items and seize the specific food items using their bill. A

sediment ingestion rate of one percent was used for the great blue heron as it may ingest some incidental sediment during food item capture, food item consumption, and grooming. This rate was also applied to the belted kingfisher, which has little contact with sediments during feeding, but may ingest some sediment during grooming because it nests in riverbanks.

Stomach content and scat analyses on mink from New York have shown trace quantities (i.e., less than or equal to one percent of the diet) of sand present (Hamilton, 1940). Based upon this study and the potential for the mink to also ingest sediments during grooming, a one percent incidental ingestion composition in the diet of the mink was applied.

The incidental sediment ingestion rate of piscivorous receptors is considered not to be biased high or low, as incidental sediment contained in fish is included in fish exposure concentrations.

Media Concentrations

Maximum soil and sediment concentrations were used in this SLERA to conservatively overestimate receptor exposures, resulting in the evaluation of a worst case scenario. Actual exposures to COPECs are lower since receptors use a range of areas on the Guterl Site, rather than always being at the area where the highest detected concentrations were found in each medium.

Uncertainty in Relative Bioavailability

The bioaccumulation and response models (for both plants and animals) assumed that the form of the constituent present in the environment was absorbed with the same efficiency as the constituent form used in the laboratory toxicity study. Constituent solubility is an important factor in absorption efficiency, and for many constituents, laboratory toxicity studies are performed using the most soluble form. This is particularly true of the metal COPECs, which are themselves natural but often biologically unavailable constituents of abiotic media such as soils and sediments. It has been shown that uranium uptake by plants is not related to simple bioavailability parameters and only complex models considering several soil characteristics predict uranium uptake which is influenced by uranium speciation (Vandenhove et al., 2006).

Concentrations of uranium in the soils on the Guterl Site were determined based on the level of radioactivity found in the soil and sediment samples. Use of these concentrations assumes 100% of the metal is available for absorption which may overestimate the potential risk. The assumption of 100% bioavailability may overestimate the potential risk, but this level of conservatism is appropriate for a SLERA.

Uncertainty in Temporal and Spatial Parameters

A year-round exposure time was used for avian and mammalian receptors in this SLERA. Avian receptors considered in this SLERA are migratory in nature, although some individuals may remain at the Guterl Site year-round. Even if receptors migrate, they are likely to breed and raise their young at the Guterl Site during warmer periods of the year. As reproductive effects were generally selected as toxicity endpoints for both radionuclides and uranium toxicity, the lack of full-time residency may overestimate exposure, however this is considered to be appropriate.

The conceptual model assumes that receptors modeled belong to closed populations that forage exclusively in and around the Guterl Site. While this may be accurate for receptors with small home ranges (e.g., belted kingfisher, short-tailed shrew), exposure may be overestimated for receptors with larger home ranges (e.g., red fox, red-tailed hawk). Therefore, the uncertainty in the spatial use of the Guterl Site may introduce a conservative bias in some years.

Uncertainty Associated with the UFs and Bioaccumulation Factors (BAFs)

There is a great deal of uncertainty associated with the UFs and BAFs used to calculate dose. Very few UFs/BAFs are available in the scientific literature, since they must be both constituent- and receptor-specific.

Concentrations of COPECs were not measured in terrestrial invertebrates, plants, or mammals. Therefore, COPEC concentrations in these food item types were estimated based on assumed media-transfer relationships. The uncertainty in media-transfer ratios and functional relationships between COPEC concentrations in soil or sediment and in tissue is greater than that of using measured food item concentrations.

BCFs and UFs or equations for the receptors were primarily taken from reports published by ORNL (e.g., Efroymson et al. 1997b), the IAEA (1994), or Shanandeh and Hossner 2002 as cited in Canadian Soil Quality Guidelines for Uranium (2007). General, rather than conservative, estimates were applied to reduce the level of conservatism associated with these estimates. Differences exist between BCFs and UFs used in RESRAD Biota and the evaluation of uranium toxicity. The use of the uptake factors from RESRAD Biota for the evaluation of total uranium metal would not be scientifically sound as RESRAD Biota looks at the most sensitive species no matter what trophic level it is. So for plant uptake it uses a factor derived from legumes which would not be appropriate for leafy plants a cottontail would consume. Also the uptake factors for aquatic species uses values for mollusks and gammarus which would not be appropriate for fish.

Transfer of constituents to body tissue is a multi-functional and dynamic process dependent on factors such as duration of exposure, availability from the medium, depuration rates, receptor species, health status, and habitat type. The uncertainty resulting from this approach cannot be quantified based on the data available from either the literature or Guterl sampling, but is not considered to be biased in either direction.

7.7.4 Uranium Toxicity Effects Assessment

Uncertainties in toxicological studies may result from the use of laboratory or field studies that may differ from the actual toxicity present at the Guterl Site due to:

- Site-specific conditions.
- Interspecies differences in sensitivity to constituents.
- Extrapolating from subchronic to chronic exposures.
- Actual bioavailability of constituents.

The derivation of final TRVs for the various receptors and constituents typically includes uncertainty factors associated with extrapolation from laboratory studies and uncertainty factors incorporated to adjust toxicity from lethal doses to chronic doses.

There are especially large uncertainties in the plant and soil invertebrate toxicity information since plants and soil organisms can adapt to a wide range of soil conditions. There are other sources of uncertainty that are not addressed using numerical uncertainty factors. For example, that laboratory studies used as a basis for generating TRVs may not accurately represent the complexities of potential exposure under field conditions. The constituent form present at the Guterl Site may be in a less soluble form than that used in the laboratory study. In addition, some studies used to generate TRVs are not chronic in nature. It is difficult to interpret the potential for long-term ecological effects from acute or subchronic studies. Toxicological studies on which TRVs are based deal with a single constituent; effects of simultaneous exposure to multiple constituents are not addressed.

A conversion factor of 0.1 was used to estimate a chronic TRV from a subchronic TRV. A conversion factor differs from an uncertainty factor in that the direction of the uncertainty is known. For example, the chronic TRV is expected to be lower than the subchronic TRV. Use of a subchronic-to-chronic conversion factor of 0.1 is supported by the results of a study that compared subchronic to chronic NOAELs and lowest observable adverse effects levels (Dourson and Stara, 1983). The avian TRV used in the SLERA to assess risk from exposure to inorganic uranium relied on a subchronic to chronic conversion factor of 0.1 while the TRV for mammalian receptors did not have any conversion or uncertainty factors applied to its derivation.

7.8 Conclusions and Scientific Management Decision Point of SLERA

7.8.1 Radiological Risk

Additional investigation (i.e., detailed dose assessment) may be warranted based on the results of the analysis herein. Biota dose evaluations using the screening and analysis methods described to this point indicate that there is a potential adverse impact from radiation as a stressor to populations of biota in EU7 (Building 8, assuming the structures and floors are removed and the soil remains) and EU 17 (IA05A, Former Railroad ROW) (see Table 7-10).

7.8.2 Uranium Risk

Based on the results of the screening-level ecological risk calculations summarized in Table 7-16 and the results of the refinement of the SLERA (Table 7-17), it was determined that the uranium on the Guterl Site poses the risk of potential adverse effects to terrestrial receptors from soil exposure. Using the EPCs for total uranium in soil, soils in EU2/Bldg. 2, EU3/Bldg. 3, EU4/Bldg. 4&9, EU 6/Bldg. 6, EU7/Bldg. 8, EU8/Bldg. 24, EU9/Bldg. 35, EU10/IA02 East, EU11/IA02 West, EU12/IA03, EU13/IA04A, EU15/IA04C, EU16/IA04D, EU17/IA05A, and EU20/IA10 (surface and subsurface), and EU14/IA04A (surface soil only) and EU 14/IA04B (subsurface soil only) exceed the calculated PRGs for one or more potential terrestrial receptors. EU18/IA05B did not exceed any terrestrial receptor calculated PRGs.

It should be noted that background concentrations of total uranium are approximately 3 mg/kg and is only slightly below the plant and rabbit PRGs of 5 and 9.5 mg/kg, respectively. As such these PRGs may be conservative at identifying potential risks at these concentrations.

No riparian species were found to be at risk.

7.8.3 **Decision Point**

Some potential risks to ecological receptors at the site were identified based on the screening level ecological risk assessment. However, given the localized nature of the exceedances of the screening levels used in the assessment, as well as the current and future use of the site, further assessment or considerations of ecological risks are not necessary. Although some limited patches of habitat exist on abandoned portions of the site, much of the Guterl Site is actively disturbed or occupied by buildings and paved areas. Although there are non-sensitive habitats on-site which require protection, the site is not currently managed for ecological purposes and the creation of an ecological preserve on-site in the future is unlikely. The current land use of the site is industrial and the current land use surrounding the site is private residences, small farms, and light industrial. Future re-development of the abandoned site is most likely to be industrial, commercial, or residential, which would further preclude the need for ecological management goals in addressing site contamination. The site will proceed into the FS phase in which potential human health risks resulting from exposure to FUSRAP contamination will be addressed. The development of remedial action objectives which are protective of human health should also be protective of ecological receptors at the Guterl Site, consistent with the premise for biota protection from exposure to radiation (ICRP 1977). Therefore, no further evaluation of potential ecological concerns needs to be considered in the FS.

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8.0 SUMMARY AND CONCLUSIONS

This RI report presents a detailed compilation and evaluation of investigation activities and environmental data collected for the Guterl Site. The report was prepared in accordance with CERCLA (USEPA, 1988b) and the NCP (USEPA, 1990). The strategy for the Guterl Site was to address all MED- and AEC-related constituents at the Guterl Site using the criteria established in CERCLA and the NCP. The RI Report goals included establishing the nature and extent of contamination, evaluating contaminant fate and transport, performing an HHRA and a SLERA, and developing data sufficient for use during the FS in estimating quantities and classification (e.g., hazardous or non-hazardous, low level radioactive waste, etc.) of contaminated material of various media (i.e., soil, groundwater, surface water, sediment, and building materials).

Section 1.0 of this RI Report presents an introduction of Guterl Site information, a brief summary of the approach to the FUSRAP RI, and an outline for the RI Report. Section 2.0 presents a summary of Guterl Site ownership and history of operations, a description of physical Guterl Site characteristics, a summary of previous investigations, development of the CSM, and a summary of DQOs. Section 3.0 describes the RI activities conducted for the current investigation. These activities included building assessments, onsite and offsite radiological screening and analyses, background sampling (soil, surface water, sediment, and groundwater), a gamma walkover survey, and sampling and analysis of the various environmental media (i.e., surface and subsurface soil, detritus, groundwater, surface water and sediment, and building materials). Section 4 presents an assessment of nature and extent of each COPC on an IA-by-IA and matrix-by-matrix basis. The nature and extent assessment incorporates current RI data, as well as data generated during previous investigations, where available and appropriate for use. Section 5.0 provides a fate and transport assessment, taking into account the mechanisms and pathways by which COPCs present at the Guterl Site could be released from their current locations, move through environmental media, and potentially impact human and ecological receptors. Section 6.0 presents the HHRA, and Section 7.0 presents the SLERA.

8.1 Summary of Investigative Findings

8.1.1 Nature and Extent of Contamination

Text, tables, and figures in Section 4 provide detailed descriptions, results, and depictions of the measurements for radioactive COPC contamination that are summarized in the following paragraphs. The potential COPCs at the Guterl Site include ^{226}Ra, ^{228}Ra, ^{228}Th, ^{230}Th, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U.

This RI confirms the results of previous studies that indicated the presence of thorium and uranium contamination at the Guterl Site as a consequence of MED/AEC support operations. The current RI also added much new information about the nature and extent of thorium and uranium contamination at the Guterl Site. No evidence was found for ^{226}Ra contamination per se (e.g., ^{226}Ra was always found in equilibrium with its ^{230}Th precursor when data were available to make the comparison), except for a single soil location in IA05A (the reason for the atypical isotopic ratios at this location was not able to be determined using the current RI and historical data sets).

The extent of MED/AEC-related constituents was found to be consistent with prior site investigations and the RI CSM. Significant observations include:

Surface and Subsurface Soil:

The distribution of MED/AEC-related COPCs in soil was non-homogeneous with respect to areal and vertical extent as presented in Section 4.1.2 and 4.1.3 discussions and in Section 4.1.2-series and Section 4.1.3-series figures.

- COPC concentrations were at or near background levels in active Allegheny Ludlum Corporation production areas and in historically undisturbed areas of the Guterl Site.
- COPC contamination was found to be greatest in and around then-active MED/AEC support operations handling areas, and in then-undeveloped portions of the property where miscellaneous land disposal of MED/AEC-related materials may have occurred.
- Some degree of MED/AEC-related constituents was found in each Excised Area building (see Section 4.1.3-series figures). Buildings 6 and 8 were the most significantly affected; this is consistent with the CSM as these were the buildings that were used for uranium metal rolling and shipping during MED/AEC support operations.
- Outside of the Excised Area buildings, MED/AEC-related constituents were found to occur in several localized outdoor areas of the undeveloped parcel, including IA02, IA03, IA04A, and IA05A (see Figure 3-9, Gamma Walkover Survey and Section 4.1.3-series figures). Horizontal and vertical distribution of contamination within these areas was variable. This is consistent with miscellaneous land disposal practices.
- Uranium concentrations on the Guterl Site were detected in subsurface samples collected on the eastern portion of IA10. Uranium COPCs were detected at concentrations less than two times background in 13 of 16 borings. At three boring locations proximal to IA05A, uranium COPCs were detected above background but less than half the individual COPC screening levels. The presence of uranium above background but below screening levels at these three boring locations is likely attributable to the proximity of the subject borings to the observed area of greater COPC concentrations in the southwestern portion of IA05A (boring location A05A-301).
- The horizontal extent of MED/AEC-related constituents in surface and subsurface soil was successfully bounded in all areas of the site; i.e., sufficient data exist to conclude that soils with MED/AEC-related constituents that exceed screening level criteria are limited to areas located within the Guterl Site. Although the horizontal bounding did not meet FSP-planned tolerance relative to horizontal bounding distance at screening level (SOR) sensitivity, application of HHRA-developed PRGs will result in a different bounding evaluation to be completed in the FS as future use scenarios are evaluated and selected. Sufficient data exist to complete these alternate evaluations within CERCLA-prescribed tolerances.
- Vertical bounding of MED/AEC-related constituents in surface and subsurface soil was successfully completed to within 2-foot tolerance (see Section 4.1.3-series figures). The RI data show that there are areas where surface soils contain MED/AEC-related constituents in excess of FSP screening levels but subsurface soils in the same boring location do not; there are areas where surface soils do not contain MED/AEC-related constituents in excess of FSP screening levels but subsurface soils do; there are areas where both surface and subsurface soils contain MED/AEC-related constituents in excess of FSP screening levels; and, there are areas where neither surface nor subsurface soil contains MED/AEC-related constituents in excess of FSP screening levels (i.e., unaffected areas of Guterl Site). As the FS is completed, application of HHRA-developed PRGs will result in a different bounding evaluation as future use scenarios are evaluated and selected. Sufficient data exist to complete these alternate evaluations within CERCLA-prescribed tolerances.
- Consistent with the CSM, uranium and thorium were the COPCs detected above FSP screening levels; i.e., radium was detected above screening levels only where associated with parent radionuclides. FSP screening level exceedances for uranium and thorium COPCs were not always collocated, although the frequency where this occurred was less than one percent based on alpha spectroscopy data for soil (with only a fraction of those cases with ^{232}Th greater than two times the FSP screening level). Additional evaluation during the FS may be performed to determine if ^{238}U plus progeny may be used as the primary COPC for the Guterl Site; however, the occurrence of limited, isolated ^{232}Th plus progeny cannot be completely ruled out based on the RI data.

- Additional data were collected to evaluate the presence of enriched, depleted, and recycled uranium. Presence of ^{236}U indicates recycled uranium; enhanced abundances of ^{234}U and ^{235}U indicate enriched uranium, and the enhanced abundance of ^{238}U indicates depleted uranium. Twelve soil samples that displayed significantly elevated uranium concentrations as determined by onsite laboratory gamma spectroscopy analysis were selected for ICP-MS isotopic uranium analysis. One sample (A02SL-028-01) shows ^{235}U and ^{238}U relative mass abundances indicative of depleted uranium. The remaining samples appear to be natural uranium but the possibility of blends of natural, depleted, and enriched uranium cannot be ruled out. Three of the samples show traces of ^{236}U, which is present only in recycled uranium.

Groundwater:

- Overburden groundwater appears to fluctuate seasonally with variations in precipitation and evapotranspiration. Overburden groundwater was not present during this RI; however, other investigators have reported measureable groundwater in overburden wells. No overburden groundwater samples were collected during this RI as groundwater was not observed in overburden wells during the July/August 2007 and November 2007 sampling events.
- The shallow bedrock hydrogeology is heterogeneous due to the presence of fractured bedrock, and the presence of the Erie Canal and dolostone quarry (i.e., dewatering at the quarry affects groundwater flow patterns on the southwestern portion of the Guterl Site).
- Uranium was the only COPC in shallow bedrock groundwater that exceeded USEPA MCLs (seven of 30 locations sampled); see Figures 4-47 and 4-48.
- The occurrence of uranium-contaminated groundwater is consistent with leaching of uranium-contaminated soil (source material) to the bedrock groundwater zone, which then follows the northwest to southeast trending groundwater flow pattern.
- Eight new shallow bedrock monitoring wells (top 15 feet of bedrock) were installed to supplement the existing network of 26 shallow bedrock wells (top 15 feet of bedrock) installed by NYSDEC (multiple prior investigations).
- The current shallow bedrock monitoring well network is sufficient to determine shallow bedrock groundwater flow patterns and shallow bedrock geochemistry on the Guterl Site.
- The horizontal extent of shallow bedrock groundwater contamination at the limits of the southwest and southeast quadrants of the Guterl Site is undetermined. In addition, the vertical extent of bedrock groundwater contamination at shallow bedrock wells with uranium screening level exceedances is also undetermined.

Surface Water:

- Naturally occurring surface water was observed in the Erie Canal and in seasonally wet depression areas in undeveloped portions of the Guterl Site. Seasonally wet depression areas were not sampled due to the limited nature and occurrence of these areas, as well as the absence of off-site migration pathways.
- MED/AEC-related constituents were not detected in surface water samples (12) collected from the Erie Canal; see Figure 4-52.

Sediment:

- Naturally occurring sediment was observed in the Erie Canal and in seasonally wet areas along the western and southern perimeter of the landfill area.
- MED/AEC-related constituents were not detected in naturally occurring sediment in seasonally low areas of landfill and the Erie Canal; see Figure 4-49 and Figure 4-53, respectively.

Excised Area Site Utilities:

- MED/AEC-related constituents were detected in non-native surface water in Excised Area utility trenches, drains, pits, catch basins, and in the basement of Building 1; see Figure 4-29. The nature and location of detections is consistent with proximity to MED/AEC-related material handling and MED/AEC-related constituents in surface soil.
- MED/AEC-related constituents were detected in non-native sediment in Excised Area utility trenches, drains, pits, catch basins, and Building 1 basement; see Figure 4-30. The nature and location of detections is consistent with proximity to MED/AEC-related material handling and MED/AEC-related constituents in surface soil.
- Although comprehensive design and/or construction record drawings for all Excised Area utilities was not able to be located during this phase of the RI, sufficient information was located and/or generated (e.g., utility surface water and sediment samples) to allow for determination of nature and extent of COPCs. Depending on options evaluated, additional exploration may be required to refine FS requirements (volume estimates, types of buried materials, depth of lines, etc.).

Building Materials:

- About 25 percent of the static measurements of average surface contamination (that is, measurements of fixed plus removable contamination) for IA01 buildings (Table 4-7) exceeded a surface screening level. However, only three of 4,594 swipe measurements of removable surface contamination for IA01 buildings were greater than the applicable thorium screening level and none were greater than the applicable uranium screening level. This confirms earlier conclusions that COPC contamination of interior building surfaces is essentially fixed.
- Radioactivity on building exterior surfaces and roofs was found to be below surface radioactivity limits. Exterior roof samples (volumetric) were not collected for safety reasons. In addition, observations and review of scanning surveys indicated that build-up of contamination was unlikely (e.g., absence of soot, soil like material, etc.).

8.1.2 Contaminant Fate and Transport

An evaluation of the fate and transport of constituents at the Guterl Site was performed to identify the mechanisms and pathways by which radionuclides present at the Guterl Site could be released from their current locations, move through environmental media, and potentially impact human and ecological receptors. The potential COPCs at the Guterl Site include uranium isotopes (^{234}U, ^{235}U, and ^{238}U), thorium isotopes (^{228}Th, ^{230}Th, and ^{232}Th), and radium isotopes (^{226}Ra and ^{228}Ra); however, ^{238}U is the dominant COPC and therefore was the focus of the fate and transport evaluation. The potential migration pathways evaluated included soil, surface water, groundwater, and air.

The original source of the COPCs was dust and debris generated by the Rolling Mill operations. Potential migration pathways for the dust and debris include: land disposal/disturbance, wind erosion/deposition, surface water runoff and transport through storm sewers, infiltration of water through surface and/or subsurface soil to groundwater and contaminant leaching, and sediment transport. Land disposal/disturbance is no longer occurring. Wind erosion/deposition is not considered to be a significant mechanism for contaminant releases from the Guterl Site due to relatively slow wind speeds, elevated soil moisture and periods of freezing, and cover by asphalt, concrete, or vegetation. Surface drainage is mostly internal to the Guterl Site, which also limits sediment transport. Therefore, the most dominant migration pathway appears to be contaminant leaching from soil to groundwater.

Radium may be readily adsorbed by earth materials and is usually not a mobile constituent in the environment. Radium is degraded through radioactive decay and produces radon gas, which has a short half-life (^{222}Rn half-life of 3.8 days; ^{220}Rn half-life of 56 seconds (USACE, 2002, Figures 5-1 and 5-2)). Soil moisture greatly retards radon diffusion, and essentially all of the radon gas produced in the

contaminated soil will undergo radioactive decay prior to reaching the surface. The relatively low concentrations of radium in soil, relatively high moisture content in the soil, and short half-lives of radon isotopes (in particular for ^{220}Rn) result in very low releases of radon gas from the Guterl Site.

Thorium has low solubility so little dissolution is expected. In water, thorium is likely present in suspended matter and sediment; the concentrations of dissolved thorium are typically small due to low solubility and its tendency to sorb strongly to soil. At the Guterl Site, the most elevated groundwater thorium concentration was 0.98 ± 0.32 pCi/L ^{230}Th, which occurred at well MW-26 in a filtered sample. The corresponding unfiltered sample activity was 0.64 ± 0.26 pCi/L.

Occurrence of uranium at elevated concentrations in soil outside MED/AEC-related support operations and material handling areas and in groundwater indicates that migration has occurred. In addition to poor material handling practices within the Excised Area creating source areas, the dominant migration pathway appears to be related to historical land disposal/disturbance source areas because soil contamination is focused in specific areas and at some locations is found throughout the vadose soil column. Occurrence of contamination at depth in soil is indicative of land disposal practices; e.g., sequential placement and subsequent burial or cover, and/or reworking previously placed material resulting in mixing and deeper placement. These practices could have resulted in direct contact of contaminated material (containing unoxidized or oxidized uranium) with the dolostone aquifer or with contaminated material that is seasonally in contact with groundwater.

Groundwater levels are shallow at the Guterl Site and fluctuate seasonally. As shown on Figure 4-50, these fluctuations result in contact of the groundwater with soil contaminated with uranium. Increases in specific conductivity when groundwater levels increase also indicate that this type of contact is occurring and causing soluble constituents to be flushed into groundwater. Water level fluctuations can also induce changes in redox conditions. Soil and contaminants subject to wetting and drying cycles are more likely to oxidize than if redox conditions are stable. Under these conditions, uranium mobility can increase. Therefore, uranium observed in groundwater may be a result of two sources: 1) uranium that was oxidized during milling operations and leached to bedrock groundwater through soil, and 2) ongoing oxidation of uranium in soil that is seasonally in contact with groundwater.

Uranium exceedances of the groundwater screening level of 30 µg/L (27 pCi/L) occurred at seven shallow bedrock monitoring wells based on 2007 groundwater data (weighted averages). The association of uranium exceedances with oxidized groundwater indicates that uranium is mobilized as a U^{6+}-carbonate complex. Once in shallow bedrock groundwater, uranium will tend to migrate along fracture and bedding plane flow paths as long as groundwater conditions remain oxidizing, although limited migration of U^{4+} complexed with organic ligands may occur.

SESOIL/AT123D modeling was performed to determine the soil concentrations of uranium that could cause groundwater exceedances of the screening level of 30 µg/L. General site conditions outside buildings were modeled. MINEQL+ was used to derive the solubility of uranium used as input into SESOIL. The modeling used conservative assumptions, assuming that the uranium source was fully oxidized (U^{6+}). The HELP and RESRAD models were used to determine infiltration, which was used for calibrating the SESOIL model and refining soil input parameters. Most modeling assumed a relatively low adsorption capacity measured in contaminated soils.

SESOIL/AT123D modeling of general site conditions and calibrated to an infiltration rate of 0.38 m/yr indicated that activities less than 1 pCi/g uranium would result in exceedances of the groundwater screening level and currently observed groundwater concentrations. The SESOIL/AT123D modeling assumed oxidized uranium (U^{6+}) is the source to groundwater, although most uranium in soil on Site is likely present as insoluble uranium (U^{4+}). The presence of oxidized uranium assumption resulted in simulated leaching rates that appear higher than observed on Site which indicates that future CERCLA efforts (i.e., FS analyses) should account for variability in solubility when conducting final remedial goals. Therefore, results of the RESRAD modeling, which is specifically designed for calculating doses and risks from residual radioactive materials, was used for the risk assessment.

8.1.3 Human Health Risk Assessment

An HHRA was conducted for the Guterl Site as part of the RI. This HHRA evaluated potential risks, doses, and systemic effects to both current (juvenile trespasser and onsite worker) and future (juvenile trespasser, onsite worker, construction worker, and hypothetical resident) human receptors from exposure to contaminated building materials within the Excised Area, surface and subsurface soil, groundwater, and sediment and surface water within ditches, trenches, etc. and within the Erie Canal. The COPCs evaluated in the HHRA were ^{226}Ra, ^{228}Ra, ^{228}Th, ^{230}Th, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U. The potential routes of exposure are presented in the CSM as shown on Figure 6-3 and include ingestion of all media, inhalation of particulates, and exposure to external gamma radiation.

The RESRAD code was used to estimate the risk and doses for all receptors and all media with the exception of sediment, surface water, and groundwater, which were estimated using RAGS equations. The noncarcinogenic effects of the uranium isotopes were also estimated using the RAGS equations because the RESRAD code is not set up to handle these evaluations. The RESRAD-Build code was used to estimate risks and doses for the building interiors. The Guterl Site was divided into 20 EUs to thoroughly assess risks to the various receptors. EUs 1-9 are the building interiors within the Excised Areas, while EUs 10-20 are considered the outdoor EUs. Since the nature and extent of contaminants may vary over time as contamination transports and degrades, the HHRA evaluated both current and future risks, doses, and hazards. RESRAD and RESRAD-Build were used to model contaminant fate and transport and to estimate the current and future dose and risk to receptors. Risk and dose were evaluated at year zero (currently sampled conditions) and at several selected years in the future (year 1, year 10, year 25, year 58, and year 1000). The risks, doses, and hazard indexes are summarized in Table 6-13 by receptor and exposure unit and discussed in Section 6.5. In Table 6-13, values are bolded when they exceed one of the following screening levels (based on USEPA, 1997c):

- Radiological carcinogenic risk of 1×10^{-4}
- Annual dose of 25 mrem/year
- Hazard Index of 1.0

To summarize Table 6-13, discussed below are the EUs that exceed one or more of these levels. Values in parentheses are the maximum risks/doses/HIs estimated for a receptor at that EU. For EUs 1-9 (all within IA01), the receptors most at risk are the onsite worker and the construction worker; the primary exposure pathway is in-building soil (flooring). For EUs 10-20 (IA02 through IA05B, IA09, IA10), the most at-risk receptor is a hypothetical resident; the primary exposure pathways are external gamma radiation and consuming home-grown produce.

EUs with Risks Exceeding 1×10^{-4} at year zero: Nine EUs/IAs had risks (excluding contribution from background) exceeding 1×10^{-4}, the upper bound of the NCP risk range. The nine EUs with risks exceeding 1×10^{-4} included:

EU6/Bldg. 6 (1×10^{-3})
EU7/Bldg. 8 (1×10^{-2})
EU10/IA02 East (3×10^{-4})
EU11/IA02 West (2×10^{-4})
EU12/IA03 (2×10^{-4})
EU13/IA04A (3×10^{-4})
EU14/IA04B (3×10^{-4})
EU16/IA04D (3×10^{-4})
EU17/IA05A (3×10^{-3})

The highest estimated risk was 1×10^{-2} at EU7/Bldg. 8.

EUs with Doses Exceeding 25 mrem/year at year zero: Nine EUs/IAs had annual dose estimates (excluding contribution from background) greater than 25 mrem/year, including:

EU1/Bldg. 1 (591 mrem/y)
EU2/Bldg. 2 (470 mrem/y)
EU3/Bldg. 3 (120 mrem/y)
EU4/Bldg. 4/9 (29.6 mrem/y)
EU6/Bldg. 6 (84.4 mrem/y)
EU7/Bldg. 8 (765 mrem/y)
EU8/Bldg. 24 (64.8 mrem/y)
EU14/IA04B (32.4 mrem/y)
EU17/IA05A (166 mrem/y)

The highest estimated dose was 765 mrem/y at EU7/Bldg. 8.

EUs with HIs Exceeding 1.0 at year zero: Only four EUs had HIs (excluding contribution from background) exceeding 1.0:

EU7/Bldg. 8 (HI = 9)
EU8/Bldg. 35 (HI = 9)
EU14/IA04B (HI = 2)
EU17/IA05A (HI = 8)

Future cancer risks and doses estimated by RESRAD and RESRAD-Build revealed several receptors exceeding the screening criteria in one or more EUs (values in parentheses are the maximum risks/doses estimated for a receptor at that EU). As in current conditions, for EUs 1-9 (all within IA01), the receptors most at risk are the onsite worker and the construction worker and the primary exposure pathway is in-building soil (flooring). For EUs 10-20 (IA02 through IA05B, IA09, IA10), the most at-risk receptor is a hypothetical resident and the primary exposure pathways are external gamma radiation and consuming home-grown produce.

EUs with Risks Exceeding 1×10^{-4} in future years: Incorporating contaminant degradation and transport, twelve EUs/IAs had risks (excluding contribution from background) exceeding 1×10^{-4}, the upper bound of the NCP risk range. EUs with risks exceeding 1×10^{-4} included:

EU6/Bldg. 6 at t=1000 (1×10^{-3})
EU7/Bldg. 8 at t=58 (2×10^{-3})
EU7/Bldg. 8 at t=1000 (2×10^{-4})
EU10/IA02 East at t=58 (1×10^{-3})
EU10/IA02 East at t=1000 (1×10^{-4})
EU11/IA02 West at t=58 (4×10^{-3})
EU12/IA03 at t=58 (2×10^{-3})
EU13/IA04A at t=58 (6×10^{-3})
EU13/IA04A at t=1000 (1×10^{-4})
EU14/IA04B at t=58 (4×10^{-4})
EU15/IA04C at t=58 (2×10^{-4})
EU16/IA04D at t=58 (8×10^{-4})
EU16/IA04D at t=1000 (1×10^{-4})
EU17/IA05A at t=58 (6×10^{-2})
EU17/IA05A at t=1000 (1×10^{-3})
EU18/IA05B at t=58 (2×10^{-4})
EU20/IA10 at t=58 (2×10^{-4})

The highest estimated future risk was 6×10^{-2} at year 58 for EU17/IA05A.

EUs with Doses Exceeding 25 mrem/year in future years: Fourteen EUs/IAs had annual dose estimates (excluding contribution from background) greater than 25 mrem/year, including:

EU1/Bldg. 1 at t=1 (591 mrem/y)	EU8/Bldg. 24 at t=1 (61 mrem/y)
EU2/Bldg. 2 at t=1(462 mrem/y)	EU10/IA02 East at t=58 (162 mrem/y)
EU3/Bldg. 3 at t=1 (113 mrem/y)	EU11/IA02 Between Bldg. at t=58 (436 mrem/y)
EU4/Bldg. 3 at t=58 (105 mrem/y)	EU12/IA03 Landfill at t=58 (292 mrem/y)
EU4/Bldg. 4/9 at t=1 (26 mrem/y)	EU13/IA04A at t=58 (789 mrem/y)
EU6/Bldg. 6 at t=58 (117 mrem/y)	EU14/IA04B at t=58 (47 mrem/y)
EU6/Bldg. 6 at t=1000 (54 mrem/y)	EU16/IA04D at t=58 (87 mrem/y)
EU7/Bldg. 8 at t=1 (94 mrem/y)	EU17/IA05A at t=58 (7368 mrem/y)
EU7/Bldg. 8 at t=58 (6481 mrem/y)	EU17/IA05A at t=1000 (96 mrem/y)
EU7/Bldg. 8 at t=1000 (55 mrem/y)	

The highest estimated dose was 7368 mrem/y at year 58 for EU17/IA05A.

Although the final COC determination will be made in the FS and will consider additional information, six of the eight COPCs evaluated in the HHRA individually exceeded the risk or dose levels at least once for a given receptor in a given EU, and may be considered potential COCs. Since ^{226}Ra and ^{228}Ra only exceeded target risk or dose levels at EU17 and since ^{228}Th and ^{230}Th were not detected in exceedance of target risk or dose levels in any EU, potential COCs would include ^{226}Ra, ^{228}Ra, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U. By media, potential COCs for soil include ^{226}Ra, ^{228}Ra, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U, while potential COCs for groundwater are limited to ^{234}U and ^{238}U.

8.1.4 Screening-Level Ecological Risk Assessment

A SLERA was performed to evaluate potential risks to avian and mammalian receptors from both external and internal exposure to radionuclides and total uranium from soil, sediment, surface water, and food items that may have bioaccumulated site-related contaminants. The screening level assessment served to identify exposure pathways and COPCs which would require further evaluation in a BERA by eliminating contaminants and exposure pathways that pose negligible risks (USEPA, 1997). These estimates ensured that the appropriate COCs are selected for further evaluation, and identifies data gaps for additional sampling or uncertainties to be addressed in the BERA.

Potential risks from radiation doses were screened using RESRAD BIOTA (USDOE, 2004) which follows the methodology outlined in the DOE standard: A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota (USDOE, 2002). This standard provides a dose evaluation approach and meets the requirements for protection of biota in DOE Orders 5400.1, "General Environmental Protection Program" (USDOE, 1990), 5400.5 (USDOE, 1993), and the dose limits for protection of biota developed

or discussed by the National Council on Radiation Protection and Measurement (NCRP, 1991) and International Atomic Energy Commission (IAEA, 1992).

In addition to examining the potential radiological exposure risks from uranium, the potential risks to terrestrial and aquatic biota from exposure to the toxic effects of uranium in its inorganic form (i.e., non-radiological toxicity) were evaluated using Steps 1 and 2 of the USEPA ERAGS process (USEPA, 1997). ERAGS Step 1 includes a screening-level problem formulation and an ecological-effects evaluation; Step 2 consists of a screening-level exposure estimate utilizing conservative assumptions to estimate EPCs for representative receptors of exposure pathways identified as complete under the exposure pathway evaluation (USEPA, 1997).

Radiological Risk: Radiological risk from exposure to maximum radionuclide concentrations in soil for terrestrial animals and plants indicates that further evaluation of this direct contact exposure pathway is required. The summed ratio (soil concentration/BCG) for terrestrial animal exposures to maximum radionuclide concentrations in soil is 2×10^{1} for the 0 to 6 inch soil depth and 2×10^{1} for the total soil depth (Table 7-6 and Table 7-7); an elevated concentration of ^{228}Ra in EU17/IA05A and elevated concentrations of ^{238}U and ^{234}U within EU7/Bldg. 8 were the primary contributions to the exceedance of the 1.0×10^{0} threshold. The summed ratio for terrestrial plants exposure to maximum radionuclide concentrations in soil is 2×10^{0} for the 0 to 6 inch depth and 2×10^{0} for the total soil depth (Table 7-6 and Table 7-7);.an elevated concentration of ^{238}U within EU7/Bldg. 8 is the reason for the exceedance of the 1.0×10^{0} threshold.

Potential risk of radionuclides to aquatic animals from exposure to maximum surface water and sediment radionuclide concentrations are below the level of concern (i.e., ratio of one) at 2×10^{-1} and 2×10^{-4}, respectively.

Risks to riparian animals from exposure to maximum surface water and sediment radionuclide concentrations are below the level of concern (i.e., ratio of one) at 4×10^{-1} and 3×10^{-2}, respectively.

In a refinement of the radiological risk, the 95 percent UCL for soil for each of the exposure units evaluated in the RI were compared to the DOE's acceptable concentrations of radionuclides in environmental media (BCGs) for ^{234}U (5×10^{3} pCi/g) and ^{238}U (2×10^{3} pCi/g). Only soils in EU7/Bldg. 8 (surface and subsurface) exceed the DOE's BCG for ^{234}U and ^{238}U, and soils in EU17/IA05A (surface only) exceeded the DOE's BCG for and ^{238}U.

Uranium Risk: Based on the conservative nature of the SLERA and the food web modeling used to evaluate the potential risk to terrestrial receptors, there is the potential for increased risk to receptors that may use the upland portions of the Guterl Site for foraging. The uranium hazard quotient (HQ) for the terrestrial species which may inhabit the Guterl Site exceeded 1.0 for the short-tailed shrew, American robin, eastern cottontail, red fox, and red-tailed hawk through ingestion of contaminated food. HQ exceedances are based on the use of the maximum uranium concentration in soil (EU7/Bldg. 8). This exceedance of an HQ = 1.0 indicates that a potential exists for risk to site plants, birds, and terrestrial mammal species. For plants there is a potential for phytotoxic effects, for avian species effects may include mortality, liver or kidney effects or effects on blood chemistry, and for terrestrial mammals there is a potential for reduced litter size and smaller offspring.

Exposure to the maximum uranium concentration in sediment did not result in any riparian ecological receptors (i.e., mink, belted kingfisher, or great blue heron) exceeding an HQ =1.0. Therefore, there is no potential for increased risk to the riparian receptors that may use the Erie Canal (EU19/IA09) for foraging.

In a refinement for uranium in its inorganic form, EPCs for total uranium in soil were compared to calculated PRGs for total uranium for several terrestrial receptors (Section 7.6.10). Soils in the following EUs/IAs exceeded the calculated PRGs for one or more potential terrestrial receptors for surface soil and total (subsurface) soil:

EU2/Bldg. 2	EU9/Bldg. 35	EU15/IA04C
EU3/Bldg. 3	EU10/IA02 East	EU16/IA04D
EU4/Bldg. 4&9	EU11/IA02 Between Buildings	EU17/IA05A
EU 6/Bldg. 6	EU12/IA03	EU20/IA10
EU7/Bldg. 8	EU13/IA04A	
EU8/Bldg. 24	EU14/IA04B	

Soils in EU18/IA05B did not exceed any terrestrial receptor calculated PRGs.

Some potential risks to ecological receptors at the site were identified based on the screening level ecological risk assessment. However, given the localized nature of the exceedances of the screening levels used in the assessment, as well as the current and future use of the site, further assessment or considerations of ecological risks are not necessary. Although some limited patches of habitat exist on abandoned portions of the site, much of the Guterl Site is actively disturbed or occupied by buildings and paved areas. Although there are non-sensitive habitats on-site which require protection, the site is not currently managed for ecological purposes and the creation of an ecological preserve on-site in the future is unlikely. The current land use of the site is industrial and the current land use surrounding the site is private residences, small farms, and light industrial. Future re-development of the abandoned site is most likely to be industrial, commercial, or residential, which would further preclude the need for ecological management goals in addressing site contamination. The site will proceed into the FS phase in which potential human health risks resulting from exposure to FUSRAP contamination will be addressed. The development of remedial action objectives which are protective of human health should also be protective of ecological receptors at the Guterl Site, consistent with the premise for biota protection from exposure to radiation (ICRP 1977). Therefore, no further evaluation of potential ecological concerns needs to be considered in the FS.

8.1.5 Achievement of Project DQOs

The project DQOs that were determined to be directly applicable to the RI data acquisition phase are listed below and discussed in more detail in Table 2-7. The project DQOs applicable to this RI are listed below; the achievement status for each is provided following each DQO.

Overarching Objectives:

1. Determine the nature and extent of MED/AEC-related constituents present at the Guterl Site (i.e., uranium, thorium, and radium[41] and the media and locations in which they are present).
   - This DQO has been met through the acquisition of surface soil, subsurface soil, surface water, sediment, groundwater, and building material data in general accordance with the project plans. A data gap for shallow bedrock groundwater has been identified as discussed in Section 4.12 and in Section 8.2.5, below.

2. Acquire information to define the fate and transport of contaminants from the Guterl Site.
   - This DQO has been met as sampling and analysis of RI field data is complete and the items necessary to evaluate fate and transport have been acquired (e.g., meteorological

[41] Radium was not included in the constituent list developed during the TPP Meeting, but was added to the list of COPCs during development of the FSP in response to further technical evaluation of the Site. This note applies to each of the project DQOs where radium is listed.

data, site lithology, groundwater hydrology, geotechnical and geochemical properties of site soils).

4. Provide sufficient characterization data to allow completion of subsequent FS, RD, and RA.
   - This DQO has been met through the acquisition of surface soil, subsurface soil, surface water, sediment, groundwater, and building material data in general accordance with the project plans. The outcome of additional bedrock groundwater data acquisition may impact this conclusion if it is determined that deeper groundwater is affected by MED/AEC-related constituents. Additional data requirements may also arise as the FS and RD are performed in coordination with future use scenarios or alternative remediation technologies.

Operations:

6. Identify the underground utility system within the Guterl Site, including if possible, utilities in place at the time of AEC contracted efforts and utilities installed after the AEC contracted efforts. Includes both between building and within building utilities.
   - This DQO has been met with respect to general layout and number of existing utilities; however, the exact construction details for both indoor and outdoor utilities were not able to be located. Field data were acquired to identify the number, relative dimensions (where accessible), and locations of major utility features inside and outside buildings. These data should allow for development of the FS without significant qualification.

Nature and Extent:

9. Define nature and extent of isotopic uranium, thorium, and radium in surface soils, subsurface soils, and buildings to support risk assessment (using Nuclear Regulatory Commission (NRC) screening levels for human health and DOE guidance for ecological [DOE, 2002]) and development and evaluation of FS alternatives (volume determination).[42]
   - This DQO has been met through the acquisition of surface soil, subsurface soil, and building material data in general accordance with the project plans. The HHRA has been completed and is presented as Section 6 of this RI Report. Determination of volumes requiring remediation will be developed during the FS as future use scenarios and remediation technologies are evaluated.

10. Determine whether groundwater has been impacted by isotopic uranium, thorium, and radium above screening levels; and if so, determine nature and extent to support risk assessment, and development and evaluation of FS alternatives.
   - This DQO has been met for the majority of the shallow bedrock zone for the Guterl Site through the installation of new wells, collection of radiological and geochemical data from new and existing wells, and assessment of groundwater data. However, a data gap for shallow bedrock groundwater nature and extent has been identified for the southwest and southeast perimeters of the Guterl Site as discussed in Section 4.12 and in Section 8.2.5, below.

11. Determine whether surface water and sediments have been impacted by isotopic uranium, thorium, and radium above screening levels.
   - This DQO has been met through the acquisition of surface water data from IA09 (Erie Canal) and sediment data from IA03 (Landfill) and IA09 (Erie Canal). It has been determined that surface water and sediment have not been impacted above screening levels.

[42] Since these elements are naturally occurring, a background concentration was established for each radioisotope. The background concentration for each was added to the appropriate NRC-provided screening level to derive an effective (working) screening level for RI purposes.

13. Determine if isotopic uranium, thorium, and radium has contaminated underground utilities.
    - This DQO has been met with respect to representative utilities sampled. The field investigation was modified to accommodate more locations than anticipated; however, the data collected should allow for adequate interpolation of results to allow for completion of the FS without significant qualification.

Risk Assessment/Feasibility Study:

14. Determine the magnitude of any comingled chemical contamination to support establishing transportation and disposal requirements (e.g., waste classification) and associated costs to be included in various FS alternatives.
    - This DQO has been met. The radiological data set is complete for each matrix, and other data sources exist for non-radiological (chemical) data.

15. Conduct an inventory of building content/structures to support FS alternatives and evaluations.
    - This DQO has been met. A building inventory survey was conducted as part of this RI and is presented in Appendix E of this RI Report.

19. Gather sufficient data to complete a Baseline HHRA for human health and a SLERA.
    - This DQO has been met. The HHRA has been completed and is presented as Section 6 of this RI Report. The SLERA has been completed and is presented as Section 7 of this RI Report.

8.2 Conclusions and Recommendations

8.2.1 Radionuclides of Concern

From the perspective of the HHRA, all of the COPCs evaluated individually exceeded the recommended risk or dose levels at least once for a given receptor in a given EU. Therefore, the following isotopes can be considered preliminary contaminants of concern (COCs) for any future Guterl Site activities or evaluations: ^{226}Ra, ^{228}Ra, ^{232}Th, ^{234}U, ^{235}U, and ^{238}U. However, because some constituents such as ^{226}Ra are not expected to be above background at the Guterl Site and may not be significant COCs at the site, the final determination of COCs will be made in the FS and will consider additional background evaluations and comparison to potential ARARs.

8.2.2 Preliminary Remediation Goals

PRGs were derived for each receptor and each media using a combination of spreadsheet calculations, RESRAD results, and RESRAD-Build results. Groundwater, surface water, and sediment PRGs were calculated by spreadsheet, soil PRGs were determined using a combination of RESRAD results and spreadsheets, and building material PRGs were developed using RESRAD-Build results and spreadsheets. Dose PRGs were based upon the drinking water maximum contaminant level of 4 mrem/yr for groundwater and surface water and based upon 25 mrem/yr for all other media. All risk PRGs were based upon radiological carcinogenic risk of 1×10^{-4} using the intake factors discussed in Section 6.

Groundwater, Sediment, and Surface Water PRG Development: Dose and risk PRGs for groundwater, sediment, and surface water were determined by spreadsheet for each receptor by calculating the DSR and RSR and multiplying the inverse of that result by the target dose or risk.

The general dose to source calculation multiplies a modified intake factor by a dose ingestion conversion factor, shown in Table 6-5. The general DSR equation follows:

$$DSR = IR \times CF \times EF \times DCF$$

In units of (mrem/yr) per (pCi/g) or units of (mrem/yr) per (pCi/L)

Where

IR = the ingestion rate (in mg/day or mL/day) for the specific medium from Table 6-9

CF = conversion factor of 0.001 (g/mg for sediment and L/mL for surface water and for groundwater)

EF = exposure frequency (days/year)

DCF = the dose conversion factor (mrem/pCi) from Table 6-10

Similarly, the general risk to source ratio is determined by multiplying a modified intake factor by a risk ingestion slope factor, shown in Table 6-10. The general RSR equation follows:

RSR (g/pCi) = IR x CF x EF x ED x SF

Where

IR = the ingestion rate (in mg/day or mL/day) for the specific medium from Table 6-9

CF = conversion factor of 0.001 (g/mg for sediment and L/mL for surface water and for groundwater)

EF = exposure frequency (days/year)

ED = exposure duration (years)

SF = the ingestion slope factor (1/pCi) from Table 6-10

The dose and risk PRGs are then determined by dividing the target dose or risk by the corresponding source ratio. The target dose for groundwater and for surface water is the tap water maximum contaminant level of 4 mrem/yr, while target dose for other media is 25 mrem/yr. The dose based PRG is determined by dividing the target dose level by the DSR. Similarly, the risk based PRG was determined by dividing the target risk level, 1×10^{-4}, by the RSR, as represented in the following equation:

PRG (pCi/g or pCi/L) = Target / (DSR or RSR)

Dose and risk PRGs are listed for each receptor in Tables V4-1 through V4-4 and summarized in Table 8-1. Two sets of PRGs are presented in Table 8-1: one set for the building interiors (EUs 1-9) and a second set for the terrestrial EUs 10 through 20. The PRG selected for each isotope for each medium is the one developed for the receptor that is the most health-protective. The receptor used is included in Table 8-1.

Soil PRG Development: Dose and risk PRGs for soil were determined by spreadsheet using RESRAD results. Unit soil contamination was modeled in RESRAD from zero to 1000 years for each receptor to determine times of peak dose. DSRs and RSRs were recorded for times of single radionuclide maximum dose to generate soil dose and risk PRGs for each receptor. As in the previous section, dose and risk PRGs were determined by dividing the target dose or target risk by the DSR or RSR, respectively. As above, the target dose for soil is 25 mrem/yr and the target risk is 1×10^{-4}. Soil sources within the building EUs were treated as though the buildings had been removed, leaving the soil subject to the same environmental conditions as soil outside the building area. Therefore, these soil PRGs are applicable to both terrestrial and to building EU locations throughout Guterl. Dose and risk PRGs are listed for each receptor in Tables V4-1 through V4-4 and summarized in Table 8-1.

Building Material PRG Development: Dose and risk PRGs for building material were determined by spreadsheet using RESRAD-Build results for beta evaluations. Unit building material contamination was modeled in RESRAD-Build for each receptor to produce dose and risk. RESRAD-Build assumes the useable life of a building is 25 years, so all models were run to estimate dose and risk at year zero (current conditions) and at 25 years. Since the model was run with unit contamination, this dose and risk are actually DSR and RSR values. In addition, EU-specific PRGs were considered less desirable than solitary building material PRGs for each receptor; so a unified approach to building materials was developed using a solitary model, EU 9, to represent exposure to building materials for each receptor. Comparison of DSRs for each building EU revealed that EU9 produced the lowest DSR for the juvenile trespasser and the onsite worker, while EU8 produced the lowest construction worker DSR. To determine a solitary building material PRG for each receptor, the single-roomed EU9 was chosen to conservatively represent all Guterl building EUs. EU9 was modeled with unit contamination for each receptor and the resultant DSRs and RSRs were recorded for the year zero. As in the previous section, dose and risk PRGs were determined by dividing the target dose or target risk by the DSR or RSR, respectively. As above, the target dose for building materials is 25 mrem/yr and the target risk is 1×10^{-4}. Dose and risk PRGs are listed for each receptor in Appendix V Tables V4-1 through V4-4 and summarized in Table 8-1.

8.2.3 Remedial Action Objectives

It is the intent of USACE that work performed for this RI be conducted following the basic methodology outlined in 40 CFR §300.430. Section 121(d) of CERCLA requires that remedial actions comply with state and federal ARARs. ARARs are used to assist in determining the appropriate extent of Guterl Site cleanup, to scope and formulate remedial action alternatives, and to govern the implementation of a selected response action.

The potential ARARs for the Guterl Site along with other to-be-considered (TBC) criteria were initially presented in the Preliminary Identification of *Data Quality Objectives and Applicable or Relevant and Appropriate Requirements for Former Guterl Specialty Steel Corporation FUSRAP Site* (USACE, 2005c). The ARARs and TBCs are summarized in Tables 8-2 through 8-4. Table 8-2 lists and summarizes potential federal ARARs identified for the Guterl Site. Potential New York State ARARs are listed in Table 8-3. Federal and state TBCs are listed in Table 8-4. It should be noted that ARARs are considered potential throughout the RI/FS process and Proposed Plan, and become final upon issuance of the Record of Decision.

In the absence of federal- or state-promulgated ARARs, or in the case where ARARs are judged to be inadequately protective, certain criteria, advisories, guidance values, and proposed standards may be used for developing remedial action alternatives or for determining what is protective to human health and the environment (i.e., to set preliminary remediation goals).

These criteria, advisories, guidance values, and proposed standards are identified by USEPA as TBC criteria. TBCs are not legally binding and do not have the status of ARARs.

ARARs provide either actual cleanup levels or a basis for calculating such levels. ARARs are also used to indicate acceptable levels of discharge to determine treatment and disposal requirements and to assess the effectiveness of remedial alternatives.

8.2.4 Data Limitations

The environmental conditions and radioactive contaminant concentrations at the Guterl Site as summarized in this RI report are sufficient to properly assess remedial action alternatives in the FS. However, there are a number of data issues that must continue to be evaluated. These limitations are generally associated with the manner in which the areas that require remedial action are defined, and how those remedial actions would be implemented.

RI radiological data were verified prior to use as discussed in Section 3.13. If, following data validation, certain data are determined to be unusable, certain assessments and conclusions may need to be reconsidered, and alternate data sources evaluated for use (e.g., ORISE, 1999).

ORISE (1999) estimated the total volume of soil that would require removal based on the screening levels used in that report at approximately 12,200 m^3 (15,982 cubic yards). This volume was based on a more conservative screening level of 35 pCi/g ^{238}U and 5 pCi/g ^{232}Th as compared to the FSP screening levels used in this RI report (see Table 4-2). However, additional data collection points were performed during this RI to supplement the ORISE data and to collect data in areas that ORISE did not investigate (i.e., IA04C, IA04D, IA05A, IA05B, and IA10). The supplemental data can be used to refine the ORISE estimates, and the additional data can be used to supplement the ORISE volume estimate.

The contaminant data obtained during this RI are consistent with available historical operational documentation, as well as nature and extent as defined in previous investigations (where there was overlap). Therefore, it is likely that the list of COPCs is complete. It is likely that certain radionuclides may only be present in concentrations in excess of the PRGs at certain locations of the Guterl Site. During the FS, efforts will continue to determine if it is possible to limit the number of COPCs in specific portions of the Guterl Site. This will expedite efforts to determine compliance with the cleanup criteria, which will be developed during preparation of the FS using the PRGs as a starting point.

8.2.5 Recommendations for Future Work

MED/AEC-related constituents have been identified at the Guterl Site in excess of media-specific, HHRA, and SLERA screening levels. Therefore, actions that should be taken to reduce the risk from exposure to the contamination to an acceptable range will be evaluated in the FS.

Eighteen discrete IAs (includes Excised Area buildings as discrete units) and two site-wide IAs (IA07 and IA08) were established during FSP development. The 18 discrete IAs were developed as twenty EUs to evaluate the risks to human health in the BRA, and these EUs were developed considering the need to identify MARSSIM final status survey units for future Guterl Site closeout activities. During FSP development, Class 1, Class 2, and Class 3 units were preliminarily identified for the Guterl Site (including Excised Area building interiors). The units were based on guidance provided in MARSSIM on the contamination potential and sizes for these various units. Data from this RI will be used during the FS to refine the boundaries of the preliminary survey units to expedite development of the final status survey plan for Guterl Site closeout in the future.

This RI confirms that the ORISE estimate is a reasonable starting estimate for the FS for the volume of soil and debris that may be required to be remediated. As FS alternatives are evaluated, volume estimates will be refined. Additional pre-excavation sampling may be warranted to refine the definition of the extent of the elevated activity as well as to provide information useful for health and safety of remediation workers.

Comprehensive design and/or construction record drawings for all Excised Area utilities were not able to be located. However, sufficient information was obtained during this phase of the RI to determine nature and extent of MED/AEC COPCs. Depending on FS options evaluated, additional exploration may be required to refine FS requirements (volume estimates, types of buried materials, depth of lines, etc.).

While bedrock groundwater contamination at the Guterl Site is localized, the shallow bedrock hydrogeology is heterogeneous due to the presence of fractured bedrock and the presence of the Erie Canal and dolostone quarry (affects groundwater flow patterns). The vertical extent of bedrock groundwater contamination, as well as the horizontal extent of shallow bedrock groundwater contamination in the southeast and southwest quadrants of the Guterl Site, is undetermined. Additional monitoring wells may be required to resolve these unknowns. To address these data gaps, additional groundwater monitoring wells and monitoring parameters are recommended, as follows:

- Install additional, deeper bedrock monitoring wells to be paired with existing shallow bedrock well locations that exceeded the USEPA MCL for combined uranium (MW-4, MW-13D, MW-18, MW-22, MW-26, MW-602D, MW-604D, and MW-605D). Regional hydrogeologic data should be reviewed, and/or test wells should be drilled, to determine the most appropriate deeper zone for monitoring.

- Install new shallow bedrock wells and paired deeper bedrock wells (depth determined pursuant to recommendation above) southwest of MW-18, southwest of the line of MW-26 and MW-604D, and southeast of MW-604D in close proximity to the Erie Canal.

- An additional goal of the new wells between MW-604D and the Erie Canal would be to determine whether bedrock groundwater discharges to the Erie Canal.

- Recommended parameters for continued monitoring include:

    - Field parameters: dissolved oxygen, redox, pH, specific conductivity, turbidity, and temperature
    - Major cations (calcium, magnesium, potassium, sodium) and anions (bicarbonate alkalinity, chloride, sulfate)
    - Redox-sensitive analytes (nitrate, total organic carbon, filtered and unfiltered iron, and Fe^{+2}/Fe^{+3})
    - Filtered and unfiltered uranium
    - Gross alpha and gross beta

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TABLE 2-1
SUMMARY OF EXCISED AREA BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Building	Year	~ Floor Space		Use of Building
#	Built [a]	(sf)	(sm)	
1	1913	8780	816	Manufactured Gas House, Metal Smelting (USACE, 2001)
2	1914	68900	6401	Metal Rolling/Manufacturing (ORNL, 1978)
3	1920/1946/1951	67800	6299	Mill Area/Metal Rolling and Grinding (ORNL, 1978); additions to north and south, respectively.
4	1920/1951	28000	2601	Mill Area/Metal Rolling/Manufacturing and Loading Dock (ORNL, 1978); addition to west.
9	1918/1951	19400	1802	Mill Area/Metal Rolling/Manufacturing and Loading Dock (ORNL, 1978); addition to west.
5	1918	3770	350	Housed Heat Exchanger (ORNL, 1978); Transformer Station and Power House (ORISE, 1999)
6	1918	15090	1402	Metal Rolling and Loading Dock (ORNL, 1978)
8	1918	27880	2590	Metal Rolling and Loading Dock (ORNL, 1978); Cold Rolling (ORISE, 1999)
24SW	1941/1951	10750	999	Mill Area (ORNL, 1978); Allegheny general storage (ORISE, 1999); addition to north.
24SE	1959	19350	1798	Mill Area (ORNL, 1978); Allegheny general storage (ORISE, 1999)
24N	1966	36250	3368	Mill Area (ORNL, 1978); Allegheny general storage (ORISE, 1999)
35	1950	3280	305	Metal Rolling and Grinding (USACE, 2001); Allegheny general storage (ORISE, 1999)

Notes:

[a] Dates of construction are based on Industrial Risk Insurers, 1985. Additions to original construction are listed to the right of original construction date.

[b] Building 24 is not in the Excised Area but is included here to consolidate this basic information.

(sf) - square feet

(sm) - square meters

SW - southwest

SE - southest

N - north

TABLE 2-2
MONITORING WELL LITHOLOGIC SUMMARY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Well ID	Date Installed or Completed	Total Boring Depth	NYS Plane Coordinates		Ground Surface Elevation (ft amsl)[a]	Fill			Glaciolacustrine Deposits			Glacial Till			Lockport Dolostone	
			Northing	Easting		Depth	Surface Elevation	Thickness	Depth	Surface Elevation	Thickness	Depth	Surface Elevation	Thickness	Depth to TOR [b]	TOR Elevation
MW-1	5/15/1997	15.00	1151169.007	1114588.147	598.18	0	598.18	3.7	3.7	594.48	0.3	NA	NA	NA	4.2	593.98
MW-2	5/16/1997	14.50	1150745.297	1114445.86	596.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.5	592.36
MW-3	5/14/1997	14.40	1151318.591	1114255.527	597.27	0	597.27	3.8	3.8	593.47	0.1	NA	NA	NA	4.5	592.77
MW-4	5/16/1997	14.40	1150991.979	1113968.992	597.70	0	597.70	1.5	1.5	596.20	0.5	2	595.70	1.5	3.5	594.20
MW-5	5/15/1997	15.50	1151022.504	1114288.966	596.68	0	596.68	2.7	2.7	593.98	1.3	NA	NA	NA	3.75	592.93
MW-06	10/16/2006	15.70	1151390.545	1114578.817	597.59	--	--	--	--	--	--	--	--	--	4	593.59
MW-07	10/16/2006	16.73	1151456.028	1114332.263	598.19	--	--	--	--	--	--	--	--	--	4.5	593.69
MW-08	10/16/2006	16.90	1151017.265	1114579.442	598.31	--	--	--	--	--	--	--	--	--	5	593.31
MW-09	10/17/2006	16.00	1150865.296	1114540.144	596.49	--	--	--	--	--	--	--	--	--	3.5	592.99
MW-10	10/17/2006	16.93	1151422.216	1114426.804	599.06	--	--	--	--	--	--	--	--	--	5.5	593.56
MW-11	10/17/2006	17.79	1150731.053	1114330.383	596.77	--	--	--	--	--	--	--	--	--	6	590.77
MW-12	10/17/2006	16.99	1151170.8	1114293.653	596.88	--	--	--	--	--	--	--	--	--	5	591.88
MW-13D	10/18/2006	16.03	1151670.936	1113213.497	600.15	--	--	--	--	--	--	--	--	--	4.5	595.65
MW-13S	10/18/2006	14.14	1151675.793	1113212.705	600.31	--	--	--	--	--	--	--	--	--	NA	NA
MW-14	10/18/2006	15.95	1151532.721	1112903.651	598.90	--	--	--	--	--	--	--	--	--	4	594.90
MW-15	10/18/2006	20.00	1151821.192	1113067.534	604.42	--	--	--	--	--	--	--	--	--	8	596.42
MW-16	10/18/2006	17.00	1151919.405	1112856.716	601.41	--	--	--	--	--	--	--	--	--	5.2	596.21
MW-17	10/19/2006	16.76	1152083.286	1113110.843	603.79	--	--	--	--	--	--	--	--	--	4.5	599.29
MW-18	10/19/2006	13.93	1151399.389	1113241.81	599.48	--	--	--	--	--	--	--	--	--	3.5	595.98
MW-19	10/19/2006	20.02	1150647.624	1113272.73	598.29	--	--	--	--	--	--	--	--	--	8	590.29
MW-20	10/19/2006	17.00	1151869.133	1113979.969	600.50	--	--	--	--	--	--	--	--	--	5	595.50
MW-21	10/19/2006	21.00	1151900.305	1113495.119	605.41	--	--	--	--	--	--	--	--	--	9	596.41
MW-22	10/20/2006	17.00	1151454.051	1114201.618	598.09	--	--	--	--	--	--	--	--	--	5	593.09
MW-23	10/20/2006	16.00	1151199.354	1113989.219	597.58	--	--	--	--	--	--	--	--	--	4	593.58
MW-24	10/20/2006	16.43	1150709.434	1114195.383	597.27	--	--	--	--	--	--	--	--	--	5.5	591.77
MW-25	10/23/2006	17.00	1150882.706	1113897.13	597.22	--	--	--	--	--	--	--	--	--	5	592.22
MW-26	10/24/2006	17.00	1150702.223	1113906.035	596.93	--	--	--	--	--	--	--	--	--	5.5	591.43
600S	7/13/2007	8.00	1152593.471	1113450.582	610.54	NA	NA	NA	NA	NA	NA	0	610.54	7.9	8.4	602.14
600D	7/12/2007	23.40	1152597.563	1113453.095	610.54	NA	NA	NA	NA	NA	NA	0	610.54	7.9	8.4	602.14
601D	7/18/2007	20.00	1151590.312	1113678.53	602.42	0	602.42	0.8	NA	NA	NA	NA	NA	NA	5	597.42
602D	7/19/2007	20.50	1151608.784	1113836.965	601.14	0	601.14	0.6	NA	NA	NA	0.6	600.54	3.9	5.5	595.64
603D	7/19/2007	20.00	1151507.173	1114576.051	597.69	0	597.69	2.1	2.1	595.59	0.2	NA	NA	NA	5	592.69
604D	7/12/2007	19.00	1150387.801	1114130.534	596.25	0	596.25	0.6	NA	NA	NA	0.6	595.65	1.8	4.2	592.05
605D	7/17/2007	18.50	1151214.561	1113641.473	598.50	0	598.50	0.2	0.2	598.30	1.8	2.0	596.50	0.6	3.5	595.00
606D	7/18/2007	20.50	1151527.708	1112903.693	598.91	NA	NA	NA	NA	NA	NA	2.4	596.51	0.3	5.5	593.41
606DR	10/8/2007	21.00	1151494.451	1113071.38	599.49	NA	NA	NA	NA	NA	NA	2.3	597.19	1.7	6	593.49
607D	7/18/2007	17.90	1151370.04	1112752.663	597.93	0	597.93	0.4	NA	NA	NA	0.4	597.53	0.1	2.9	595.03

Notes:

[a] Elevation data from FUSRAP remedial investigation (2007) survey; elevation data from prior reports not used.

[b] Difference between thickness of overburden and depth to TOR is the thickness of augerable bedrock .

-- Information not available

ft amsl - feet above mean sea level

ID - identification

NA = not applicable

TOR = Top of Rock (defined as top of competent bedrock, not weathered [augerable] bedrock)

TABLE 2-3
RQD (%) VALUE SUMMARY FOR 600 SERIES MONITORING WELLS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Well ID	Interval Depth Below Top of Rock (ft BTOR)	Run No.	RQD(%)	Average Horizontal Hydraulic Conductivity (cm/sec)[a]
MW-600D	0.5-4	1	61	1.23E-02
MW-600D	4-9	2	37	
MW-600D	9-14	3	58	
MW-600D	14-15.5	4	42	
MW-601D	2.8-7.8	1	16	9.60E-03
MW-601D	7.8-12.8	2	32	
MW-601D	12.8-17.8	3	58	
MW-602D	2.5-7.5	1	0	1.38E-02
MW-602D	7.5-12.5	2	36	
MW-602D	12.5-17.5	3	44	
MW-603D	2-7	1	0	4.93E-03
MW-603D	7-12	2	7.5	
MW-603D	12-17	3	7.5	
MW-604D	1.8-3.3	1	0	5.47E-03
MW-604D	3.3-8.3	2	0	
MW-604D	8.3-13.3	3	39	
MW-604D	13.3-16.8	4	60	
MW-605D	0.9-2.9	1	0	1.20E-02
MW-605D	2.9-6.9	2	0	
MW-605D	6.9-7.9	3	0	
MW-605D	7.9-12.9	4	0.7	
MW-605D	12.9-15.9	5	17	
MW-606D	0.8-5.8	1	17	Nab
MW-606D	5.8-10.8	2	52	
MW-606D	10.8-15.8	3	52	
MW-606DR	2-4.5	1	0	NA[b]
MW-606DR	4.5-9.5	2	24	
MW-606DR	9.5-14.5	3	46	
MW-606DR	14.5-17	4	52	
MW-607D	1.3-4.3	1	0	2.50E-03
MW-607D	4.3-9.3	2	22	
MW-607D	9.3-14.3	3	20	
MW-607D	14.3-16.3	4	92	

Notes:
[a] Hydraulic conductivity data are from Table 3-51 and are presented for comparison.
[b] NA - Not Available. Hydraulic conductivity data not available for 606D and 606DR.
ft BTOR = feet below top of rock
RQD = Rock Quality Designation

RQD was calculated using the following equation:
RQD = (sum of length of core pieces greater than 10 cm / total length of core run)*100%
cm/sec = centimeters per second

TABLE 2-4
SUMMARY OF THE DIFFERENCE BETWEEN SHALLOW BEDROCK GROUNDWATER ELEVATIONS AND BEDROCK ELEVATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Monitoring Well ID	Ground Elevation (ft AMSL)	Bedrock		7/17/2007		9/11/2007		11/13/2007		3/7/2008 [a]	
		Depth to Top of Bedrock (ft BGS)	Top of Bedrock Elevation (ft AMSL)	Groundwater Elevation (ft AMSL)	Difference between Groundwater and Bedrock Elevations (ft)	Groundwater Elevation (ft AMSL)	Difference between Groundwater and Bedrock Elevations (ft)	Groundwater Elevation (ft AMSL)	Difference between Groundwater and Bedrock Elevations (ft)	Groundwater Elevation (ft AMSL)	Difference between Groundwater and Bedrock Elevations (ft)
MW-1	598.18	4.2	593.98	592.93	-1.05	592.56	-1.42	592.92	-1.06	594.69	**0.71**
MW-2	596.86	4.5	592.36	589.83	-2.53	590.14	-2.22	590.13	-2.23	590.68	-1.68
MW-3	597.27	4.5	592.77	593.21	**0.44**	593.15	**0.38**	593.23	**0.46**	594.72	**1.95**
MW-4	597.70	3.5	594.20	NM	NA	593.74	-0.46	593.66	-0.54	595.22	**1.02**
MW-5	596.68	3.75	592.93	593.07	**0.14**	592.77	-0.16	592.78	-0.15	593.99	**1.06**
MW-06	597.59	4	593.59	593.17	-0.42	592.92	-0.67	593.25	-0.34	595.68	**2.09**
MW-07	598.19	4.5	593.69	NM	NA	593.29	-0.40	593.65	-0.04	595.25	**1.56**
MW-08	598.31	5	593.31	NM	NA	591.99	-1.32	592.31	-1.00	593.27	-0.04
MW-09	596.49	3.5	592.99	591.00	-1.99	590.94	-2.05	590.94	-2.05	591.39	-1.60
MW-10	599.06	5.5	593.56	NM	NA	593.02	-0.54	593.47	-0.09	595.50	**1.94**
MW-11	596.77	6	590.77	NM	NA	590.24	-0.53	590.22	-0.55	590.87	**0.10**
MW-12	596.88	5	591.88	NM	NA	593.51	**1.63**	593.26	**1.38**	594.71	**2.83**
MW-13D	600.15	4.5	595.65	595.42	-0.23	594.02	-1.63	594.37	-1.28	599.22	**3.57**
MW-14	598.90	4	594.90	594.75	-0.15	592.96	-1.94	593.88	-1.02	597.97	**3.07**
MW-15	604.42	8	596.42	NM	NA	594.60	-1.82	594.95	-1.47	600.09	**3.67**
MW-16	601.41	5.2	596.21	595.79	-0.42	593.77	-2.44	594.72	-1.49	NM	NA
MW-17	603.79	4.5	599.29	597.86	-1.43	596.10	-3.19	596.92	-2.37	603.06	**3.77**
MW-18	599.48	3.5	595.98	NM	NA	593.63	-2.35	593.91	-2.07	598.05	**2.07**
MW-19	598.29	8	590.29	590.76	**0.47**	590.16	-0.13	590.82	**0.53**	596.89	**6.60**
MW-20	600.50	5	595.50	594.42	-1.08	593.84	-1.66	594.23	-1.27	597.03	**1.53**
MW-21	605.41	9	596.41	NM	NA	594.56	-1.85	594.62	-1.79	599.00	**2.59**
MW-22	598.09	5	593.09	594.05	**0.96**	594.01	**0.92**	593.95	**0.86**	595.73	**2.64**
MW-23	597.58	4	593.58	594.33	**0.75**	594.36	**0.78**	594.13	**0.55**	595.80	**2.22**
MW-24	597.27	5.5	591.77	593.61	**1.84**	593.27	**1.50**	593.12	**1.35**	NM	NA
MW-25	597.22	5	592.22	594.41	**2.19**	594.30	**2.08**	593.93	**1.71**	NM	NA
MW-26	596.93	5.5	591.43	594.05	**2.62**	593.69	**2.26**	593.33	**1.90**	NM	NA
MW-600D	610.54	7.9	602.64	NM	NA	600.54	-2.10	601.62	-1.02	607.24	**4.60**
MW-601D	602.42	2.2	600.22	NM	NA	594.05	-6.17	594.03	-6.19	596.47	-3.75
MW-602D	601.14	3	598.14	NM	NA	594.13	-4.01	594.04	-4.11	595.99	-2.15
MW-603D	597.69	3	594.69	NM	NA	592.93	-1.76	593.22	-1.47	595.42	**0.73**
MW-604D	596.25	2.4	593.85	NM	NA	589.28	-4.57	589.03	-4.82	NM	NA
MW-605D	598.5	2.6	595.90	NM	NA	593.81	-2.09	593.86	-2.04	NM	NA
MW-606D	598.91	4.7	594.21	NM	NA	592.69	-1.52	593.60	-0.61	597.74	**3.53**
MW-606DR	599.49	4	595.49	NM	NA	NM	NA	593.30	-2.19	597.95	**2.46**
MW-607D	597.93	1.6	596.33	NM	NA	591.60	-4.73	592.49	-3.84	596.99	**0.66**

Notes:
[a] Provided by United States Army Corps of Engineers.
Bold (positive number) = Groundwater elevation is higher than bedrock surface elevation.
ft AMSL = feet above mean sea level
ft BGS = feet below ground surface
NA = Not Applicable
NM = Not Measured (well was unaccessable due to snow management or site operations)

TABLE 2-5
BEDROCK GROUNDWATER ELEVATION FLUCTUATIONS BETWEEN NOVEMBER 2007 AND MARCH 2008
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Monioring Well ID	Reference Point Elevation (ft AMSL)[a]	11/13/2007		3/7/2008[b]		Difference Between Fall (November 2007) and Spring (March 2008) Groundwater Elevations (ft)[c]
		Depth to Water (ft BRP)	Elevation of Water (ft AMSL)	Depth to Water (ft BRP)	Elevation of Water (ft AMSL)	
MW-1	599.92	7.00	592.92	5.23	594.69	1.77
MW-2	598.78	8.65	590.13	8.10	590.68	0.55
MW-3	599.03	5.80	593.23	4.31	594.72	1.49
MW-4	599.52	5.86	593.66	4.30	595.22	1.56
MW-5	598.52	5.74	592.78	4.53	593.99	1.21
MW-06	600.68	7.43	593.25	5.00	595.68	2.43
MW-07	601.32	7.67	593.65	6.07	595.25	1.60
MW-08	601.37	9.06	592.31	8.10	593.27	0.96
MW-09	599.70	8.76	590.94	8.31	591.39	0.45
MW-10	601.92	8.45	593.47	6.42	595.50	2.03
MW-11	599.79	9.57	590.22	8.92	590.87	0.65
MW-12	600.01	6.75	593.26	5.30	594.71	1.45
MW-13D	603.47	9.10	594.37	4.25	599.22	4.85
MW-14	602.36	8.48	593.88	4.39	597.97	4.09
MW-15	608.09	13.14	594.95	8.00	600.09	5.14
MW-16	604.37	9.65	594.72	NM	NA	NA
MW-17	606.97	10.05	596.92	3.91	603.06	6.14
MW-18	602.36	8.45	593.91	4.31	598.05	4.14
MW-19	601.36	10.54	590.82	4.47	596.89	6.07
MW-20	603.62	9.39	594.23	6.59	597.03	2.80
MW-21	608.46	13.84	594.62	9.46	599.00	4.38
MW-22	601.35	7.40	593.95	5.62	595.73	1.78
MW-23	600.50	6.37	594.13	4.70	595.80	1.67
MW-24	597.27	4.15	593.12	NM	NA	NA
MW-25	597.22	3.29	593.93	NM	NA	NA
MW-26	596.93	3.60	593.33	NM	NA	NA
MW-601D	604.85	10.82	594.03	8.38	596.47	2.44
MW-602D	604.01	9.97	594.04	8.02	595.99	1.95
MW-603D	600.43	7.21	593.22	5.01	595.42	2.20
MW-604D	595.98	6.95	589.03	NM	NA	NA
MW-605D	598.11	4.25	593.86	NM	NA	NA
MW-606D	601.49	7.89	593.60	3.75	597.74	4.14
MW-606DR	602.21	8.91	593.30	4.26	597.95	4.65
MW-607D	600.38	7.89	592.49	3.39	596.99	4.50
MW-600D	613.29	11.67	601.62	6.05	607.24	5.62

Notes:

[a] Measured from top of inner casing.

[b] Provided by United States Army Corps of Engineers.

[c] Positive number indicates groundwater elevation is higher in the Spring than in the Fall.

[d] Statistical Summary generated using ProUCL 4.00.02.

ft = feet

ft AMSL = feet above mean sea level

ft BRP = feet below reference point

NA = Not Applicable

NM = Not Measured

SD = Standard Deviation

CV = Coefficient of Variation

UCL = Upper Confidence Limit of the Mean

BTV = Background Threshold Value

UTL = Upper Threshold Limit

Statistical Summary[d]	
NumObs	29
Minimum	0.45
Maximum	6.14
Mean	2.852
Median	2.2
Geometric Mean	2.285
Variance	3.087
SD	1.757
UCL	3.553
UCL Method	95% Approximate Gamma UCL
BTV	6.105
UTL	8.812

TABLE 2-6
PRIOR INVESTIGATION AND ANYLYSIS SUMMARY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analysis																				Usability																		
									Analytical Method						Field Radiation Measurements						Matrix																		
Investigation	Radium	Uranium	Thorium	Metals	Pesticides	PCBs	SVOCs	VOCs	ICAP (USEPA SW-846)	Gas Chromatograph	X-Ray Fluorescence	TCLP	Gamma Spectroscopy	Gross Alpha and Beta	Alpha Contamination (direct alpha)	Beta/Gamma Contamination	Beta/Gamma Dose Rate (mrad/hr)	Gamma Exposure (uR/hr) (external Gamma	Removable Alpha/beta-gamma	Removable Alpha and Beta	Cinders	Surface Soil Sample Locations	Subsurface Soil Sample Locations (>15 cm)	Sediment	Surface Water	Groundwater	Building Material	Waste	Results/Units	COCs	Calibration	DLs	MDLs	Uncertainty	Method	Location	Depth	Qualifiers	Building Survey
***Radiological Survey of the Former Simonds Saw and Steel Company, Lockport, New York, Final Report.* Prepared by Oak Ridge National Laboratory (ORNL) for United States Department of Energy (DOE), September 1978.**																																							
Excised Area	28	28	28										28	73	114	57	89	71	34			22	6		Y									X	X	X	X	X	X
Landfill																																							
Other																																							
***Preliminary Engineering and Environmental Evaluation of the Remedial Action Alternatives for the Former Simonds Saw and Steel Company Site, Lockport, New York.* Prepared by Ford, Bacon & Davis Utah, Inc. (FBDU) for Bechtel National, Inc., for DOE, November 1981.**																																							
Excised Area	14	14	14																		14						scan		X							X	X		
Landfill																																							
Other																																							
***Engineering Investigations at Inactive Hazardous Waste Sites - Phase I Investigation, Guterl Specialty Steel, City of Lockport, Niagara County.* Prepared by Engineering-Science and Dames & Moore for New York State Department of Environmental Conservation (NYSDEC), January 1988.**																																							
Excised Area																																							
Landfill				18			16	18																		18			X							X			
Other																																							
***Engineering Investigations at Inactive Hazardous Waste Sites - Preliminary Site Assessment, Task 1 Records Search, Guterl Specialty Steel Corporation, City of Lockport, Niagara County.* Prepared by E.C. Jordan for NYSDEC, January 1991.**																																							
Excised Area																																							
Landfill				18			16	18																		18			X							X			
Other																																							
***Engineering Investigations at Inactive Hazardous Waste Sites- Preliminary Site Assessment Evaluation Report of Initial Data, Guterl Specialty Steel, City of Lockport, Niagara County, Volumes I and II.* Prepared by ABB Environmental Services (ABB-ES) for NYSDEC, April 1994.**																																							
Excised Area																																							
Landfill				29	16	16	29	29				16		8									9	5	5	10		1	X	X	X	X	X		X	X	X	X	
Other																																							
***Final Report, Guterl Steel Site, Lockport, New York, USEPA Work Assignment No. 2-194.* Prepared by Roy F. Weston, Inc. for USEPA/Environmental Response Team Center (ERTC), April 1998.**																																							
Excised Area				399		11			38	11	399	58										299	91					2	X	X	X		X		X	X	X	X	
Landfill																																							
Other																																							
***Radiological Survey of the Guterl Specialty Steel Corporation, Lockport, New York.* Prepared under a contract with DOE by Oak Ridge Institute for Science and Education (ORISE) for United States Bankruptcy Court for the Western District of Pennsylvania, December 1999.**																																							
Excised Area	149	149	149										149					131				111	18						X		X	X	X	X	X	X	X	X	X
Landfill	53	53	53										53									37	4																
NCIDA	177	177	177										177					129				64	28																
Class 3	18	18	18										18									64	28																
Building interiors	135	135	135										135			473		72		473		111	18	6			scan		X		X	X	X	X	X	X	X	X	X
***Immediate Investigative Work Assignment (IIWA) Report for the Unlisted Guterl Excised Area, City of Lockport, Niagara County.* Prepared by NYSDEC, October 2000.**																																							
Excised Area				34	22	22	34	29				32										18	40	1	3	4			X						X	X	X	X	
Landfill																																							
Other				2	2	2	2	1															1			2			X						X	X	X	X	

Notes:
ORNL collected one tap water sample, one surface water sample (Erie Barge Canal is assumed), and one "drain" sample.
Table based on information compiled and reviewed by USACE (June 2005); except ORNL (1978) information compiled by Earth Tech.

TABLE 2-7
REMEDIAL INVESTIGATION REPORT
FORMER GUTERL SPECIALTY STEEL FUSRAP SITE
LOCKPORT, NEW YORK

PROJECT DATA QUALITY OBJECTIVES AND DATA NEEDS TO BE ACHIEVED IN RI/FS

Project Data Quality Objective	Data Needed	Data Acquired	Project Completeness Assessment Evaluation
1. Determine the nature and extent of MED/AEC related constituents present at the site (i.e., uranium, thorium, radium and the media and locations in which they are present).	Isotope-specific data for the COPCs in each Investigative Area. Preliminary Gamma Walkover Survey to target areas for intrusive investigation. Subsurface sampling in IAs 01, 02, 03, 04, 05, 08, and 10. Also need to establish local background conditions for COPCs.	Gamma walkover survey conducted as planned. Field investigation included field scanning of cores; selecting 6-inch intervals for on-site gamma spectroscopy analysis; and identification of samples submitted for off-site gamma spec and alpha spec. Background area identified and 12 surface and 12 subsurface soil samples analyzed for isotopic U, Th, and Ra COPCs.	This DQO has been met with respect to sampling and analysis to determine nature of contamination; affected matrices (surface soil, subsurface soil, groundwater, building materials) have been confirmed; no data gap exists for soil or building material matrices, however, a potential data gap exists for groundwater extent (see DQO No. 10).
2. Acquire information to define the fate and transport of contaminants from the site.	Same as DQO 1; also geotechnical data (soil properties – porosity, conductivity, pH, bulk density). Also requires groundwater sampling (IA 07) and surface water/sediment sampling (IA 09).	See DQO 1. Geotechnical data collected as described in the FSP. Groundwater data collected from IA 07 (see DQO 10). Surface water/sediment sampling (IA 09) colleted as described in the FSP.	This DQO has been met; sampling and analysis is complete; no significant data gaps noted for surface soil, subsurface soil, surface water, sediment, or shallow bedrock groundwater.
4. Provide sufficient characterization data to allow completion of subsequent Feasibility Study (FS), Remedial Design (RD), and Remedial Action (RA).	Same as DQO 2. Additional data relevant to the FS, RD, and RA to be obtained from subcontractor-generated IDW characterization data and from the ongoing NYSDEC RI/FS.	See DQO 2. Data not generated during this RI, NYSDEC conducting concurrent HTW (i.e., non-radiological) RI.	Radiological data set is complete; other data sources exist for conventional data (e.g. NYSDEC/Mactec RI 2006/2007).
6. Identify the underground utility system within the site, including if possible, utilities in place at the time of AEC contracted efforts and utilities installed after the AEC contracted efforts. Includes both between-building and within-building utilities.	Acquire as-built utility drawings (completed; quality is low). Evaluate other geophysical and/or remote sensing methods (see FSP).	Collected additional as-built utility drawings to the extent available (sanitary sewer location drawings in IA01, IA02, and parts of IA04A through IA04D). Conducted geophysical surveys in IA 04B and IA 04D at planned boring locations.	This DQO has been met. The field investigation was completed as planned and included sampling of subsurface conduits where located. However, depending on location, additional pre-design investigation may be required.

TABLE 2-7
REMEDIAL INVESTIGATION REPORT
FORMER GUTERL SPECIALTY STEEL FUSRAP SITE
LOCKPORT, NEW YORK

PROJECT DATA QUALITY OBJECTIVES AND DATA NEEDS TO BE ACHIEVED IN RI/FS

Project Data Quality Objective	Data Needed	Data Acquired	Project Completeness Assessment Evaluation
9. Define nature and extent of isotopic uranium and thorium in surface soils, subsurface soils, and buildings to support risk assessment (using Nuclear Regulatory Commission screening levels for human health and Department of Energy [DOE, 2002] for ecological) and development and evaluation of FS alternatives (volume determination).	See DQO 1 and 2, above. Review of DOE 2002 suggests that ecological risk unlikely to be a driver at Guterl. Discuss with USACE using RESRAD models (including RESRAD-BUILD) for human health risk assessment. (See also DQO 4).	See DQO 1 and 2. Data reviewed and appropriate data sets established for nature and extent, and also for human health and ecological risk assessments. RESRAD software determined to be appropriate for human health risk assessment.	This DQO has been met; sampling and analysis of soils and building material is complete; no significant data gaps noted in the RI.
10. Determine whether groundwater has been impacted by isotopic uranium, thorium, or radium above screening levels; and if so, determine nature and extent to support risk assessment, and development and evaluation of FS alternatives.	Additional monitoring wells to be installed; groundwater to be sampled for radiological constituents (radiological COPCs and gross alpha/beta radiation).	Additional wells installed. Two rounds of sampling conducted during RI for U, Th, and Ra COPCs, gross alpha/beta,and total suspended solids. USACE acquired additional geochemical parameters March 2008.	This DQO has been met with respect to nature of contamination; groundwater sampling and analysis is complete; however, a potential data gap exists for extent of contamination to southeast and southwest of Guterl Site, and additional investigation to determine if groundwater in bedrock greater than 15 feet below top of rock is affected by MED/AEC materials is recommended.
11. Determine whether surface water and sediments (IA03, IA09) have been impacted by isotopic uranium, thorium, or radium above screening levels (screening levels for these media will need to be researched and developed during RI/FS tasks).	Determine location(s) of historical outfalls to Erie Canal (see DQO 6). Limited sediment sampling upstream, at discharge location, and downstream for COPCs. Surface water (IA09) and sediment (IA03/IA09) sampling to be conducted.	Conducted field surveys to confirm location of historical outfall. Collected surface water (IA09) and sediment samples (IA03, IA09) as needed.	This DQO has been met; sampling and analysis of surface water and sediment complete; no significant data gaps noted in the RI.
13. Determine if isotopic uranium, thorium, and radium has contaminated underground utilities (IA08).	Sample solids from sewers, drains, trenches (in conjunction with DQO 6). Contingency for water sampling if present.	Performed field surveys, reviewed available drawings, and collected aqueous and non-aqueous samples (IA08).	This DQO has been met. The field investigation was modified to accommodate more locations than anticipated. Depending on location, additional pre-design sampling may be necessary to locate entire utility.

TABLE 2-7
REMEDIAL INVESTIGATION REPORT
FORMER GUTERL SPECIALTY STEEL FUSRAP SITE
LOCKPORT, NEW YORK

PROJECT DATA QUALITY OBJECTIVES AND DATA NEEDS TO BE ACHIEVED IN RI/FS

Project Data Quality Objective	Data Needed	Data Acquired	Project Completeness Assessment Evaluation
14. Determine the magnitude of any chemical contamination to support establishing transportation and disposal requirements (e.g., waste classification) and associated costs to be included in various FS alternatives.	See DQO 4.	No chemical analyses (other than isotopic U by ICP-MS) obtained. Chemical contamination to be assessed using data generated by historical and concurrent NYSDEC site investigation(s).	This DQO has been met. Radiological data set is complete; other data sources exist for conventional data (e.g. NYSDEC/Mactec 2006/2007).
15. Conduct an inventory of building content/structures to support FS alternatives and evaluations.	Compile observations from structural survey and field sampling activities in IA 01 and IA 02.	Numerous photographs collected for each building. Inventory of furnaces and rolls acquired during radiological surveys of Excised Area buildings. Note that an exhaustive inventory was not complied; small items such as lockers, ancillary support equipment, etc., not included.	Data acquired during radiological surveys of Excised Area buildings. Additional pre-design inventory may be required depending on disposition of building.
19. Gather sufficient data to complete a Baseline Human Health Risk Assessment (HHRA) and a screening level ecological risk assessment.	See DQOs 9 and 10 (for use in future DQOs 17 and 18).	At least 12 samples form each IA/EU from each depth interval (defined as surface and subsurface) analyzed by for COPCs by alpha spectroscopy.	This DQO has been achieved. HHRA and SLERA developed as part of this RI Report. No significant data gaps have been identified.

Note:
DQO numbering, as presented in the Data Gap Analysis Report (USACE, 2006), has been retained. DQOs 5, 7, 8, 12, and 16 were addressed prior to RI field investigation. DQOs 3, 17, 18, 20, and 21 are to be addressed in tasks subsequent to completion of the RI/FS.

TABLE 2-8
OFF-SITE LABORATORY ANALYTICAL METHODS AND MATRICES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

MATRIX/ANALYSIS	Sample Prep Method [a]	Analytical Method	Laboratory	Reporting Limit Goal (units as specified)	Field Sample Quantity[b]	Soil	Sediment	Bldg Material	Ground-water	Surface Water	IDW
Non-Aqueous [c]											
Uranium 234, 235, 238 (γ-spec)	STL RC-0025	STL RD-0101 (DOE GA-01-R MOD)	STL-St L	1.0 pCi/g (each isotope) [d]	249	138	71	40			0
Thorium-232 (γ-spec)	STL RC-0025	STL RD-0101 (DOE GA-01-R MOD)	STL-St L	1.0 pCi/g (each isotope)	249	138	71	40			0
Radium 226, 228 (γ-spec)	STL RC-0025	STL RD-0101 (EPA GA-01-R-MOD)	STL-St L	1.0 pCi/g (each isotope)	249	138	71	40			0
Uranium 234, 235, 238 (α-spec), short count	STL RC-004 and RC-240	STL RD-0210 (DOE A-01-R MOD)	STL-St L	1.0 pCi/g (each isotope)	599	488	71	40			0
Thorium-228, 230, 232 (α-spec), short count	STL RC-004 and RC-240	STL RD-0210 (DOE A-01-R MOD)	STL-St L	1.0 pCi/g (each isotope)	609	498	71	40			0
U, Th, α-spec, long count	STL RC-004 and RC-240	STL RD-0210 (DOE A-01-R MOD)	STL-St L	0.1 pCi/g (each isotope)	36	36	0	0			0
Radium 226, 228 (GFPC)	STL RC-004 and RC-240	STL RC-0040/0041 (EPA 903.0/904 MOD)	STL-St L	1.0 pCi/g (each isotope)	378	277	61	40			0
Uranium (isotopic by ICP/MS)	STL IP-0002	STL MT-001 (ICP/MS-6020B)	STL-St L	0.00002 to 0.00013 mg/kg [e]	36	36	0	0			0
Gross Alpha and Beta (GFPC)	NA	STL-RC-0020 (SW846 9310 MOD)	STL-St L	10 pCi/g (each)	35	35	0	0			0
Total Organic Carbon	NA	SW846 9060	STL-St L	100 mg/kg	22	13	9	0			0
Aqueous Samples (IA03,07,08,09)[f]											
Uranium 234, 235, 238 (α-spec)	NA	STL RD-0210 (DOE A-01-R MOD)	STL-St L	1.0 pCi/L (each isotope) [d]	164				118	46	0
Thorium-228, 230, 232 (α-spec)	NA	STL RD-0210 (DOE A-01-R MOD)	STL-St L	1 pCi/L (each isotope)	164				118	46	0
Radium 226, 228 (GFPC)	NA	STL RC-0040/0041 (EPA 903.0/904 MOD)	STL-St L	0.5 pCi/L (each isotope)	165				118	47	0
Gross alpha and beta (GFPC)	NA	STL-RC-0020 (SW846 9310 MOD)	STL-St L	5 pCi/L (each)	118				118	0	0
Total Suspended Solids	NA	EPA 160.2	STL-St L	1 mg/L	59				59	0	0
Geotechnical Analyses											
Grain Size (sieve/hydrometer)	NA	ASTM D 421/422	SJB Services, Inc.	1 percent of total	15	15	0				
Atterberg Limits (LL/PL/PI)	NA	ASTM D 4318	SJB Services, Inc.	NA	15	15	0				
Hydraulic Conductivity	NA	ASTM D 5084-03	SJB Services, Inc.	10^{-7} cm/sec	2	2	0				

TABLE 2-8
OFF-SITE LABORATORY ANALYTICAL METHODS AND MATRICES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

MATRIX/ANALYSIS	Sample Prep Method [a]	Analytical Method	Laboratory	Reporting Limit Goal (units as specified)	Field Sample Quantity[b]	Soil	Sediment	Bldg Material	Ground-water	Surface Water	IDW
IDW Characterization - Aqueous											
Volatile Organics (VOCs)	SW 846 5030B	SW 846 8260B	STL-St L	5 µg/L (typical)	1	0	0	0	0	0	1
RCRA Metals except mercury	NA	SW-846 6010B	STL-St L	5 - 50 µg/L	1	0	0	0	0	0	1
Mercury	SW-846 7470A	SW-846 7470A Cold Vapor	STL-St L	0.3 µg/L	1	0	0	0	0	0	1
Polychlorinated Biphenyls (PCBs)	SW 846 3510C	SW-846 8082	STL-St L	1.0 - 1.5 µg/L	1	0	0	0	0	0	1

Notes:

[a] STL SOPs included in QAPP Attachment E

[b] Field Sample Quantity excludes QA/QC samples (field duplicates, blanks, splits)

[c] Non-aqueous matrices include surface and subsurface soil (IA02, 03, 04, 05, 10, and background), buildings (IA01; walls and floors), solids in sewers/drains/trenches (IA08), and sediment (IA 03 and IA09); non-aqueous matrices do not include swipe samples.

[d] U-235 result also includes any U-236 present in sample

[e] MDLs are isotope-specific; see QAPP Table 5-1.

[f] Aqueous sample quantities include both groundwater (IA07; two rounds; filtered and unfiltered for COPCs; see FSP Table 5-11) and surface water (IA03, IA08, and IA09; see FSP Table 5-12

α-spec = analysis by alpha spectroscopy

γ-spec = analysis by gamma spectroscopy

GFPC = Gas Flow Proportional Counting

ICP/MS - Inductively Coupled Plasma / Mass Spectrometry

IDW - Investigation Derived Waste

TABLE 3-1
FIELD SAMPLING PLAN DEVIATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Applicable RI Section	Section Title	FSP Required/Suggested	Deviations
3.4	**Background Sampling (Soil, Surface Water, Sediment, Groundwater)**	FSP required an overburden groundwater sample be collected.	The planned overburden groundwater sample was not collected because there was insufficient groundwater available for sampling during each of the two groundwater sampling rounds.
3.7	**Surface and Subsurface Soil Sampling and Analysis**	FSP required a certain number of borings be completed in each building.	B03-037 - additional boring in Building 3. Originally there were 36 primary borings in Building 3. (No core scan sheet exists for this boring because the entire interval was sent directly to the onsite laboratory for gamma spectroscopy.)
3.7	**Surface and Subsurface Soil Sampling and Analysis**	FSP required a certain number of borings be completed in each building.	B02-059 - additional boring in Building 2. Originally there were 58 primary borings in Building 2, but due to the geometry of the building, B02-002 fell outside the building. B02-059 was added just inside the building next to Boring B02-002.
3.7	**Surface and Subsurface Soil Sampling and Analysis**	FSP did not require detritus samples.	B02-039: 2.5 feet of concrete was cored at this location without soil being encountered. A detritus sample was collected; however, because soil was not encountered, no soil samples were collected.
3.7	**Surface and Subsurface Soil Sampling and Analysis**	FSP required a certain number of borings be completed in each IA.	A04B-042 and A04B-043 - Two additional borings were completed within IA04B as confirmation borings for ORISE location 264.
3.7	**Surface and Subsurface Soil Sampling and Analysis**	FSP required a certain number of borings be completed in each IA.	A04A-301 through A04A-305 - Five additional borings were completed within IA04A as delineation borings for ORISE location 358N, 19W.
3.7.1	**Surface Soil Sampling**	FSP suggested macrocore soil sampling device be used.	A large diameter split spoon sampler was used in lieu of the macrocore sampler. The large diameter split-spoon sampler was lined with a dedicated acetate sleeve (2 ½" OD x 2 7/16" ID x 24" length x 1/32" wall thickness) in the same manner as would have been performed for the macrocore sampler.
3.7.1	**Surface Soil Sampling**	FSP required frequency for onsite gamma spectroscopy analysis of a minimum of 50 percent of the sample locations.	During the early stages of the RI, field personnel determined that it would be more representative to analyze each surface soil sample at the onsite laboratory; i.e., increase frequency for onsite gamma spectroscopy analysis from minimum 50 percent of sample locations to 100 percent.
3.7.2	**Subsurface Soil Sampling**	One visit to each soil boring location planned.	Due to the overburden fill and soil being more dense/hard than anticipated, the track-mounted direct push technology rig was not able to advance each boring to the desired depth (refusal on bedrock). Earth Tech and USACE agreed that re-visiting shallow refusal borings with the heavier and more powerful CME-75 hollow-stem auger rig was justified to better achieve project DQOs for nature and extent of contamination.
3.7.3	**Detritus Identification and Sampling**	Detritus samples were not anticipated by the FSP.	During layout of the IA01 soil borings, a layer of soil-like material was identified on top of the floor surface in numerous locations. This layer of material consisted of varying amounts of loose dirt, anthropogenic materials, bird dander, etc., and was characterized as dry and less consolidated than a normal soil or fill matrix. Occurrence and thickness of this loose material was discontinuous and sporadic. With USACE concurrence, Earth Tech identified this material as 'detritus' and collected samples for onsite radiological analysis when this material was identified at soil boring locations.

TABLE 3-1
FIELD SAMPLING PLAN DEVIATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Applicable RI Section	Section Title	FSP Required/Suggested	Deviations
3.7.4	**Delineation Borings**	FSP required delineation of nature and extent to 5 meter tolerance	The onsite gamma spectroscopy data were used to generate sum of ratio (SOR) scores for each FSP-planned boring location. According to the FSP, for boring locations where SOR scores exceeded unity (SOR > 1), a delineation boring was to be performed. A total of 109 delineation borings were planned (budgeted). The number of soil boring locations that required delineation borings was greater than anticipated. A total of 117 delineation borings were performed prior to budget constraints causing a stoppage of the delineation boring program. As a result, not all boring locations where SOR > 1 occurred were delineated to the FSP tolerance for FSP screening levels. Completion of the 117 delineation borings did provide sufficient data to determine that MED/AEC materials exceeding FSP screening levels were confined to the Guterl Site, and sufficient data were produced to allow for delineation of nature and extent at alternate screening levels (developed during HHRA and to be evaluated during FS) to acceptable tolerances.
3.8.1	**Monitoring Well Drilling, Installation, and Development**	FSP required that a shallow bedrock monitoring well be installed next to overburden well MW-81-01.	MW-606D was inadvertently installed adjacent to bedrock well MW-14. MW-606DR was installed in the correct location. MW-606D was not abandoned due to concerns about potential cross-grouting of MW-14.
3.8.2	**Aquifer (Slug) Testing**	FSP suggested use of a solid slug for hydraulic conductivity testing.	Two methods of slug testing were conducted during the RI: solid slug as suggested by FSP; and, pneumatic slug testing. Where solid slug testing was used, both rising and falling head conductivity tests were performed. Where pneumatic testing was performed, only rising head tests were performed; multiple runs were made to ensure data quality.
3.8.3	**Groundwater Sampling**	FSP Table 5-11 listed proposed wells for sampling.	Overburden groundwater was not observed in planned wells and certain overburden wells were deemed unsuitable for sampling following the monitoring well assessment activity. For both sampling rounds, the suggested overburden wells were not sampled and an equal number of existing shallow bedrock wells were substituted for overburden wells in each round of sampling to improve the spatial coverage of the network of wells sampled.
3.8.3	**Groundwater Sampling**	FSP required 30 monitoring wells be sampled during each of the two groundwater sampling rounds.	Groundwater samples were collected from 29 shallow bedrock groundwater monitoring wells from July 31, 2008 through August 20, 2008 (29 wells); the 30th well was not sampled because MW-606DR had not been drilled yet. (MW-606DR was sampled during the November 2007 round.)
3.9	**IA08 Site Utilities Sampling (IA01, IA02, IA04)**	FSP identified certain features to be sampled and a distribution of sample quantities.	The visual survey identified more features than anticipated in the FSP. Based on the relative distribution of sample quantities proposed in the FSP and an assessment of features identified in the visual survey, USACE and Earth Tech developed a revised list of IA08 surface water and sediment samples. The revised list was designed to collect representative samples from features (drains, trenches, sewers) with the highest potential of containing MED/AEC-related contamination.
3.10.1	**IA03 - Landfill Area**	Surface water and sediment pairs were to be collected.	Surface water was not present at the designated surface water/sediment sample locations in IA03 during the RI field data acquisition phase of work. As a result, only sediment samples were collected at the IA03 sample locations.
3.10.1	**IA03 - Landfill Area**	FSP identified five sediment locations in IA03.	A sixth sediment sample location was added to the five FSP locations to improve lateral coverage of the landfill perimeter.
4.2.2.2	**Building 2 - Surface Soil Samples**	FSP called for 13 surface soil samples for alpha spectroscopy analyses	Only 11 of 59 boring locations in Building 2 had surface soil present. To supplement the surface soil data set to meet the FSP goal, the two highest ranking SOR detritus samples (as determined by onsite gamma spectroscopy data) were added to the surface soil data set to fulfill the FSP requirement.

FS = Feasibility Study
HHRA = Human Health Risk Assessment
IA = Investigative Area
MED/AEC = Manhattan Engineer District/Atomic Energy Commission
RI = Remedial Investigation
SOR = sum of ratios

TABLE 3-2
SUMMARY OF RADIOLOGICAL ANALYSES AND THE CHOICE OF METHODS FOR EACH ANALYTE
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Radiological Method Use by Matrix[a] :	Detritus	Surface Soil	Subsurface Soil	Surface Water	Sediment	Ground-water	Building Materials	Swipes
Gamma walkover survey		X						
Onsite Gross α and Gross β [b]								X
Ex situ core scanning	X	X	X					
Onsite gamma spectroscopy	X	X	X					
Offsite gamma spectroscopy	X	X	X		X		X	
Offsite alpha spectroscopy	X	X	X	X	X	X	X	
Offsite gas flow proportional counter	X	X	X	X	X	X	X	
Offsite ICP-MS [c]		X	X					

Radiological Method Generates Data for:	Gross *α*	Gross *β*	Gross *γ*	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{236}U	^{238}U
Gamma walkover survey			X									
Onsite Gross α and Gross β [b]	X	X										
Ex situ core scanning			X									
Onsite gamma spectroscopy								X				X
Offsite gamma spectroscopy				X	X			X	Note D	X		Note D
Offsite alpha spectroscopy						X	X	X	X	X		X
Offsite gas flow proportional counter	X	X		X	X							
Offsite ICP-MS [c]									X	X	X	X

End Data Use:	Nature and Extent of Contamination	Human Health Risk Assessment	Screening Level Risk Assessment
Gamma walkover survey	X		
Onsite Gross α and Gross β [b]	X		
Ex situ core scanning	X		
Onsite gamma spectroscopy	X		
Offsite gamma spectroscopy	X		
Offsite alpha spectroscopy	X	X	X
Offsite gas flow proportional counter	X	X	X
Offsite ICP-MS [c]	X	X	X

Notes:

[a] Not all samples for each matrix were analyzed for each method.

[b] Swipes for removable alpha and beta activity were analyzed for gross alpha and beta activity using a Ludlum Model 2929 coupled with a Ludlum Model 43-10-1 detector (before the onsite laboratory was set up) and a Tennelec LB5100 Low Background Alpha/Beta gas-flow proportional counter with automatic sample changer afterwards.

[c] Although ICP-MS is not a radiological analytical technique, it is included here because it was applied to three of the radiological COPCs (analytes).

[d] Offsite gamma spectroscopy results for ^{238}U were not used in this report because of concerns about their accuracy. The laboratory assumed ^{234}U was in secular equilibrium with ^{238}U, so these results are also not used in this report. See Section 3.3.3.1.

COPC = constituent of potential concern
ICP-MS = inductively coupled plasma-mass spectrometry
α = alpha
β = beta
γ = gamma

TABLE 3-3
NUMBER OF BORINGS AND SOIL CORE SEGMENTS PRODUCED AND ANALYZED ON-SITE
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Investigative Area	Soil Borings[a]	Core Scan Intervals[b]	Gamma Spectroscopy Samples[c]
Background Reference Area	12	128	105
IA01			
B02	59	246	112
B03	37	176	83
B04&09	41	201	90
B06	24	130	52
B08	28	172	65
B024	34	110	62
B035	4	58	24
IA02	43	335	116
IA03	42	421	153
IA04A	78	743	287
IA04B	43	336	113
IA04C	15	94	48
IA04D	32	316	156
IA05A	31	395	118
IA05B	11	112	37
IA10	13	86	34
TOTAL	547	4059	1655

Notes:
[a] Primary boring locations presented for illustration.
[b] Weighted average six-inch intervals.
[c] Six-inch intervals.

TABLE 3-4
SCREENING LEVELS FOR BUILDING SURFACES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Nuclide [a]	***Average (dpm/100 cm^2)*** [b c]	***Maximum (dpm/100 cm^2)*** [b d]	***Removable (dpm/100 cm^2)*** [b e]
Natural U, ^{235}U, ^{238}U and associated decay products [f]	5,000	15,000	1,000
Natural Th, ^{232}Th [f]	1,000	3,000	200

Notes:
[a] Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, the limits established for alpha- and beta/gamma-emitting nuclides should apply independently.
[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive materials as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency and geometric factors associated with the instrumentation.
[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each object.
[d] The maximum contamination level applies to an area of not more than 100 cm^2.
[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.
[f] The radium isotopes are progeny in the thorium and uranium decay chains and, hence, the listed values include them with their parent radionuclides.
SOURCE: Table 6-4, USACE Engineer Manual 385-1-80, *Radiation Protection Manual*, 30 May 1997.

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A02SL-001-01	0.25 ± 0.12	5.3 ± 1.1
A02SL-001-03	1.3 ± 0.2	1.5 ± 0.7
A02SL-002-01	0.6 ± 0.2	9.5 ± 2.0
A02SL-002-02	0.6 ± 0.2	4.0 ± 1.0
A02SL-003-01	0.0 ± 0.9	6.7 ± 1.0
A02SL-004-01	0.24 ± 0.12	0.8 ± 0.5
A02SL-004-06	0.79 ± 0.17	1.4 ± 0.6
A02SL-004-07	1.4 ± 0.3	1.7 ± 0.8
A02SL-005-01	0.46 ± 0.14	4.4 ± 0.9
A02SL-005-02	0.59 ± 0.16	5.6 ± 1.0
A02SL-006-01	0.02 ± 0.11	0.2 ± 0.3
A02SL-006-03	1.4 ± 0.2	12.7 ± 1.7
A02SL-007-01	0.15 ± 0.15	13.9 ± 1.4
A02SL-007-05	0.54 ± 0.17	9.2 ± 1.1
A02SL-008-01	0.68 ± 0.19	1.9 ± 0.8
A02SL-008-02	0.65 ± 0.15	1.6 ± 0.8
A02SL-009-01	0.65 ± 0.20	1.1 ± 0.5
A02SL-009-03	1.42 ± 0.17	1.2 ± 0.4
A02SL-009-04	1.7 ± 0.3	1.8 ± 0.7
A02SL-010-01	0.68 ± 0.20	2.0 ± 0.7
A02SL-010-02	1.1 ± 0.2	2.9 ± 0.7
A02SL-011-01	0.95 ± 0.20	2.0 ± 0.6
A02SL-011-02	0.7 ± 0.2	1.1 ± 0.7
A02SL-012-01	0.53 ± 0.17	3.0 ± 0.7
A02SL-012-02	0.84 ± 0.19	6.4 ± 1.4
A02SL-013-01	0.10 ± 0.12	0.2 ± 0.3
A02SL-013-03	0.8 ± 0.2	1.3 ± 0.8
A02SL-014-01	0.50 ± 0.13	8.9 ± 0.8
A02SL-014-06	1.0 ± 0.3	2.2 ± 0.7
A02SL-015-01	1.5 ± 0.2	3.8 ± 0.5
A02SL-015-10	1.8 ± 0.2	2.5 ± 0.6
A02SL-015-11	1.92 ± 0.20	2.5 ± 0.7
A02SL-016-01	1.12 ± 0.19	2.7 ± 0.8
A02SL-016-02	1.5 ± 0.2	3.3 ± 0.7
A02SL-016-03	2.1 ± 0.2	5.1 ± 0.7
A02SL-017-01	0.44 ± 0.13	2.5 ± 0.6
A02SL-017-02	1.1 ± 0.2	2.3 ± 0.8
A02SL-018-01	0.70 ± 0.16	2.4 ± 0.6
A02SL-018-03	1.5 ± 0.2	2.2 ± 0.6
A02SL-018-05	1.34 ± 0.20	1.4 ± 0.7
A02SL-019-01	0.46 ± 0.17	1.8 ± 0.5
A02SL-019-02	1.9 ± 0.2	2.7 ± 0.8

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A02SL-019-06	1.60 ± 0.20	2.4 ± 0.6
A02SL-020-01	0.97 ± 0.18	2.6 ± 0.7
A02SL-020-02	1.2 ± 0.2	3.1 ± 0.8
A02SL-020-03	1.3 ± 0.3	2.4 ± 1.1
A02SL-021-01	0.57 ± 0.18	2.4 ± 0.7
A02SL-021-03	2.0 ± 0.3	3.9 ± 1.3
A02SL-021-04	1.33 ± 0.20	1.8 ± 0.7
A02SL-022-01	0.78 ± 0.18	4.2 ± 0.8
A02SL-022-03	0.75 ± 0.17	1.8 ± 0.6
A02SL-022-04	2.1 ± 0.3	3.0 ± 0.8
A02SL-023-01	0.78 ± 0.16	2.9 ± 1.0
A02SL-023-02	1.2 ± 0.3	2.8 ± 0.8
A02SL-024-01	0.60 ± 0.17	11.7 ± 1.5
A02SL-024-03	0.56 ± 0.18	3.9 ± 1.0
A02SL-024-06	0.52 ± 0.16	1.8 ± 0.7
A02SL-024-07	1.33 ± 0.20	2.3 ± 0.8
A02SL-025-01	0.5 ± 0.2	3.9 ± 0.9
A02SL-025-06	0.73 ± 0.18	2.0 ± 0.4
A02SL-025-07	0.38 ± 0.19	1.1 ± 0.7
A02SL-026-01	0.38 ± 0.18	3.6 ± 1.0
A02SL-026-07	0.48 ± 0.17	0.4 ± 0.9
A02SL-027-01	0.42 ± 0.16	5.5 ± 0.8
A02SL-027-06	0.75 ± 0.14	1.6 ± 0.6
A02SL-028-01	2.6 ± 0.4	212 ± 6
A02SL-028-02	0.21 ± 0.11	17.4 ± 1.5
A02SL-029-01	0.45 ± 0.15	7.3 ± 1.1
A02SL-030-01	0.24 ± 0.10	3.8 ± 0.6
A02SL-030-06	1.7 ± 0.3	2.2 ± 0.7
A02SL-031-01	0.24 ± 0.15	3.1 ± 0.6
A02SL-031-06	1.8 ± 0.2	1.3 ± 0.9
A02SL-031-07	0.63 ± 0.19	0.7 ± 0.4
A02SL-032-01	0.40 ± 0.14	13.6 ± 1.7
A02SL-032-03	0.85 ± 0.16	2.8 ± 0.7
A02SL-033-01	0.3 ± 0.2	7.6 ± 1.5
A02SL-033-03	0.38 ± 0.16	2.4 ± 0.6
A02SL-034-01	0.48 ± 0.15	4.3 ± 0.7
A02SL-034-03	0.7 ± 0.2	5.2 ± 1.2
A02SL-035-01	1.1 ± 0.2	6.1 ± 1.2
A02SL-035-02	1.38 ± 0.20	5.4 ± 0.9
A02SL-036-01	0.09 ± 0.14	0.7 ± 0.4
A02SL-036-03	0.70 ± 0.19	1.0 ± 0.5
A02SL-036-05	0.47 ± 0.18	1.8 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A02SL-037-01	0.38 ± 0.17	2.7 ± 0.8
A02SL-037-05	3.1 ± 0.3	4.3 ± 0.9
A02SL-037-06	1.42 ± 0.18	1.6 ± 0.7
A02SL-038-01	1.0 ± 0.3	5 ± 2
A02SL-038-03	2.0 ± 0.2	1.9 ± 0.7
A02SL-038-04	1.44 ± 0.18	1.7 ± 0.6
A02SL-039-01	1.00 ± 0.19	1.0 ± 0.5
A02SL-039-03	0.82 ± 0.18	26 ± 2
A02SL-039-06	0.90 ± 0.19	3.1 ± 1.1
A02SL-040-01	0.23 ± 0.15	1.4 ± 0.4
A02SL-040-04	0.84 ± 0.20	2.8 ± 0.7
A02SL-041-01	1.11 ± 0.20	12.1 ± 1.9
A02SL-041-02	0.71 ± 0.17	2.0 ± 0.6
A02SL-042-01	0.56 ± 0.15	3.1 ± 0.7
A02SL-042-06	1.2 ± 0.2	0.6 ± 0.7
A02SL-043-01	1.0 ± 0.3	5 ± 2
A02SL-043-06	0.87 ± 0.18	1.5 ± 0.6
A02SL-208-01	0.25 ± 0.14	2.4 ± 0.7
A02SL-208-06	1.9 ± 0.3	2.1 ± 0.8
A02SL-208-07	1.8 ± 0.3	3.4 ± 1.0
A02SL-215-01	1.6 ± 0.2	2.8 ± 0.8
A02SL-215-10	2.2 ± 0.3	3.4 ± 0.9
A02SL-215-11	2.3 ± 0.3	2.0 ± 0.6
A02SL-216-01	0.8 ± 0.3	3.3 ± 1.0
A02SL-216-10	2.8 ± 0.3	2.8 ± 1.2
A02SL-216-13	2.2 ± 0.4	4.0 ± 0.9
A02SL-217-01	0.58 ± 0.19	2.2 ± 0.8
A02SL-217-02	0.63 ± 0.19	3.1 ± 1.2
A02SL-223-01	0.56 ± 0.17	0.8 ± 0.6
A02SL-229-01	0.07 ± 0.09	0.0 ± 0.5
A02SL-229-02	0.28 ± 0.16	10.9 ± 1.8
A02SL-234-01	0.93 ± 0.19	20.1 ± 1.6
A02SL-234-02	0.31 ± 0.15	8.2 ± 1.4
A03SL-001-01	0.6 ± 0.4	1.9 ± 1.1
A03SL-001-02	0.60 ± 0.16	2.6 ± 0.7
A03SL-002-01	1.00 ± 0.17	2.6 ± 0.6
A03SL-003-01	0.6 ± 0.3	1.7 ± 0.7
A03SL-003-02	0.81 ± 0.20	2.3 ± 1.0
A03SL-004-01	0.4 ± 0.2	1.9 ± 0.7
A03SL-005-01	0.9 ± 0.3	2.1 ± 1.1
A03SL-006-01	0.57 ± 0.17	3.4 ± 0.7
A03SL-006-02	0.65 ± 0.19	1.1 ± 0.5

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A03SL-007-01	0.69 ± 0.17	2.1 ± 0.5
A03SL-007-02	0.62 ± 0.17	2.1 ± 0.6
A03SL-008-01	0.53 ± 0.18	2.8 ± 0.7
A03SL-008-03	0.9 ± 0.2	3.1 ± 0.6
A03SL-008-05	0.65 ± 0.15	2.6 ± 0.7
A03SL-009-01	1.2 ± 0.3	3.5 ± 1.4
A03SL-009-02	1.1 ± 0.4	2.4 ± 0.9
A03SL-010-01	0.54 ± 0.16	2.1 ± 0.7
A03SL-010-06	0.31 ± 0.14	1.2 ± 0.6
A03SL-011-01	2.5 ± 0.3	3.3 ± 0.8
A03SL-011-02	2.1 ± 0.3	2.2 ± 0.8
A03SL-011-03	1.1 ± 0.2	2.2 ± 0.7
A03SL-012-01	0.67 ± 0.15	1.9 ± 0.6
A03SL-012-02	0.5 ± 0.2	1.1 ± 0.6
A03SL-013-01	0.92 ± 0.18	2.0 ± 0.7
A03SL-013-02	0.54 ± 0.15	1.2 ± 0.6
A03SL-014-01	0.30 ± 0.14	2.0 ± 0.6
A03SL-015-01	0.50 ± 0.13	1.9 ± 0.7
A03SL-015-02	1.2 ± 0.2	3.8 ± 0.8
A03SL-016-01	0.55 ± 0.15	2.1 ± 0.7
A03SL-016-02	0.67 ± 0.17	2.4 ± 0.7
A03SL-017-01	0.46 ± 0.17	3.0 ± 1.0
A03SL-018-01	1.3 ± 0.3	3.3 ± 0.7
A03SL-018-02	0.66 ± 0.16	3.2 ± 0.7
A03SL-018-03	0.75 ± 0.18	8.0 ± 1.0
A03SL-019-01	0.61 ± 0.14	1.5 ± 0.6
A03SL-019-10	0.70 ± 0.14	1.2 ± 0.6
A03SL-019-11	0.55 ± 0.18	1.3 ± 0.6
A03SL-020-01	0.82 ± 0.17	3.0 ± 0.8
A03SL-020-02	0.95 ± 0.20	1.6 ± 0.7
A03SL-021-01	0.69 ± 0.15	4.5 ± 1.0
A03SL-021-02	0.45 ± 0.13	4.1 ± 0.7
A03SL-022-01	0.52 ± 0.16	4.2 ± 0.8
A03SL-022-02	0.48 ± 0.14	7.6 ± 1.0
A03SL-023-01	0.55 ± 0.15	2.5 ± 0.7
A03SL-023-03	0.47 ± 0.14	3.9 ± 0.7
A03SL-024-01	0.44 ± 0.14	7.6 ± 1.0
A03SL-025-01	0.34 ± 0.12	2.7 ± 0.9
A03SL-025-02	0.56 ± 0.20	3.1 ± 0.9
A03SL-026-01	0.53 ± 0.14	8.7 ± 1.2
A03SL-027-01	0.58 ± 0.18	4.7 ± 0.9
A03SL-027-02	0.65 ± 0.15	2.5 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A03SL-028-01	0.32 ± 0.13	5.6 ± 0.8
A03SL-028-03	3.3 ± 0.3	3.9 ± 0.9
A03SL-028-05	1.61 ± 0.20	7.3 ± 0.9
A03SL-029-01	0.30 ± 0.15	5.5 ± 0.7
A03SL-029-11	0.83 ± 0.17	2.4 ± 0.7
A03SL-030-01	0.47 ± 0.13	2.4 ± 0.6
A03SL-030-02	0.5 ± 0.2	8.4 ± 1.1
A03SL-031-01	0.48 ± 0.14	15.5 ± 1.3
A03SL-031-02	0.41 ± 0.15	13.3 ± 1.2
A03SL-032-01	0.48 ± 0.13	3.0 ± 0.6
A03SL-032-02	0.58 ± 0.16	2.4 ± 0.9
A03SL-033-01	0.50 ± 0.15	5.5 ± 1.2
A03SL-033-02	0.48 ± 0.14	4.3 ± 1.1
A03SL-033-03	0.48 ± 0.16	5.0 ± 0.8
A03SL-034-01	0.47 ± 0.19	2.9 ± 0.8
A03SL-035-01	0.09 ± 0.13	4.0 ± 1.2
A03SL-035-02	0.52 ± 0.19	53 ± 3
A03SL-036-01	0.7 ± 0.3	4.9 ± 1.2
A03SL-036-02	0.50 ± 0.14	0.7 ± 0.4
A03SL-037-01	1.3 ± 0.2	7.1 ± 1.2
A03SL-037-02	0.82 ± 0.16	3.8 ± 1.2
A03SL-038-01	0.45 ± 0.15	40 ± 2
A03SL-038-10	0.6 ± 0.2	7.2 ± 1.0
A03SL-038-11	0.8 ± 0.2	4.3 ± 1.3
A03SL-039-01	0.25 ± 0.13	4.0 ± 1.0
A03SL-039-02	0.31 ± 0.18	30 ± 3
A03SL-040-01	0.30 ± 0.12	6.3 ± 0.8
A03SL-041-01	0.75 ± 0.15	2.8 ± 0.7
A03SL-041-02	0.53 ± 0.16	1.7 ± 0.7
A03SL-042-01	0.91 ± 0.19	6.7 ± 1.0
A03SL-042-02	1.0 ± 0.2	4.9 ± 0.8
A03SL-201-01	0.45 ± 0.17	2.5 ± 0.7
A03SL-201-02	0.45 ± 0.14	2.5 ± 0.6
A03SL-202-01	0.47 ± 0.15	1.7 ± 0.5
A03SL-202-05	0.51 ± 0.14	1.8 ± 0.9
A03SL-203-01	2.6 ± 0.4	3.9 ± 1.0
A03SL-203-02	1.05 ± 0.19	1.7 ± 0.7
A03SL-204-01	0.5 ± 0.2	2.1 ± 0.7
A03SL-205-01	0.44 ± 0.17	2.2 ± 0.7
A03SL-206-01	0.79 ± 0.19	2.8 ± 0.8
A03SL-207-01	0.38 ± 0.15	2.8 ± 0.8
A03SL-207-06	0.61 ± 0.15	3.2 ± 0.7

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A03SL-208-01	0.6 ± 0.3	3.4 ± 0.9
A03SL-208-09	0.56 ± 0.16	3.4 ± 0.7
A03SL-209-01	0.59 ± 0.18	10.3 ± 1.4
A03SL-209-06	0.31 ± 0.14	1.0 ± 0.6
A03SL-210-01	0.49 ± 0.15	3.0 ± 0.7
A03SL-210-06	0.19 ± 0.12	0.9 ± 0.5
A03SL-214-01	0.28 ± 0.15	2.0 ± 0.6
A03SL-214-06	0.7 ± 0.2	5.0 ± 1.0
A03SL-215-01	0.44 ± 0.16	2.5 ± 0.7
A03SL-215-06	0.40 ± 0.15	3.3 ± 0.8
A03SL-216-01	0.58 ± 0.14	1.3 ± 0.7
A03SL-216-10	0.88 ± 0.16	7.2 ± 0.8
A03SL-216-14	0.9 ± 0.3	3.6 ± 1.2
A03SL-217-01	0.56 ± 0.15	4.3 ± 0.7
A03SL-217-13	0.44 ± 0.19	85 ± 4
A03SL-217-14	0.68 ± 0.17	27 ± 2
A03SL-218-01	0.59 ± 0.15	3.8 ± 0.7
A03SL-218-10	0.44 ± 0.15	0.4 ± 0.7
A03SL-220-01	0.44 ± 0.15	2.7 ± 0.7
A03SL-220-02	1.14 ± 0.17	1.5 ± 0.7
A03SL-221-01	1.5 ± 0.3	3.7 ± 1.1
A03SL-222-01	0.56 ± 0.16	2.0 ± 0.8
A03SL-222-10	2.5 ± 0.3	6.7 ± 1.1
A03SL-222-13	0.62 ± 0.20	1.6 ± 0.7
A03SL-223-01	0.7 ± 0.2	2.9 ± 0.9
A03SL-223-05	0.77 ± 0.16	7.0 ± 1.2
A03SL-224-01	0.46 ± 0.18	10.1 ± 1.7
A03SL-224-02	0.33 ± 0.19	5.4 ± 1.3
A03SL-224-05	1.16 ± 0.20	5.1 ± 1.2
A03SL-225-01	0.31 ± 0.13	2.6 ± 0.9
A03SL-225-10	0.97 ± 0.20	1.5 ± 0.7
A03SL-226-01	0.64 ± 0.14	6.3 ± 1.4
A03SL-226-25	0.60 ± 0.16	1.0 ± 0.7
A03SL-227-04	0.32 ± 0.19	5.4 ± 1.1
A03SL-227-18	0.59 ± 0.18	4.2 ± 0.8
A03SL-228-01	0.48 ± 0.14	5.7 ± 1.1
A03SL-228-06	0.62 ± 0.17	5.2 ± 1.0
A03SL-230-01	0.33 ± 0.17	2.2 ± 0.7
A03SL-230-06	0.86 ± 0.19	2.5 ± 0.7
A03SL-231-01	0.69 ± 0.14	14.7 ± 1.6
A03SL-231-02	1.6 ± 0.3	17 ± 2
A03SL-231-05	0.74 ± 0.16	10.3 ± 1.4

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A03SL-232-01	0.69 ± 0.17	5.7 ± 0.7
A03SL-232-06	1.05 ± 0.17	5.5 ± 1.0
A03SL-233-01	0.54 ± 0.14	5.9 ± 0.8
A03SL-233-07	2.7 ± 0.2	5.1 ± 1.2
A03SL-233-09	0.7 ± 0.2	2.6 ± 0.9
A03SL-234-01	0.99 ± 0.18	4.5 ± 0.8
A03SL-234-13	1.2 ± 0.2	3.8 ± 0.7
A03SL-236-01	1.03 ± 0.20	2.2 ± 0.7
A03SL-237-01	1.0 ± 0.3	8.6 ± 1.1
A03SL-237-10	0.5 ± 0.2	1.5 ± 0.7
A03SL-239-01	0.50 ± 0.14	4.4 ± 1.1
A03SL-239-10	2.3 ± 0.2	3.4 ± 1.0
A03SL-239-11	3.7 ± 0.4	5.6 ± 1.7
A03SL-239-13	1.0 ± 0.2	2.2 ± 1.0
A03SL-240-01	0.17 ± 0.12	4.0 ± 1.0
A03SL-240-06	1.1 ± 0.2	14.5 ± 1.6
A03SL-240-07	0.64 ± 0.19	17.7 ± 1.9
A03SL-241-01	0.68 ± 0.17	3.8 ± 0.9
A04ASL-001-01	0.18 ± 0.13	0.7 ± 0.4
A04ASL-001-03	1.3 ± 0.3	3.5 ± 0.8
A04ASL-001-05	0.44 ± 0.19	2.6 ± 0.8
A04ASL-002-01	0.7 ± 0.2	2.1 ± 0.6
A04ASL-002-03	0.7 ± 0.3	1.2 ± 0.5
A04ASL-002-04	0.86 ± 0.18	1.3 ± 0.7
A04ASL-003-01	0.87 ± 0.19	6.1 ± 1.1
A04ASL-003-03	3.1 ± 0.3	4.4 ± 1.0
A04ASL-004-01	0.12 ± 0.10	0.4 ± 0.3
A04ASL-004-03	0.9 ± 0.2	1.4 ± 0.6
A04ASL-004-04	0.8 ± 0.2	2.8 ± 0.8
A04ASL-005-01	0.53 ± 0.17	2.8 ± 0.8
A04ASL-005-03	0.70 ± 0.19	1.7 ± 0.7
A04ASL-006-01	1.13 ± 0.20	1.1 ± 0.5
A04ASL-006-03	0.65 ± 0.15	1.2 ± 0.6
A04ASL-007-01	0.8 ± 0.2	1.1 ± 0.6
A04ASL-007-06	0.62 ± 0.20	0.7 ± 0.5
A04ASL-008-01	0.6 ± 0.2	1.1 ± 0.8
A04ASL-008-02	1.09 ± 0.19	1.2 ± 0.6
A04ASL-009-01	0.64 ± 0.14	8.0 ± 1.1
A04ASL-009-06	1.08 ± 0.11	8.8 ± 0.7
A04ASL-010-01	0.13 ± 0.10	0.1 ± 0.3
A04ASL-011-01	0.76 ± 0.16	1.4 ± 0.6
A04ASL-011-03	0.83 ± 0.17	1.0 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04ASL-011-04	0.6 ± 0.2	1.0 ± 0.6
A04ASL-012-01	1.1 ± 0.3	1.7 ± 0.6
A04ASL-012-03	0.69 ± 0.20	0.10 ± 0.14
A04ASL-012-04	1.1 ± 0.2	1.3 ± 0.8
A04ASL-013-01	0.58 ± 0.15	1.3 ± 0.5
A04ASL-013-02	0.26 ± 0.16	1.0 ± 0.6
A04ASL-014-01	0.59 ± 0.18	7.5 ± 1.1
A04ASL-015-01	1.26 ± 0.19	1.8 ± 0.7
A04ASL-016-01	0.78 ± 0.17	1.7 ± 0.6
A04ASL-016-03	0.79 ± 0.17	1.2 ± 0.5
A04ASL-016-04	0.65 ± 0.20	2.0 ± 1.1
A04ASL-017-01	0.90 ± 0.18	1.3 ± 0.5
A04ASL-017-03	0.64 ± 0.18	1.0 ± 0.5
A04ASL-018-01	0.18 ± 0.12	0.05 ± 0.07
A04ASL-018-03	0.9 ± 0.2	1.1 ± 0.5
A04ASL-019-01	0.11 ± 0.13	0.8 ± 0.4
A04ASL-019-06	0.34 ± 0.14	2.6 ± 0.7
A04ASL-020-01	0.50 ± 0.15	9.1 ± 1.5
A04ASL-021-01	0.70 ± 0.16	0.6 ± 0.5
A04ASL-021-03	0.8 ± 0.2	1.1 ± 0.6
A04ASL-021-04	0.63 ± 0.20	1.0 ± 0.7
A04ASL-022-01	0.85 ± 0.18	1.2 ± 0.8
A04ASL-022-03	0.85 ± 0.17	0.5 ± 0.5
A04ASL-023-01	0.53 ± 0.15	3.0 ± 0.8
A04ASL-024-01	0.34 ± 0.13	5.3 ± 0.9
A04ASL-025-01	0.26 ± 0.14	3.0 ± 0.7
A04ASL-026-01	0.84 ± 0.19	1.3 ± 0.7
A04ASL-026-03	0.72 ± 0.19	1.4 ± 0.7
A04ASL-027-01	0.15 ± 0.12	0.6 ± 0.4
A04ASL-027-03	1.14 ± 0.19	1.3 ± 0.5
A04ASL-027-04	1.2 ± 0.3	1.5 ± 0.8
A04ASL-028-01	0.6 ± 0.2	1.4 ± 0.6
A04ASL-028-02	0.99 ± 0.17	0.9 ± 0.5
A04ASL-029-01	0.80 ± 0.20	1.4 ± 0.5
A04ASL-029-03	0.7 ± 0.2	2.1 ± 0.7
A04ASL-030-01	0.60 ± 0.15	2.9 ± 0.7
A04ASL-030-02	0.68 ± 0.18	2.3 ± 0.7
A04ASL-031-01	0.89 ± 0.17	100 ± 4
A04ASL-031-02	0.4 ± 0.2	147 ± 5
A04ASL-031-03	1.5 ± 0.3	65 ± 4
A04ASL-031-04	0.9 ± 0.3	33 ± 3
A04ASL-031-05	0.70 ± 0.20	64 ± 3

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04ASL-031-06	0.6 ± 0.2	19.7 ± 1.7
A04ASL-031-07	0.6 ± 0.2	4.5 ± 0.9
A04ASL-031-08	0.46 ± 0.15	3.3 ± 0.7
A04ASL-031-09	0.9 ± 0.3	105 ± 3
A04ASL-031-10	0.53 ± 0.18	99 ± 3
A04ASL-031-11	0.69 ± 0.19	3.4 ± 0.7
A04ASL-031-12	0.63 ± 0.17	2.5 ± 0.7
A04ASL-032-01	0.83 ± 0.18	1.2 ± 0.7
A04ASL-032-03	0.81 ± 0.20	0.9 ± 0.5
A04ASL-032-04	0.9 ± 0.2	0.7 ± 0.5
A04ASL-033-01	0.33 ± 0.14	3.0 ± 0.7
A04ASL-033-03	0.72 ± 0.18	8.1 ± 1.4
A04ASL-033-04	1.05 ± 0.18	6.5 ± 1.4
A04ASL-034-01	0.57 ± 0.19	1.7 ± 0.6
A04ASL-035-01	0.72 ± 0.15	3.5 ± 0.7
A04ASL-036-01	0.57 ± 0.19	2.7 ± 0.8
A04ASL-036-02	1.0 ± 0.3	3.2 ± 0.7
A04ASL-037-01	0.61 ± 0.16	1.9 ± 0.7
A04ASL-037-02	0.64 ± 0.18	3.1 ± 0.6
A04ASL-038-01	0.63 ± 0.17	5.6 ± 1.3
A04ASL-038-02	0.57 ± 0.14	8.1 ± 1.3
A04ASL-039-01	0.62 ± 0.17	3.9 ± 0.8
A04ASL-039-02	0.76 ± 0.17	3.5 ± 0.7
A04ASL-040-01	0.54 ± 0.15	2.1 ± 0.6
A04ASL-042-01	0.73 ± 0.18	2.5 ± 0.7
A04ASL-042-03	0.79 ± 0.18	4.5 ± 1.0
A04ASL-044-01	0.55 ± 0.16	9.5 ± 1.1
A04ASL-045-01	0.22 ± 0.12	0.3 ± 0.4
A04ASL-045-03	0.19 ± 0.10	0.4 ± 0.3
A04ASL-046-01	0.07 ± 0.06	0.4 ± 0.3
A04ASL-046-06	0.54 ± 0.15	0.9 ± 0.6
A04ASL-047-01	0.36 ± 0.16	1.7 ± 0.6
A04ASL-047-02	0.96 ± 0.17	2.4 ± 1.0
A04ASL-048-01	0.49 ± 0.19	2.5 ± 0.8
A04ASL-048-02	1.5 ± 0.2	3.6 ± 0.8
A04ASL-051-01	1.5 ± 0.3	68 ± 3
A04ASL-051-02	1.7 ± 0.3	77 ± 2
A04ASL-052-01	0.80 ± 0.17	3.9 ± 0.7
A04ASL-052-02	1.0 ± 0.2	3.3 ± 0.6
A04ASL-053-01	0.4 ± 0.2	0.7 ± 0.4
A04ASL-053-02	0.53 ± 0.13	0.7 ± 0.4
A04ASL-054-01	0.67 ± 0.19	14.5 ± 1.7

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04ASL-055-01	0.60 ± 0.19	14.9 ± 1.9
A04ASL-055-02	0.54 ± 0.17	14.4 ± 2.0
A04ASL-056-01	1.9 ± 0.2	58 ± 3
A04ASL-056-04	0.9 ± 0.3	54 ± 3
A04ASL-056-05	0.9 ± 0.2	22.8 ± 1.9
A04ASL-057-01	0.08 ± 0.10	0.6 ± 0.4
A04ASL-057-05	0.7 ± 0.2	1.6 ± 0.6
A04ASL-057-06	0.63 ± 0.15	1.4 ± 0.6
A04ASL-058-01	0.61 ± 0.18	14.7 ± 1.5
A04ASL-058-02	0.9 ± 0.4	20 ± 3
A04ASL-059-01	0.68 ± 0.19	5.3 ± 1.2
A04ASL-059-02	1.06 ± 0.18	2.4 ± 0.6
A04ASL-060-01	0.55 ± 0.20	7.5 ± 1.1
A04ASL-061-01	0.60 ± 0.18	6.1 ± 1.1
A04ASL-061-02	0.95 ± 0.19	8.8 ± 1.2
A04ASL-062-01	1.4 ± 0.2	19.4 ± 1.7
A04ASL-062-02	1.9 ± 0.3	20.1 ± 1.9
A04ASL-063-01	0.28 ± 0.11	2.2 ± 0.6
A04ASL-063-03	0.43 ± 0.15	13.7 ± 1.6
A04ASL-064-01	0.49 ± 0.16	3.6 ± 0.9
A04ASL-064-02	0.54 ± 0.14	6.2 ± 1.1
A04ASL-065-01	0.22 ± 0.11	1.5 ± 0.6
A04ASL-065-02	0.66 ± 0.15	4.4 ± 1.1
A04ASL-066-01	0.47 ± 0.16	2.7 ± 0.6
A04ASL-066-03	0.8 ± 0.2	1.7 ± 0.8
A04ASL-067-01	0.8 ± 0.2	2.3 ± 0.6
A04ASL-067-02	1.13 ± 0.20	3.1 ± 1.0
A04ASL-068-01	0.98 ± 0.18	2.0 ± 0.6
A04ASL-068-02	0.7 ± 0.2	1.3 ± 0.5
A04ASL-069-01	0.48 ± 0.14	2.4 ± 0.9
A04ASL-069-02	0.45 ± 0.13	1.5 ± 0.5
A04ASL-070-01	0.47 ± 0.16	1.0 ± 0.6
A04ASL-071-01	0.98 ± 0.17	2.8 ± 1.0
A04ASL-072-01	0.21 ± 0.12	1.0 ± 0.5
A04ASL-073-01	0.61 ± 0.15	1.7 ± 0.7
A04ASL-073-02	0.84 ± 0.18	2.2 ± 0.7
A04ASL-076-01	0.71 ± 0.16	0.5 ± 0.6
A04ASL-076-02	0.79 ± 0.17	1.3 ± 0.6
A04ASL-076-03	0.65 ± 0.19	2.1 ± 0.7
A04ASL-077-01	0.72 ± 0.17	2.8 ± 0.9
A04ASL-077-06	0.67 ± 0.20	1.6 ± 0.7
A04ASL-077-07	0.6 ± 0.2	0.9 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04ASL-203-01	1.1 ± 0.2	4.9 ± 1.0
A04ASL-203-06	1.7 ± 0.3	9.8 ± 1.9
A04ASL-203-09	0.79 ± 0.17	2.4 ± 0.7
A04ASL-208-01	0.55 ± 0.16	1.4 ± 0.6
A04ASL-208-15	0.46 ± 0.19	1.0 ± 0.6
A04ASL-209-01	0.22 ± 0.12	0.7 ± 0.4
A04ASL-209-10	0.46 ± 0.18	5.2 ± 1.5
A04ASL-210-01	0.12 ± 0.13	0.6 ± 0.3
A04ASL-210-03	0.90 ± 0.18	2.1 ± 0.7
A04ASL-211-01	0.47 ± 0.15	1.1 ± 0.6
A04ASL-211-06	0.38 ± 0.13	0.7 ± 0.5
A04ASL-213-01	0.61 ± 0.19	1.5 ± 0.6
A04ASL-213-14	0.56 ± 0.19	1.5 ± 0.6
A04ASL-213-17	0.47 ± 0.16	0.9 ± 0.6
A04ASL-214-01	0.86 ± 0.15	7.6 ± 0.9
A04ASL-214-03	0.95 ± 0.17	3.8 ± 1.0
A04ASL-214-05	0.9 ± 0.2	110 ± 4
A04ASL-214-06	2.3 ± 0.2	34 ± 2
A04ASL-214-09	1.2 ± 0.2	25.9 ± 1.8
A04ASL-215-01	0.43 ± 0.16	2.3 ± 0.6
A04ASL-215-03	0.9 ± 0.2	3.2 ± 1.1
A04ASL-215-05	0.43 ± 0.16	5.8 ± 1.1
A04ASL-218-04	0.70 ± 0.16	1.1 ± 0.7
A04ASL-218-15	0.55 ± 0.17	1.0 ± 0.7
A04ASL-218-17	0.38 ± 0.17	0.5 ± 0.3
A04ASL-220-01	0.48 ± 0.14	12.0 ± 1.0
A04ASL-220-14	0.60 ± 0.16	5.2 ± 0.8
A04ASL-220-15	0.96 ± 0.17	7.1 ± 1.0
A04ASL-223-06	0.67 ± 0.16	8.1 ± 0.9
A04ASL-224-01	0.41 ± 0.14	3.7 ± 1.0
A04ASL-224-10	1.9 ± 0.3	44 ± 3
A04ASL-224-11	2.2 ± 0.3	37 ± 2
A04ASL-224-14	1.0 ± 0.2	3.4 ± 0.7
A04ASL-224-15	0.80 ± 0.17	1.6 ± 0.6
A04ASL-225-01	1.00 ± 0.17	2.1 ± 0.6
A04ASL-225-06	0.62 ± 0.18	8.6 ± 1.1
A04ASL-228-01	0.60 ± 0.19	1.7 ± 0.6
A04ASL-228-02	0.53 ± 0.16	1.4 ± 0.6
A04ASL-230-01	0.71 ± 0.18	3.2 ± 0.8
A04ASL-230-05	1.4 ± 0.2	13.2 ± 1.6
A04ASL-230-06	0.7 ± 0.2	10.5 ± 1.5
A04ASL-236-01	0.58 ± 0.14	1.7 ± 0.9

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04ASL-236-09	2.1 ± 0.3	5.1 ± 0.9
A04ASL-236-10	0.53 ± 0.17	2.1 ± 0.7
A04ASL-238-01	0.43 ± 0.16	11.4 ± 1.2
A04ASL-238-05	1.0 ± 0.2	10.7 ± 1.4
A04ASL-239-01	0.65 ± 0.17	3.3 ± 1.0
A04ASL-239-03	1.1 ± 0.2	4.0 ± 1.5
A04ASL-239-04	0.61 ± 0.15	8.7 ± 1.1
A04ASL-240-02	0.7 ± 0.2	0.9 ± 0.4
A04ASL-241-01	1.0 ± 0.2	14.4 ± 1.6
A04ASL-241-06	0.73 ± 0.19	6.0 ± 1.0
A04ASL-241-07	0.44 ± 0.16	5.5 ± 1.2
A04ASL-243-01	0.13 ± 0.10	0.8 ± 0.4
A04ASL-243-03	0.80 ± 0.18	6.6 ± 1.1
A04ASL-244-01	0.88 ± 0.19	5.9 ± 0.9
A04ASL-244-02	0.60 ± 0.17	41 ± 3
A04ASL-244-03	0.42 ± 0.16	9.9 ± 1.1
A04ASL-247-01	0.55 ± 0.14	1.8 ± 0.6
A04ASL-247-03	1.9 ± 0.2	2.2 ± 0.8
A04ASL-247-04	1.7 ± 0.3	2.2 ± 0.8
A04ASL-249-01	0.05 ± 0.04	0.3 ± 0.4
A04ASL-249-03	1.6 ± 0.2	1.6 ± 0.6
A04ASL-249-06	0.8 ± 0.2	1.4 ± 0.8
A04ASL-250-01	0.84 ± 0.15	3.2 ± 0.9
A04ASL-250-04	0.5 ± 0.2	11.7 ± 1.5
A04ASL-266-02	1.4 ± 0.3	3.8 ± 0.8
A04ASL-270-03	0.82 ± 0.16	1.6 ± 0.6
A04ASL-271-01	0.9 ± 0.2	1.5 ± 0.6
A04ASL-271-03	0.64 ± 0.16	1.6 ± 0.7
A04ASL-274-01	0.84 ± 0.16	2.6 ± 0.7
A04ASL-274-02	1.07 ± 0.19	4.2 ± 1.1
A04ASL-274-10	0.99 ± 0.18	2.6 ± 1.1
A04ASL-274-11	1.0 ± 0.2	3.3 ± 0.8
A04ASL-275-01	0.26 ± 0.11	0.8 ± 0.5
A04ASL-275-03	1.98 ± 0.20	3.5 ± 0.8
A04ASL-276-01	0.66 ± 0.19	38 ± 3
A04ASL-276-05	1.0 ± 0.2	11.6 ± 1.4
A04ASL-278-01	0.93 ± 0.18	6.5 ± 0.9
A04ASL-278-10	0.96 ± 0.20	250 ± 5
A04ASL-278-19	0.55 ± 0.15	8.6 ± 1.4
A04ASL-301-01	0.16 ± 0.12	0.4 ± 0.4
A04ASL-301-06	0.7 ± 0.2	5.4 ± 0.9
A04ASL-301-07	0.84 ± 0.19	1.8 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04ASL-302-01	0.13 ± 0.13	0.8 ± 0.5
A04ASL-302-06	0.7 ± 0.2	7.1 ± 1.0
A04ASL-302-07	0.8 ± 0.2	3.0 ± 0.7
A04ASL-303-01	0.11 ± 0.12	0.6 ± 0.4
A04ASL-303-03	1.2 ± 0.2	3.6 ± 0.7
A04ASL-304-01	0.58 ± 0.19	1.1 ± 0.7
A04ASL-304-03	0.53 ± 0.20	0.7 ± 0.5
A04ASL-305-01	0.12 ± 0.11	0.3 ± 0.4
A04ASL-305-14	0.55 ± 0.19	0.6 ± 0.5
A04ASL-305-17	0.38 ± 0.12	0.4 ± 0.3
A04ASL-306-01	0.07 ± 0.15	0.4 ± 0.7
A04ASL-306-03	0.69 ± 0.20	1.1 ± 0.7
A04ASL-307-01	0.42 ± 0.16	1.0 ± 0.6
A04ASL-307-06	0.9 ± 0.2	1.3 ± 0.7
A04ASL-307-07	0.43 ± 0.18	0.9 ± 0.6
A04ASL-308-01	0.7 ± 0.3	1.3 ± 0.8
A04ASL-308-06	0.44 ± 0.16	0.7 ± 0.6
A04ASL-308-07	0.9 ± 0.2	1.2 ± 0.6
A04ASL-309-01	0.65 ± 0.17	10.4 ± 1.3
A04ASL-309-06	0.63 ± 0.17	2.1 ± 0.7
A04ASL-310-01	0.70 ± 0.17	2.0 ± 0.6
A04ASL-310-02	1.5 ± 0.2	4.7 ± 0.9
A04ASL-310-09	0.6 ± 0.2	0.9 ± 0.5
A04ASL-311-01	0.33 ± 0.16	2.3 ± 0.8
A04ASL-311-06	1.2 ± 0.3	1.2 ± 0.8
A04ASL-311-07	0.7 ± 0.2	1.3 ± 0.7
A04ASL-312-01	0.13 ± 0.06	0.9 ± 0.4
A04ASL-312-03	0.85 ± 0.20	3.2 ± 0.9
A04ASL-312-04	0.8 ± 0.3	2.3 ± 0.9
A04ASL-313-01	0.8 ± 0.2	1.9 ± 0.7
A04ASL-313-06	0.50 ± 0.15	0.6 ± 0.5
A04ASL-314-01	0.8 ± 0.2	2.6 ± 0.9
A04ASL-314-03	3.6 ± 0.5	4.6 ± 1.6
A04ASL-314-07	0.65 ± 0.18	0.8 ± 0.7
A04ASL-315-01	0.0 ± 0.2	1.9 ± 0.6
A04ASL-315-03	0.8 ± 0.2	8.8 ± 1.7
A04ASL-315-05	0.8 ± 0.3	1.8 ± 0.8
A04ASL-316-01	0.44 ± 0.19	2.6 ± 0.8
A04ASL-316-06	0.77 ± 0.20	2.3 ± 1.0
A04ASL-317-01	0.33 ± 0.18	0.6 ± 0.4
A04ASL-317-02	0.8 ± 0.3	2.8 ± 0.8
A04ASL-318-01	0.43 ± 0.15	6.1 ± 1.2

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04ASL-318-02	0.3 ± 0.2	22 ± 2
A04ASL-319-01	0.32 ± 0.17	5.6 ± 1.6
A04ASL-319-02	0.72 ± 0.18	10.3 ± 1.4
A04ASL-320-01	0.70 ± 0.19	44 ± 3
A04ASL-320-03	1.0 ± 0.3	1.9 ± 0.8
A04ASL-321-01	0.25 ± 0.17	1.0 ± 0.6
A04ASL-321-03	0.03 ± 0.03	2.2 ± 0.9
A04ASL-322-01	0.29 ± 0.18	1.6 ± 0.7
A04ASL-322-03	0.73 ± 0.18	2.5 ± 0.9
A04ASL-322-09	0.45 ± 0.13	0.6 ± 0.5
A04ASL-323-01	0.74 ± 0.19	2.3 ± 0.7
A04BSL-001-01	0.16 ± 0.10	1.2 ± 0.4
A04BSL-001-05	0.49 ± 0.13	0.9 ± 0.4
A04BSL-002-01	0.37 ± 0.13	1.3 ± 0.5
A04BSL-002-05	0.17 ± 0.09	1.0 ± 0.4
A04BSL-003-01	0.28 ± 0.18	0.5 ± 0.4
A04BSL-003-03	0.72 ± 0.14	0.9 ± 0.7
A04BSL-004-01	0.16 ± 0.09	0.6 ± 0.4
A04BSL-004-02	0.26 ± 0.10	0.9 ± 0.4
A04BSL-005-01	0.36 ± 0.12	1.7 ± 0.7
A04BSL-005-02	0.20 ± 0.12	0.9 ± 0.5
A04BSL-006-01	0.43 ± 0.13	1.1 ± 0.5
A04BSL-006-06	0.64 ± 0.14	0.4 ± 0.4
A04BSL-007-06	0.85 ± 0.17	5.8 ± 1.3
A04BSL-008-01	0.32 ± 0.13	0.8 ± 0.5
A04BSL-008-03	0.9 ± 0.2	1.4 ± 0.8
A04BSL-009-01	0.16 ± 0.16	0.5 ± 0.5
A04BSL-009-06	0.36 ± 0.12	0.8 ± 0.5
A04BSL-010-01	0.26 ± 0.12	0.2 ± 0.2
A04BSL-011-01	0.78 ± 0.17	1.3 ± 0.5
A04BSL-012-01	0.10 ± 0.06	0.2 ± 0.3
A04BSL-012-06	0.93 ± 0.18	2.0 ± 0.6
A04BSL-013-01	0.11 ± 0.09	0.2 ± 0.2
A04BSL-013-07	1.2 ± 0.3	4.4 ± 0.9
A04BSL-014-01	0.22 ± 0.11	0.5 ± 0.4
A04BSL-014-07	1.0 ± 0.2	1.0 ± 0.6
A04BSL-015-01	0.12 ± 0.07	0.5 ± 0.4
A04BSL-015-06	0.93 ± 0.16	1.2 ± 0.6
A04BSL-015-07	1.00 ± 0.20	0.6 ± 0.5
A04BSL-016-01	0.64 ± 0.12	2.4 ± 0.5
A04BSL-016-03	0.91 ± 0.14	1.5 ± 0.6
A04BSL-017-01	0.22 ± 0.10	0.5 ± 0.4

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04BSL-017-02	0.24 ± 0.11	1.0 ± 0.4
A04BSL-018-01	0.12 ± 0.12	0.3 ± 0.3
A04BSL-018-06	1.5 ± 0.3	1.8 ± 0.6
A04BSL-018-07	0.93 ± 0.18	0.9 ± 1.0
A04BSL-019-01	0.20 ± 0.12	0.7 ± 0.5
A04BSL-019-02	0.45 ± 0.13	2.7 ± 0.7
A04BSL-020-01	0.12 ± 0.09	0.3 ± 0.2
A04BSL-020-06	0.47 ± 0.18	0.6 ± 0.6
A04BSL-021-01	0.33 ± 0.13	1.4 ± 0.6
A04BSL-022-01	0.23 ± 0.12	0.4 ± 0.3
A04BSL-022-03	0.47 ± 0.14	1.3 ± 0.6
A04BSL-023-01	0.06 ± 0.15	0.6 ± 0.5
A04BSL-023-02	0.18 ± 0.12	0.8 ± 0.4
A04BSL-024-01	0.14 ± 0.09	0.2 ± 0.3
A04BSL-024-06	0.77 ± 0.16	1.8 ± 0.5
A04BSL-025-01	0.22 ± 0.14	1.0 ± 0.5
A04BSL-025-03	0.48 ± 0.14	8.4 ± 1.3
A04BSL-026-01	0.54 ± 0.20	0.5 ± 0.5
A04BSL-026-06	0.15 ± 0.11	0.3 ± 0.4
A04BSL-027-01	0.45 ± 0.15	0.5 ± 0.6
A04BSL-028-01	0.34 ± 0.17	1.6 ± 0.6
A04BSL-029-01	0.10 ± 0.10	0.4 ± 0.3
A04BSL-029-03	0.17 ± 0.10	0.8 ± 0.4
A04BSL-030-01	0.27 ± 0.10	0.6 ± 0.3
A04BSL-030-02	0.45 ± 0.12	2.0 ± 0.5
A04BSL-031-01	0.27 ± 0.13	0.7 ± 0.4
A04BSL-031-06	0.94 ± 0.19	2.2 ± 0.9
A04BSL-031-07	0.85 ± 0.20	1.7 ± 0.7
A04BSL-032-01	0.13 ± 0.10	-0.02 ± 0.03
A04BSL-032-06	1.04 ± 0.17	1.2 ± 0.5
A04BSL-032-07	0.9 ± 0.3	1.9 ± 0.7
A04BSL-033-01	0.20 ± 0.11	0.8 ± 0.4
A04BSL-033-06	0.47 ± 0.18	1.0 ± 0.5
A04BSL-034-01	0.12 ± 0.11	0.2 ± 0.3
A04BSL-034-05	0.49 ± 0.16	0.7 ± 0.6
A04BSL-035-01	0.10 ± 0.11	0.4 ± 0.4
A04BSL-035-06	0.68 ± 0.17	0.8 ± 0.6
A04BSL-036-01	0.09 ± 0.14	0.17 ± 0.13
A04BSL-036-05	0.49 ± 0.18	2.4 ± 0.8
A04BSL-037-01	0.05 ± 0.08	0.2 ± 0.4
A04BSL-037-05	0.59 ± 0.17	2.5 ± 0.7
A04BSL-038-01	0.05 ± 0.08	0.4 ± 0.3

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04BSL-038-07	0.86 ± 0.17	1.7 ± 0.7
A04BSL-039-01	0.82 ± 0.19	1.8 ± 0.7
A04BSL-040-01	0.27 ± 0.14	0.5 ± 0.3
A04BSL-040-03	0.86 ± 0.18	2.2 ± 0.7
A04BSL-041-01	0.10 ± 0.11	0.4 ± 0.4
A04BSL-041-05	0.62 ± 0.15	12.2 ± 1.5
A04BSL-042-01	1.9 ± 0.3	8.3 ± 1.3
A04BSL-042-02	0.9 ± 0.2	2.3 ± 0.7
A04BSL-043-01	1.0 ± 0.3	11.9 ± 1.6
A04BSL-043-02	0.7 ± 0.2	3.4 ± 0.8
A04BSL-219-01	0.15 ± 0.13	0.5 ± 0.5
A04BSL-219-03	1.0 ± 0.2	2.8 ± 0.8
A04BSL-221-01	0.20 ± 0.17	1.1 ± 0.7
A04BSL-301-01	0.22 ± 0.09	0.3 ± 0.3
A04BSL-301-11	0.60 ± 0.15	0.6 ± 0.4
A04BSL-302-01	0.27 ± 0.09	0.5 ± 0.3
A04BSL-302-06	0.93 ± 0.20	1.4 ± 0.7
A04BSL-303-01	0.2 ± 0.3	0.6 ± 1.0
A04BSL-303-06	0.7 ± 0.2	1.6 ± 0.7
A04BSL-303-07	0.53 ± 0.17	1.4 ± 0.6
A04BSL-304-01	0.27 ± 0.15	0.6 ± 0.5
A04BSL-304-02	0.7 ± 0.2	1.4 ± 0.8
A04BSL-304-03	0.81 ± 0.17	2.3 ± 0.8
A04BSL-305-01	0.09 ± 0.07	0.01 ± 0.02
A04BSL-305-06	0.45 ± 0.14	1.0 ± 0.4
A04BSL-306-01	0.24 ± 0.10	0.4 ± 0.3
A04BSL-306-03	1.06 ± 0.18	9.7 ± 1.4
A04BSL-307-01	0.37 ± 0.16	1.3 ± 0.7
A04BSL-307-02	0.44 ± 0.16	0.7 ± 0.5
A04BSL-308-01	0.72 ± 0.20	1.7 ± 0.7
A04BSL-308-02	0.85 ± 0.18	4.4 ± 1.2
A04BSL-309-01	0.04 ± 0.06	0.7 ± 0.4
A04BSL-309-03	0.12 ± 0.15	0.2 ± 0.7
A04BSL-310-01	0.31 ± 0.17	1.0 ± 0.5
A04BSL-310-06	1.7 ± 0.3	2.8 ± 1.1
A04BSL-310-07	0.9 ± 0.2	1.3 ± 0.8
A04BSL-311-01	0.20 ± 0.11	0.21 ± 0.14
A04BSL-311-05	0.38 ± 0.20	2.5 ± 0.8
A04BSL-312-01	0.20 ± 0.12	0.7 ± 0.5
A04BSL-312-02	1.3 ± 0.3	0.8 ± 0.5
A04CSL-001-01	0.9 ± 0.2	1.0 ± 0.6
A04CSL-002-01	1.1 ± 0.2	1.6 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04CSL-003-01	0.86 ± 0.19	1.4 ± 0.5
A04CSL-003-02	0.86 ± 0.20	1.2 ± 0.7
A04CSL-004-02	1.4 ± 0.2	0.9 ± 0.6
A04CSL-005-01	0.86 ± 0.16	1.5 ± 0.6
A04CSL-006-01	0.88 ± 0.19	1.1 ± 0.8
A04CSL-006-02	1.2 ± 0.2	2.8 ± 0.8
A04CSL-006-03	1.37 ± 0.20	1.5 ± 0.6
A04CSL-007-01	0.63 ± 0.18	0.9 ± 0.5
A04CSL-008-01	0.74 ± 0.20	0.9 ± 0.5
A04CSL-009-01	1.5 ± 0.3	1.7 ± 0.6
A04CSL-010-01	0.39 ± 0.16	0.8 ± 0.5
A04CSL-011-01	1.02 ± 0.19	1.5 ± 0.5
A04CSL-011-03	1.0 ± 0.2	2.2 ± 1.0
A04CSL-011-04	1.4 ± 0.3	1.9 ± 0.6
A04CSL-012-01	1.4 ± 0.3	1.9 ± 0.7
A04CSL-013-01	0.74 ± 0.19	2.2 ± 0.7
A04CSL-013-02	1.6 ± 0.3	4.2 ± 0.9
A04CSL-014-01	0.37 ± 0.20	0.6 ± 0.7
A04CSL-015-01	0.36 ± 0.12	1.5 ± 0.5
A04CSL-301-01	0.86 ± 0.17	5.8 ± 1.2
A04CSL-302-01	0.67 ± 0.16	2.0 ± 0.6
A04CSL-302-05	1.6 ± 0.2	4.0 ± 1.0
A04CSL-303-01	0.23 ± 0.11	0.24 ± 0.20
A04CSL-303-05	0.16 ± 0.13	0.8 ± 0.4
A04CSL-304-01	0.21 ± 0.13	0 ± 4
A04CSL-304-03	0.60 ± 0.20	1.4 ± 0.6
A04CSL-304-13	-0.01 ± 0.01	0.09 ± 0.11
A04CSL-305-01	1.1 ± 0.3	3.1 ± 1.1
A04CSL-305-06	0.67 ± 0.20	0.7 ± 0.7
A04CSL-306-01	0.8 ± 0.4	2.1 ± 0.9
A04CSL-306-06	0.50 ± 0.16	0.9 ± 0.7
A04CSL-307-01	0.9 ± 0.3	2.9 ± 1.5
A04CSL-307-02	1.2 ± 0.3	2.7 ± 1.0
A04CSL-308-01	0.9 ± 0.3	1.7 ± 1.1
A04CSL-308-02	0.9 ± 0.3	1.5 ± 0.8
A04CSL-309-01	1.6 ± 0.4	4.0 ± 1.4
A04CSL-309-02	0.8 ± 0.2	1.5 ± 0.7
A04CSL-309-05	0.9 ± 0.3	2.2 ± 0.9
A04CSL-310-01	0.6 ± 0.3	3.4 ± 1.4
A04CSL-310-02	0.7 ± 0.3	4.7 ± 1.3
A04CSL-311-01	0.5 ± 0.2	2.3 ± 0.7
A04CSL-311-02	0.6 ± 0.2	2.8 ± 0.9

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04CSL-312-01	0.27 ± 0.18	2.3 ± 0.9
A04CSL-312-02	0.8 ± 0.3	3.0 ± 1.1
A04CSL-313-01	0.05 ± 0.09	0.4 ± 0.6
A04CSL-313-03	0.8 ± 0.2	2.0 ± 0.9
A04DSL-001-01	0.57 ± 0.16	0.7 ± 0.5
A04DSL-002-01	0.14 ± 0.11	0.7 ± 0.3
A04DSL-002-05	0.55 ± 0.16	1.4 ± 0.6
A04DSL-003-01	0.43 ± 0.16	2.0 ± 0.5
A04DSL-003-02	0.54 ± 0.17	1.6 ± 0.6
A04DSL-004-01	0.16 ± 0.13	0.0 ± 0.6
A04DSL-005-01	0.08 ± 0.05	0.02 ± 0.03
A04DSL-005-02	0.7 ± 0.2	2.3 ± 0.7
A04DSL-005-03	1.3 ± 0.2	1.2 ± 0.8
A04DSL-006-01	0.43 ± 0.16	1.3 ± 0.4
A04DSL-006-02	0.79 ± 0.17	1.8 ± 0.7
A04DSL-006-03	0.38 ± 0.19	0.8 ± 0.6
A04DSL-007-01	0.65 ± 0.15	1.1 ± 0.5
A04DSL-007-02	0.8 ± 0.2	1.9 ± 0.8
A04DSL-007-03	0.89 ± 0.18	1.1 ± 0.5
A04DSL-008-01	0.22 ± 0.14	0.19 ± 0.20
A04DSL-008-05	2.0 ± 0.3	2.0 ± 0.7
A04DSL-008-06	0.66 ± 0.14	0.6 ± 0.5
A04DSL-009-01	0.22 ± 0.15	-0.04 ± 0.04
A04DSL-010-01	0.37 ± 0.16	0.7 ± 0.6
A04DSL-010-02	0.95 ± 0.19	1.5 ± 0.7
A04DSL-011-01	0.0 ± 0.4	1.7 ± 0.8
A04DSL-011-03	1.10 ± 0.20	1.3 ± 0.6
A04DSL-011-04	1.0 ± 0.2	1.1 ± 1.0
A04DSL-012-01	1.00 ± 0.20	1.7 ± 0.7
A04DSL-013-01	0.44 ± 0.19	1.6 ± 0.7
A04DSL-013-02	0.71 ± 0.17	2.6 ± 0.7
A04DSL-014-01	0.09 ± 0.10	0.2 ± 0.2
A04DSL-014-02	1.12 ± 0.16	2.9 ± 0.9
A04DSL-015-01	1.23 ± 0.18	1.6 ± 0.6
A04DSL-015-02	1.2 ± 0.2	1.7 ± 0.6
A04DSL-015-03	0.92 ± 0.18	1.5 ± 0.6
A04DSL-016-01	0.39 ± 0.17	0.3 ± 0.4
A04DSL-016-02	0.68 ± 0.16	1.1 ± 0.6
A04DSL-017-01	0.62 ± 0.16	2.1 ± 0.6
A04DSL-017-02	1.2 ± 0.3	1.8 ± 0.7
A04DSL-018-01	0.62 ± 0.15	0.8 ± 0.6
A04DSL-018-03	1.39 ± 0.20	1.1 ± 0.7

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04DSL-018-04	1.05 ± 0.19	1.5 ± 0.6
A04DSL-019-01	0.5 ± 0.3	1.3 ± 0.8
A04DSL-019-06	1.11 ± 0.18	1.0 ± 0.6
A04DSL-019-07	0.76 ± 0.17	1.2 ± 0.6
A04DSL-020-01	0.62 ± 0.17	4.9 ± 1.2
A04DSL-021-01	1.6 ± 0.3	1.9 ± 0.7
A04DSL-021-02	1.1 ± 0.2	1.9 ± 0.7
A04DSL-021-03	1.45 ± 0.20	1.6 ± 0.6
A04DSL-022-01	1.18 ± 0.19	1.2 ± 0.8
A04DSL-022-06	1.7 ± 0.2	2.1 ± 0.8
A04DSL-022-07	0.87 ± 0.18	1.2 ± 0.6
A04DSL-023-01	0.97 ± 0.18	2.9 ± 0.7
A04DSL-023-03	1.7 ± 0.3	3.3 ± 0.8
A04DSL-023-04	0.99 ± 0.18	3.0 ± 1.0
A04DSL-024-01	1.09 ± 0.18	1.9 ± 0.6
A04DSL-024-02	1.4 ± 0.2	1.9 ± 0.7
A04DSL-024-03	1.43 ± 0.19	2.0 ± 0.6
A04DSL-024-04	1.3 ± 0.3	1.8 ± 0.9
A04DSL-025-01	0.98 ± 0.19	2.1 ± 0.6
A04DSL-026-01	1.3 ± 0.2	3.3 ± 0.8
A04DSL-026-02	0.95 ± 0.17	1.5 ± 0.6
A04DSL-027-01	0.89 ± 0.17	2.7 ± 0.7
A04DSL-027-02	0.49 ± 0.14	1.0 ± 0.4
A04DSL-028-01	0.9 ± 0.2	1.0 ± 0.6
A04DSL-028-02	1.5 ± 0.2	2.2 ± 0.7
A04DSL-029-01	1.2 ± 0.2	1.6 ± 0.6
A04DSL-029-02	0.71 ± 0.19	0.8 ± 0.6
A04DSL-030-01	0.51 ± 0.16	1.2 ± 0.5
A04DSL-030-02	1.1 ± 0.2	2.8 ± 0.7
A04DSL-030-05	1.0 ± 0.2	1.7 ± 0.6
A04DSL-031-01	0.61 ± 0.16	1.5 ± 0.7
A04DSL-031-03	2.1 ± 0.3	3.8 ± 0.8
A04DSL-031-04	1.0 ± 0.2	1.6 ± 0.7
A04DSL-032-01	0.56 ± 0.15	1.0 ± 0.5
A04DSL-032-02	0.55 ± 0.16	0.8 ± 0.4
A04DSL-201-01	0.40 ± 0.14	1.0 ± 0.6
A04DSL-201-02	0.54 ± 0.20	1.7 ± 0.6
A04DSL-203-01	0.7 ± 0.2	2.4 ± 0.7
A04DSL-203-06	1.4 ± 0.2	0.9 ± 0.5
A04DSL-204-01	0.17 ± 0.10	0.5 ± 0.4
A04DSL-204-03	0.32 ± 0.12	0.6 ± 0.4
A04DSL-209-01	0.19 ± 0.12	0.5 ± 0.4

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04DSL-209-06	0.37 ± 0.14	1.0 ± 0.6
A04DSL-210-01	0.25 ± 0.13	0.9 ± 0.5
A04DSL-210-02	1.5 ± 0.3	1.9 ± 1.0
A04DSL-212-01	0.76 ± 0.18	1.4 ± 0.6
A04DSL-212-02	1.10 ± 0.18	2.1 ± 0.6
A04DSL-213-01	0.70 ± 0.18	1.2 ± 0.4
A04DSL-213-02	0.37 ± 0.13	0.9 ± 0.5
A04DSL-214-01	0.15 ± 0.13	0.5 ± 0.6
A04DSL-214-02	1.4 ± 0.2	3.3 ± 0.7
A04DSL-220-01	0.28 ± 0.17	8.2 ± 1.1
A04DSL-223-01	0.79 ± 0.20	3.0 ± 0.8
A04DSL-223-02	1.3 ± 0.2	3.5 ± 0.8
A04DSL-225-01	0.62 ± 0.16	1.9 ± 0.6
A04DSL-225-05	0.82 ± 0.20	3.6 ± 0.8
A04DSL-226-01	0.40 ± 0.13	1.2 ± 0.5
A04DSL-226-02	0.9 ± 0.2	1.8 ± 0.8
A04DSL-228-01	0.81 ± 0.19	1.9 ± 0.7
A04DSL-228-02	1.30 ± 0.20	2.4 ± 0.8
A04DSL-301-01	0.9 ± 0.2	1.5 ± 0.5
A04DSL-301-02	0.57 ± 0.17	0.7 ± 0.4
A04DSL-301-05	0.25 ± 0.15	0.7 ± 0.6
A04DSL-302-01	0.85 ± 0.19	2.4 ± 1.2
A04DSL-303-01	0.32 ± 0.15	1.0 ± 0.5
A04DSL-303-06	0.62 ± 0.16	1.0 ± 0.5
A04DSL-304-01	0.5 ± 0.2	1.6 ± 0.7
A04DSL-304-03	2.0 ± 0.4	2.4 ± 0.8
A04DSL-304-05	0.86 ± 0.19	0.8 ± 0.7
A04DSL-305-01	0.6 ± 0.2	1.2 ± 0.8
A04DSL-305-02	1.2 ± 0.2	2.2 ± 0.8
A04DSL-306-01	0.9 ± 0.2	2.0 ± 0.8
A04DSL-306-02	1.7 ± 0.3	2.5 ± 0.8
A04DSL-306-03	1.0 ± 0.2	1.3 ± 1.0
A04DSL-307-01	1.6 ± 0.3	2.1 ± 0.8
A04DSL-307-02	1.7 ± 0.4	1.9 ± 0.9
A04DSL-307-03	0.7 ± 0.2	0.4 ± 1.0
A04DSL-308-01	1.0 ± 0.3	5.9 ± 1.3
A04DSL-308-02	1.2 ± 0.2	2.3 ± 0.8
A04DSL-309-01	0.19 ± 0.15	0.4 ± 0.5
A04DSL-309-02	1.1 ± 0.3	3.5 ± 1.0
A04DSL-310-01	0.8 ± 0.3	2.4 ± 1.1
A04DSL-311-01	0.7 ± 0.3	2.3 ± 1.1
A04DSL-311-02	1.6 ± 0.3	4.0 ± 1.2

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A04DSL-311-03	0.9 ± 0.2	2.0 ± 0.7
A04DSL-312-01	1.0 ± 0.2	1.6 ± 0.8
A04DSL-312-02	1.0 ± 0.3	3.5 ± 1.2
A04DSL-313-01	0.1 ± 0.2	0.2 ± 0.3
A04DSL-313-02	0.9 ± 0.3	2.5 ± 1.3
A04DSL-314-01	0.7 ± 0.3	1.7 ± 0.9
A04DSL-314-02	1.3 ± 0.3	3.1 ± 1.1
A04DSL-315-01	0.8 ± 0.2	2.3 ± 0.9
A04DSL-315-02	1.4 ± 0.3	2.9 ± 1.0
A04DSL-316-01	0.68 ± 0.20	2.1 ± 0.8
A04DSL-316-02	1.0 ± 0.2	3.0 ± 1.1
A04DSL-317-01	1.0 ± 0.2	2.2 ± 0.9
A04DSL-317-03	0.9 ± 0.3	3.0 ± 1.1
A04DSL-317-05	0.8 ± 0.3	2.1 ± 1.1
A04DSL-318-01	0.60 ± 0.19	2.3 ± 0.7
A04DSL-318-02	1.3 ± 0.3	2.8 ± 1.1
A04DSL-319-01	0.13 ± 0.17	1.0 ± 0.7
A04DSL-319-06	0.06 ± 0.06	0.3 ± 0.2
A04DSL-320-01	0.20 ± 0.17	0.6 ± 0.5
A04DSL-320-05	1.4 ± 0.4	3.5 ± 1.1
A04DSL-321-01	0.58 ± 0.17	2.1 ± 0.7
A04DSL-321-02	0.8 ± 0.2	3.6 ± 1.2
A04DSL-322-01	0.16 ± 0.20	0.6 ± 0.4
A04DSL-322-06	0.48 ± 0.19	0.3 ± 0.9
A04DSL-323-01	0.9 ± 0.3	1.8 ± 1.3
A04DSL-323-06	0.7 ± 0.2	1.0 ± 0.7
A04DSL-324-01	0.2 ± 0.2	0.2 ± 0.7
A04DSL-324-03	2.6 ± 0.5	5.0 ± 1.5
A04DSL-324-04	1.5 ± 0.5	3.6 ± 1.7
A04DSL-325-01	0.5 ± 0.2	1.0 ± 0.7
A04DSL-325-02	1.2 ± 0.2	1.3 ± 0.8
A04DSL-326-01	0.17 ± 0.15	6.8 ± 1.1
A04DSL-326-02	0.68 ± 0.17	4.3 ± 0.8
A04DSL-326-03	0.15 ± 0.10	5.6 ± 0.7
A05ASL-001-01	0.37 ± 0.18	1.1 ± 0.6
A05ASL-002-01	0.17 ± 0.10	0.4 ± 0.6
A05ASL-003-01	0.86 ± 0.19	1.1 ± 0.6
A05ASL-003-02	0.78 ± 0.19	1.0 ± 0.7
A05ASL-003-03	0.59 ± 0.17	0.1 ± 0.2
A05ASL-004-01	1.0 ± 0.2	3.2 ± 0.7
A05ASL-004-02	1.1 ± 0.2	1.6 ± 0.6
A05ASL-004-03	0.8 ± 0.2	0.9 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A05ASL-005-01	0.93 ± 0.15	1.8 ± 0.6
A05ASL-006-01	0.19 ± 0.12	0.6 ± 0.4
A05ASL-006-06	0.49 ± 0.18	0.9 ± 0.4
A05ASL-007-01	0.47 ± 0.17	1.2 ± 0.6
A05ASL-007-03	1.2 ± 0.3	2.3 ± 0.6
A05ASL-008-01	1.0 ± 0.2	1.4 ± 0.6
A05ASL-008-06	0.012 ± 0.002	0.012 ± 0.007
A05ASL-008-07	1.1 ± 0.2	2.0 ± 0.9
A05ASL-008-08	0.65 ± 0.19	1.2 ± 0.8
A05ASL-009-01	0.67 ± 0.19	1.6 ± 0.6
A05ASL-009-07	0.9 ± 0.2	0.9 ± 0.7
A05ASL-009-12	0.40 ± 0.18	0.7 ± 0.6
A05ASL-009-16	0.51 ± 0.17	1.3 ± 0.6
A05ASL-010-01	0.28 ± 0.13	0.7 ± 0.4
A05ASL-010-07	1.4 ± 0.3	1.0 ± 0.7
A05ASL-010-08	1.0 ± 0.2	1.0 ± 0.6
A05ASL-010-09	0.28 ± 0.12	0.6 ± 0.4
A05ASL-011-01	0.9 ± 0.2	1.2 ± 0.6
A05ASL-011-06	1.20 ± 0.20	1.1 ± 0.6
A05ASL-011-12	0.67 ± 0.06	0.70 ± 0.13
A05ASL-012-01	1.1 ± 0.2	1.6 ± 0.6
A05ASL-012-06	1.2 ± 0.2	1.5 ± 0.7
A05ASL-012-07	0.85 ± 0.19	1.3 ± 1.0
A05ASL-013-01	0.21 ± 0.11	0.2 ± 0.2
A05ASL-014-01	0.32 ± 0.12	0.4 ± 0.4
A05ASL-015-01	0.39 ± 0.13	1.0 ± 0.5
A05ASL-015-02	0.77 ± 0.16	1.7 ± 0.5
A05ASL-016-01	0.46 ± 0.17	0.5 ± 0.5
A05ASL-017-01	0.75 ± 0.17	1.4 ± 0.6
A05ASL-017-03	0.8 ± 0.2	1.6 ± 0.8
A05ASL-018-01	0.72 ± 0.18	1.8 ± 0.6
A05ASL-018-02	1.1 ± 0.3	0.9 ± 0.6
A05ASL-018-03	0.88 ± 0.17	0.7 ± 0.5
A05ASL-019-01	0.68 ± 0.20	7.1 ± 1.2
A05ASL-020-01	0.9 ± 0.2	2.1 ± 0.6
A05ASL-021-01	0.55 ± 0.15	1.4 ± 0.6
A05ASL-021-06	0.77 ± 0.17	1.0 ± 0.5
A05ASL-022-01	0.75 ± 0.17	1.3 ± 0.7
A05ASL-022-02	0.69 ± 0.18	1.1 ± 0.5
A05ASL-022-03	0.83 ± 0.20	0.9 ± 0.7
A05ASL-023-01	0.89 ± 0.18	1.0 ± 0.6
A05ASL-023-03	1.1 ± 0.2	1.0 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A05ASL-024-01	0.89 ± 0.16	1.6 ± 0.6
A05ASL-024-02	1.2 ± 0.2	1.4 ± 0.6
A05ASL-025-01	0.59 ± 0.15	1.3 ± 0.6
A05ASL-025-02	0.63 ± 0.15	0.8 ± 0.6
A05ASL-026-01	0.83 ± 0.15	1.3 ± 0.6
A05ASL-027-01	0.71 ± 0.15	1.0 ± 0.5
A05ASL-027-03	1.0 ± 0.2	1.3 ± 0.5
A05ASL-028-01	0.32 ± 0.19	0.5 ± 0.4
A05ASL-029-01	0.60 ± 0.19	1.6 ± 0.6
A05ASL-029-03	1.0 ± 0.2	1.2 ± 0.6
A05ASL-029-04	0.57 ± 0.20	0.9 ± 0.6
A05ASL-030-01	0.64 ± 0.17	1.2 ± 0.6
A05ASL-031-01	0.63 ± 0.16	1.0 ± 0.5
A05ASL-031-03	0.91 ± 0.20	1.4 ± 0.6
A05ASL-201-01	0.41 ± 0.15	0.4 ± 0.5
A05ASL-201-06	0.67 ± 0.18	1.8 ± 0.8
A05ASL-201-15	0.57 ± 0.18	0.7 ± 0.6
A05ASL-202-01	0.25 ± 0.13	0.2 ± 0.2
A05ASL-202-14	0.79 ± 0.17	1.4 ± 0.6
A05ASL-209-01	0.6 ± 0.2	1.1 ± 0.8
A05ASL-209-14	0.48 ± 0.14	1.0 ± 0.6
A05ASL-209-25	1.2 ± 0.3	0.7 ± 0.7
A05ASL-210-01	0.8 ± 0.2	1.3 ± 0.5
A05ASL-210-11	0.53 ± 0.17	0.5 ± 0.4
A05ASL-210-15	0.50 ± 0.18	0.9 ± 0.6
A05ASL-211-01	1.4 ± 0.2	2.4 ± 0.8
A05ASL-211-07	0.51 ± 0.20	0.9 ± 0.7
A05ASL-211-11	0.73 ± 0.17	1.4 ± 0.6
A05ASL-213-01	0.26 ± 0.14	0.4 ± 0.3
A05ASL-213-06	0.76 ± 0.18	1.1 ± 0.8
A05ASL-213-17	0.35 ± 0.15	0.9 ± 0.5
A05ASL-214-01	0.43 ± 0.15	0.8 ± 0.4
A05ASL-214-06	0.65 ± 0.19	1.5 ± 0.7
A05ASL-214-09	0.47 ± 0.16	0.7 ± 0.5
A05ASL-215-01	0.56 ± 0.20	1.1 ± 0.7
A05ASL-216-01	0.43 ± 0.16	1.1 ± 0.6
A05ASL-216-06	0.77 ± 0.18	1.1 ± 0.6
A05ASL-216-10	0.55 ± 0.20	1.0 ± 0.9
A05ASL-219-01	1.8 ± 0.3	4.8 ± 0.9
A05ASL-219-02	1.06 ± 0.19	4.9 ± 1.1
A05ASL-226-01	0.52 ± 0.15	1.5 ± 0.6
A05ASL-226-02	0.7 ± 0.2	1.4 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A05ASL-228-01	0.25 ± 0.15	0.5 ± 0.4
A05ASL-228-23	0.45 ± 0.12	0.8 ± 0.5
A05ASL-301-01	60 ± 3	4103 ± 33
A05ASL-301-02	18.3 ± 1.4	1820 ± 18
A05ASL-301-06	2.5 ± 0.4	256 ± 8
A05ASL-302-01	0.6 ± 0.2	11.5 ± 1.4
A05ASL-302-10	0.62 ± 0.18	1.6 ± 0.6
A05ASL-302-13	0.6 ± 0.3	0 ± 18
A05ASL-302-14	0.11 ± 0.13	1.4 ± 0.8
A05ASL-303-01	0.9 ± 0.3	12 ± 2
A05ASL-303-13	0.73 ± 0.20	2.6 ± 1.0
A05ASL-303-14	0.8 ± 0.2	2.2 ± 0.9
A05ASL-304-01	1.0 ± 0.3	10.5 ± 2.0
A05ASL-304-02	1.0 ± 0.3	8.5 ± 1.5
A05ASL-304-13	0.4 ± 0.3	3.0 ± 1.5
A05ASL-304-14	0.5 ± 0.3	3.3 ± 0.9
A05ASL-305-01	1.2 ± 0.4	6.3 ± 1.2
A05ASL-305-02	1.5 ± 0.3	4.8 ± 1.2
A05ASL-305-03	0.8 ± 0.4	5.6 ± 1.5
A05ASL-305-13	0.9 ± 0.4	2.6 ± 1.1
A05ASL-305-14	0.7 ± 0.2	1.3 ± 0.8
A05ASL-306-01	0.2 ± 0.3	0.4 ± 0.5
A05ASL-306-03	1.0 ± 0.3	1.5 ± 0.9
A05ASL-307-01	0.4 ± 0.2	1.4 ± 0.8
A05ASL-308-01	1.3 ± 0.4	2.7 ± 1.0
A05ASL-308-04	0.76 ± 0.20	0.8 ± 0.7
A05BSL-001-01	0.82 ± 0.19	1.5 ± 0.6
A05BSL-001-11	0.55 ± 0.17	0.8 ± 0.5
A05BSL-001-12	0.60 ± 0.16	1.3 ± 0.6
A05BSL-001-13	0.66 ± 0.16	1.5 ± 0.8
A05BSL-002-01	0.79 ± 0.16	1.6 ± 0.6
A05BSL-002-10	0.62 ± 0.16	1.2 ± 0.4
A05BSL-002-11	0.95 ± 0.19	0.8 ± 0.6
A05BSL-003-01	0.8 ± 0.2	1.3 ± 0.9
A05BSL-003-03	1.2 ± 0.2	0.8 ± 0.6
A05BSL-003-06	0.57 ± 0.17	1.2 ± 0.6
A05BSL-003-08	0.49 ± 0.17	0.7 ± 0.5
A05BSL-004-01	0.81 ± 0.17	1.3 ± 0.7
A05BSL-004-03	0.96 ± 0.19	1.5 ± 0.6
A05BSL-004-04	0.60 ± 0.16	0.9 ± 0.6
A05BSL-005-01	1.5 ± 0.2	1.4 ± 0.6
A05BSL-005-03	0.6 ± 0.3	1.3 ± 0.7

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A05BSL-005-04	0.68 ± 0.19	0.8 ± 0.6
A05BSL-005-06	0.51 ± 0.17	0.8 ± 0.6
A05BSL-006-01	0.96 ± 0.19	1.2 ± 0.6
A05BSL-006-11	0.86 ± 0.19	1.0 ± 0.5
A05BSL-006-13	0.73 ± 0.16	1.3 ± 0.6
A05BSL-007-01	0.87 ± 0.20	1.4 ± 0.7
A05BSL-007-03	0.96 ± 0.18	1.6 ± 0.6
A05BSL-007-10	0.9 ± 0.2	0.9 ± 0.6
A05BSL-008-01	0.58 ± 0.17	-1 ± 6
A05BSL-008-03	0.88 ± 0.19	0.8 ± 0.5
A05BSL-008-06	0.7 ± 0.2	0.8 ± 0.5
A05BSL-008-07	0.56 ± 0.16	0.7 ± 0.4
A05BSL-009-01	0.9 ± 0.3	1.9 ± 0.8
A05BSL-009-03	0.72 ± 0.19	0.6 ± 0.6
A05BSL-009-04	0.41 ± 0.17	0.7 ± 0.7
A05BSL-010-01	0.68 ± 0.16	0.9 ± 0.6
A05BSL-010-03	1.00 ± 0.18	1.2 ± 0.6
A05BSL-010-04	0.74 ± 0.15	1.9 ± 0.6
A05BSL-011-01	1.03 ± 0.18	1.1 ± 0.5
A05BSL-011-03	1.01 ± 0.16	1.6 ± 0.6
A05BSL-011-04	0.74 ± 0.19	0.9 ± 0.7
A10SL-001-01	0.8 ± 0.2	1.8 ± 0.6
A10SL-002-01	0.27 ± 0.19	-0.02 ± 0.03
A10SL-003-01	1.1 ± 0.2	1.5 ± 0.6
A10SL-003-02	0.49 ± 0.13	0.7 ± 0.4
A10SL-004-01	0.69 ± 0.18	1.5 ± 0.8
A10SL-004-02	0.8 ± 0.2	1.6 ± 0.6
A10SL-005-01	0.29 ± 0.15	2.0 ± 0.7
A10SL-006-01	0.72 ± 0.19	1.5 ± 0.6
A10SL-006-06	0.67 ± 0.18	0.8 ± 0.7
A10SL-007-01	0.86 ± 0.18	2.1 ± 0.7
A10SL-007-06	0.41 ± 0.20	1.1 ± 0.6
A10SL-008-01	1.12 ± 0.17	1.9 ± 0.5
A10SL-009-01	0.79 ± 0.20	1.1 ± 0.9
A10SL-009-02	0.88 ± 0.19	1.3 ± 0.6
A10SL-010-01	0.55 ± 0.16	2.0 ± 0.7
A10SL-010-02	0.66 ± 0.16	1.7 ± 0.6
A10SL-011-01	0.49 ± 0.14	0.5 ± 0.5
A10SL-011-02	0.8 ± 0.2	1.2 ± 0.6
A10SL-012-01	0.90 ± 0.18	1.3 ± 0.6
A10SL-012-02	0.47 ± 0.14	0.7 ± 0.5
A10SL-013-01	3.9 ± 0.4	3.1 ± 1.2

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
A10SL-013-02	3.9 ± 0.5	5.2 ± 1.5
A10SL-301-01	0.8 ± 0.4	5.2 ± 1.2
A10SL-301-02	0.55 ± 0.18	1.4 ± 0.6
A10SL-301-13	0.08 ± 0.09	0.6 ± 0.5
A10SL-302-01	0.22 ± 0.15	0.7 ± 0.8
A10SL-302-02	0.79 ± 0.18	2.3 ± 0.8
A10SL-302-13	0.5 ± 0.2	2.7 ± 0.9
A10SL-302-15	0.42 ± 0.15	1.1 ± 0.5
A10SL-303-01	0.38 ± 0.20	3.8 ± 0.9
A10SL-303-02	0.42 ± 0.19	2.7 ± 0.8
A10SL-303-13	0.6 ± 0.2	2.9 ± 1.0
A10SL-303-18	0.28 ± 0.14	1.5 ± 0.5
A10SL-303-25	0.50 ± 0.16	0.9 ± 0.6
B02SL-001-01	0.86 ± 0.16	1.1 ± 0.6
B02SL-002-01	-0.01 ± 0.01	0.3 ± 0.3
B02SL-002-03	0.23 ± 0.13	0.7 ± 0.4
B02SL-003-01	0.9 ± 0.2	4.2 ± 1.1
B02SL-003-03	1.1 ± 0.2	0.4 ± 0.9
B02SL-004-01	0.67 ± 0.19	1.5 ± 0.6
B02SL-004-02	1.16 ± 0.20	1.3 ± 0.6
B02SL-005-01	2.1 ± 0.2	7.0 ± 1.3
B02SL-006-01	0.38 ± 0.12	8.2 ± 1.1
B02SL-006-02	0.70 ± 0.19	3.3 ± 0.8
B02SL-007-01	0.51 ± 0.16	2.7 ± 0.6
B02SL-007-02	0.93 ± 0.17	3.1 ± 0.7
B02SL-008-01	0.35 ± 0.12	14.7 ± 1.5
B02SL-008-02	1.4 ± 0.2	3.5 ± 1.6
B02SL-008-03	1.5 ± 0.2	1.5 ± 0.7
B02SL-009-01	0.34 ± 0.15	9.3 ± 1.4
B02SL-009-02	2.5 ± 0.4	8.8 ± 1.6
B02SL-010-01	0.63 ± 0.18	3.0 ± 1.2
B02SL-010-02	1.05 ± 0.18	2.1 ± 0.7
B02SL-011-01	0.96 ± 0.19	2.6 ± 0.6
B02SL-012-01	0.7 ± 0.2	9.4 ± 1.4
B02SL-012-02	1.2 ± 0.2	4.3 ± 0.8
B02SL-013-01	0.74 ± 0.17	2.6 ± 0.7
B02SL-014-01	0.5 ± 0.2	2.7 ± 0.8
B02SL-014-02	0.33 ± 0.20	1.9 ± 0.7
B02SL-015-01	0.7 ± 0.2	0.8 ± 0.7
B02SL-016-01	1.2 ± 0.3	2.7 ± 0.8
B02SL-017-01	0.54 ± 0.15	5.0 ± 0.8
B02SL-017-05	0.89 ± 0.15	22.9 ± 1.8

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B02SL-018-01	3.4 ± 0.4	9.1 ± 1.2
B02SL-018-02	2.8 ± 0.3	6.0 ± 1.5
B02SL-018-03	4.0 ± 0.4	3.4 ± 1.3
B02SL-019-01	1.0 ± 0.2	1.8 ± 0.8
B02SL-019-02	1.1 ± 0.2	2.3 ± 1.1
B02SL-020-01	1.3 ± 0.3	7.4 ± 1.2
B02SL-020-03	0.68 ± 0.19	1.5 ± 0.5
B02SL-022-01	0.7 ± 0.2	2.9 ± 0.7
B02SL-022-03	2.0 ± 0.3	2.1 ± 0.8
B02SL-022-04	1.5 ± 0.3	4.3 ± 1.1
B02SL-023-01	0.81 ± 0.17	1.8 ± 0.6
B02SL-023-02	0.88 ± 0.17	1.5 ± 0.5
B02SL-023-03	0.91 ± 0.20	1.2 ± 1.0
B02SL-024-01	0.9 ± 0.2	1.8 ± 0.8
B02SL-024-02	1.0 ± 0.2	1.6 ± 0.7
B02SL-025-01	0.61 ± 0.19	2.1 ± 0.8
B02SL-025-02	2.4 ± 0.4	2.8 ± 0.7
B02SL-026-01	0.79 ± 0.17	3.0 ± 0.7
B02SL-026-02	0.77 ± 0.18	1.0 ± 0.4
B02SL-027-01	0.45 ± 0.15	1.4 ± 0.6
B02SL-027-03	0.58 ± 0.15	0.7 ± 0.5
B02SL-028-01	0.64 ± 0.18	1.8 ± 0.5
B02SL-029-01	0.7 ± 0.2	2.4 ± 0.8
B02SL-029-02	0.88 ± 0.19	1.8 ± 0.6
B02SL-030-01	0.46 ± 0.16	0.4 ± 0.3
B02SL-031-01	1.1 ± 0.2	1.4 ± 0.7
B02SL-031-02	1.3 ± 0.3	1.9 ± 0.7
B02SL-032-01	0.84 ± 0.17	1.5 ± 0.6
B02SL-033-01	1.3 ± 0.3	1.2 ± 0.7
B02SL-033-02	1.43 ± 0.19	2.0 ± 0.5
B02SL-034-01	0.98 ± 0.19	1.7 ± 0.7
B02SL-035-01	0.66 ± 0.18	1.0 ± 0.5
B02SL-035-02	1.03 ± 0.17	0.8 ± 0.5
B02SL-036-01	1.3 ± 0.2	2.2 ± 0.6
B02SL-036-02	0.73 ± 0.17	0.9 ± 0.4
B02SL-037-02	1.8 ± 0.4	2.0 ± 0.7
B02SL-037-05	1.8 ± 0.2	3.2 ± 0.7
B02SL-037-06	0.6 ± 0.2	1.1 ± 0.8
B02SL-038-01	0.86 ± 0.17	0.9 ± 0.5
B02SL-040-01	1.0 ± 0.2	1.8 ± 1.0
B02SL-040-03	1.3 ± 0.2	1.5 ± 0.9
B02SL-041-01	1.3 ± 0.2	1.8 ± 0.9

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B02SL-041-02	0.97 ± 0.17	1.2 ± 0.6
B02SL-042-01	0.90 ± 0.20	7.0 ± 1.0
B02SL-043-01	0.90 ± 0.17	4.9 ± 1.2
B02SL-043-02	1.01 ± 0.18	2.0 ± 0.6
B02SL-044-01	0.38 ± 0.16	0.4 ± 0.5
B02SL-045-01	2.1 ± 0.3	3.1 ± 0.9
B02SL-046-01	1.2 ± 0.3	5.1 ± 1.0
B02SL-046-02	0.87 ± 0.18	1.5 ± 0.6
B02SL-047-01	0.94 ± 0.20	1.0 ± 0.5
B02SL-048-01	0.9 ± 0.3	3.7 ± 1.1
B02SL-048-02	1.3 ± 0.2	2.0 ± 0.8
B02SL-049-01	2.6 ± 0.3	2.4 ± 0.8
B02SL-049-02	3.0 ± 0.4	3.7 ± 1.4
B02SL-050-01	0.68 ± 0.17	0.9 ± 0.7
B02SL-050-02	0.39 ± 0.13	0.6 ± 0.5
B02SL-051-01	1.11 ± 0.18	1.7 ± 0.6
B02SL-051-02	1.7 ± 0.2	2.3 ± 0.7
B02SL-051-05	1.8 ± 0.2	1.5 ± 0.7
B02SL-052-01	0.19 ± 0.14	1.8 ± 0.7
B02SL-052-03	2.8 ± 0.3	2.1 ± 1.3
B02SL-052-05	1.7 ± 0.3	3.6 ± 0.6
B02SL-052-06	2.3 ± 0.3	3.5 ± 0.8
B02SL-053-01	0.53 ± 0.17	0.9 ± 0.4
B02SL-053-02	0.30 ± 0.14	0.05 ± 0.05
B02SL-054-01	1.9 ± 0.3	1.1 ± 0.7
B02SL-054-02	1.33 ± 0.19	1.8 ± 0.7
B02SL-055-01	0.36 ± 0.14	0.9 ± 0.5
B02SL-055-02	1.5 ± 0.2	1.8 ± 0.7
B02SL-055-03	2.0 ± 0.3	1.9 ± 1.0
B02SL-055-05	0.85 ± 0.20	1.1 ± 1.0
B02SL-056-01	0.45 ± 0.14	0.6 ± 0.7
B02SL-057-05	0.85 ± 0.18	0.5 ± 0.2
B02SL-058-01	0.87 ± 0.18	1.1 ± 0.6
B02SL-059-01	1.04 ± 0.18	13.8 ± 1.6
B02SL-059-02	1.0 ± 0.2	4.8 ± 0.8
B02SL-301-01	1.1 ± 0.3	3.8 ± 1.0
B02SL-301-02	0.48 ± 0.18	1.0 ± 0.6
B02SL-302-01	0.7 ± 0.3	12.9 ± 1.7
B02SL-302-05	0.49 ± 0.20	18.9 ± 2.0
B02SL-303-01	1.7 ± 0.2	2.6 ± 0.7
B02SL-303-06	0.44 ± 0.16	0.7 ± 0.5
B02SL-707-01	0.06 ± 0.13	0.9 ± 0.4

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B02SL-709-01	0.21 ± 0.12	2.0 ± 0.5
B02SL-710-01	0.08 ± 0.07	0.4 ± 0.3
B02SL-713-01	-0.04 ± 0.18	0.06 ± 0.05
B02SL-714-01	0.11 ± 0.09	1.2 ± 0.4
B02SL-715-01	-0.01 ± 0.15	1.2 ± 0.4
B02SL-716-01	0.17 ± 0.14	2.2 ± 0.6
B02SL-717-01	0.10 ± 0.12	2.3 ± 0.4
B02SL-718-01	0.06 ± 0.07	1.9 ± 0.5
B02SL-719-01	0.09 ± 0.11	0.8 ± 0.4
B02SL-720-01	0.55 ± 0.18	7.7 ± 1.2
B02SL-721-01	0.78 ± 0.14	10.4 ± 1.0
B02SL-722-01	0.32 ± 0.08	1.6 ± 0.4
B02SL-723-01	0.36 ± 0.15	1.7 ± 0.7
B02SL-724-01	0.41 ± 0.14	2.9 ± 0.6
B02SL-725-01	0.26 ± 0.09	1.6 ± 0.4
B02SL-726-01	0.75 ± 0.18	1.5 ± 0.6
B02SL-727-01	0.39 ± 0.12	3.4 ± 0.6
B02SL-728-01	0.35 ± 0.12	2.7 ± 0.6
B02SL-729-01	0.69 ± 0.15	4.9 ± 0.8
B02SL-730-01	0.32 ± 0.16	3.5 ± 0.7
B02SL-732-01	0.28 ± 0.11	3.9 ± 0.8
B02SL-733-01	0.63 ± 0.14	3.0 ± 0.6
B02SL-736-01	1.0 ± 0.2	2.3 ± 0.8
B02SL-737-01	0.61 ± 0.16	5.2 ± 1.2
B02SL-738-01	0.41 ± 0.15	6.2 ± 1.2
B02SL-739-01	1.7 ± 0.2	5.4 ± 0.9
B02SL-742-01	0.43 ± 0.13	3.0 ± 0.7
B02SL-743-01	0.35 ± 0.13	1.6 ± 0.4
B02SL-745-01	0.92 ± 0.18	3.0 ± 0.7
B02SL-746-01	0.71 ± 0.17	3.2 ± 0.8
B02SL-748-01	0.48 ± 0.15	6.2 ± 0.9
B02SL-749-01	0.44 ± 0.13	2.3 ± 0.6
B02SL-750-01	0.09 ± 0.08	3.3 ± 0.8
B02SL-751-01	0.23 ± 0.10	0.9 ± 0.3
B02SL-752-01	0.78 ± 0.18	1.7 ± 0.6
B02SL-753-01	0.17 ± 0.10	2.0 ± 0.6
B02SL-754-01	0.50 ± 0.15	3.2 ± 0.5
B02SL-755-01	0.46 ± 0.10	2.8 ± 0.7
B02SL-756-01	0.06 ± 0.05	1.0 ± 0.4
B02SL-757-01	0.22 ± 0.10	2.0 ± 0.5
B02SL-758-01	0.78 ± 0.20	3.5 ± 0.7
B03SL-001-01	0.55 ± 0.15	1.8 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B03SL-001-02	1.12 ± 0.20	1.7 ± 0.5
B03SL-002-01	1.4 ± 0.2	1.8 ± 0.7
B03SL-002-02	1.5 ± 0.3	1.0 ± 0.4
B03SL-003-01	1.2 ± 0.3	2.2 ± 0.6
B03SL-003-02	1.4 ± 0.3	1.8 ± 0.6
B03SL-004-01	0.27 ± 0.13	1.6 ± 0.7
B03SL-004-02	1.0 ± 0.2	1.2 ± 0.6
B03SL-005-01	1.2 ± 0.2	1.1 ± 0.4
B03SL-006-01	0.57 ± 0.16	1.5 ± 0.6
B03SL-006-03	0.59 ± 0.16	1.3 ± 0.5
B03SL-007-01	0.9 ± 0.2	1.3 ± 0.6
B03SL-008-01	1.5 ± 0.2	2.2 ± 0.7
B03SL-009-01	0.70 ± 0.17	11.0 ± 1.3
B03SL-010-01	0.44 ± 0.18	2.4 ± 1.0
B03SL-010-02	0.63 ± 0.14	1.6 ± 0.5
B03SL-011-01	1.01 ± 0.18	1.7 ± 0.6
B03SL-011-02	1.05 ± 0.20	1.2 ± 0.5
B03SL-013-01	0.8 ± 0.2	12.4 ± 1.4
B03SL-013-02	0.75 ± 0.16	1.5 ± 0.6
B03SL-014-01	0.22 ± 0.12	12.4 ± 1.3
B03SL-014-05	0.8 ± 0.3	180 ± 5
B03SL-014-08	0.37 ± 0.13	1.3 ± 0.5
B03SL-015-01	0.95 ± 0.18	0.6 ± 0.4
B03SL-015-02	1.1 ± 0.2	0.9 ± 0.7
B03SL-016-01	0.8 ± 0.3	18.9 ± 1.7
B03SL-016-05	0.92 ± 0.20	41 ± 3
B03SL-016-07	0.42 ± 0.15	1.4 ± 0.6
B03SL-017-01	0.42 ± 0.19	5.2 ± 0.8
B03SL-017-02	0.69 ± 0.16	1.4 ± 0.6
B03SL-017-03	1.3 ± 0.3	1.4 ± 0.6
B03SL-018-01	1.10 ± 0.19	1.6 ± 0.6
B03SL-018-02	1.5 ± 0.3	1.4 ± 0.7
B03SL-019-01	0.35 ± 0.18	1.0 ± 0.6
B03SL-020-01	0.54 ± 0.19	13.9 ± 1.3
B03SL-020-02	0.79 ± 0.15	1.5 ± 0.7
B03SL-021-01	0.41 ± 0.16	3.5 ± 0.8
B03SL-021-02	0.6 ± 0.2	3.0 ± 1.1
B03SL-022-01	0.8 ± 0.2	8.1 ± 1.1
B03SL-022-02	1.1 ± 0.2	1.5 ± 0.5
B03SL-023-01	2.8 ± 0.3	4.1 ± 1.0
B03SL-024-01	0.77 ± 0.19	3.2 ± 1.0
B03SL-024-03	1.2 ± 0.2	1.5 ± 0.8

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B03SL-024-04	0.76 ± 0.17	1.1 ± 0.7
B03SL-025-01	0.7 ± 0.2	2.5 ± 0.7
B03SL-025-02	1.0 ± 0.3	1.6 ± 0.6
B03SL-025-03	1.53 ± 0.20	2.4 ± 0.7
B03SL-026-01	0.68 ± 0.14	2.2 ± 0.7
B03SL-026-02	1.3 ± 0.2	2.8 ± 0.7
B03SL-027-01	0.57 ± 0.17	2.6 ± 0.7
B03SL-027-02	1.5 ± 0.2	1.9 ± 0.6
B03SL-027-03	1.7 ± 0.3	2.4 ± 0.6
B03SL-028-01	0.42 ± 0.18	0.7 ± 0.6
B03SL-028-02	0.45 ± 0.18	1.1 ± 0.6
B03SL-029-01	0.64 ± 0.20	2.8 ± 0.7
B03SL-029-06	0.99 ± 0.17	1.7 ± 0.7
B03SL-030-01	0.27 ± 0.12	10.3 ± 1.4
B03SL-030-02	0.33 ± 0.18	22 ± 2
B03SL-031-01	0.29 ± 0.11	1.3 ± 0.5
B03SL-031-05	0.53 ± 0.16	1.7 ± 0.6
B03SL-032-01	0.5 ± 0.2	1.2 ± 0.7
B03SL-032-02	0.7 ± 0.4	1.4 ± 1.2
B03SL-033-01	1.0 ± 0.3	4.2 ± 1.3
B03SL-033-03	0.9 ± 0.4	2.8 ± 1.0
B03SL-033-05	0.7 ± 0.2	3.2 ± 0.8
B03SL-034-01	0.07 ± 0.10	0.6 ± 0.4
B03SL-035-01	1.4 ± 0.3	13.6 ± 1.7
B03SL-036-01	1.0 ± 0.3	5.3 ± 1.3
B03SL-036-02	1.3 ± 0.3	3.3 ± 1.3
B03SL-037-01	0.35 ± 0.19	31 ± 3
B03SL-301-01	0.03 ± 0.04	1.6 ± 0.8
B03SL-301-06	0.6 ± 0.3	1.0 ± 0.9
B03SL-302-01	0.58 ± 0.20	2.8 ± 0.8
B03SL-303-01	0.9 ± 0.3	2.0 ± 1.1
B03SL-303-06	0.4 ± 0.3	0.6 ± 0.6
B03SL-304-01	0.6 ± 0.3	1.1 ± 1.1
B03SL-304-02	0.6 ± 0.2	1.4 ± 0.8
B03SL-305-01	0.5 ± 0.2	1.8 ± 0.9
B03SL-305-02	0.5 ± 0.2	1.6 ± 0.8
B03SL-306-01	0.28 ± 0.18	3.0 ± 0.6
B03SL-306-10	0.8 ± 0.2	2.7 ± 1.3
B03SL-306-11	0.41 ± 0.19	1.7 ± 1.2
B03SL-307-01	0.7 ± 0.2	3.8 ± 1.0
B03SL-701-01	0.44 ± 0.13	4.1 ± 0.7
B03SL-702-01	0.36 ± 0.11	2.7 ± 0.7

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B03SL-704-01	0.29 ± 0.13	1.5 ± 0.4
B03SL-705-01	0.40 ± 0.12	3.7 ± 0.8
B03SL-706-01	0.08 ± 0.10	2.8 ± 0.6
B03SL-707-01	0.65 ± 0.14	21.3 ± 1.6
B03SL-708-01	0.26 ± 0.13	5.0 ± 1.0
B03SL-709-01	0.60 ± 0.15	6.4 ± 0.9
B03SL-710-01	0.41 ± 0.14	10.2 ± 1.2
B03SL-711-01	0.50 ± 0.19	5.7 ± 1.1
B03SL-712-01	1.22 ± 0.19	49 ± 3
B03SL-713-01	0.47 ± 0.14	21.6 ± 1.6
B03SL-715-01	0.21 ± 0.11	8.3 ± 0.8
B03SL-717-01	0.56 ± 0.16	35 ± 2
B03SL-718-01	0.63 ± 0.10	6.3 ± 0.5
B03SL-719-01	0.48 ± 0.18	33 ± 3
B03SL-720-01	1.4 ± 0.3	32 ± 3
B03SL-721-01	1.1 ± 0.2	59 ± 3
B03SL-722-01	0.69 ± 0.19	9.1 ± 1.6
B03SL-723-01	0.38 ± 0.13	44.0 ± 1.9
B03SL-724-01	0.17 ± 0.12	5.6 ± 1.1
B03SL-725-01	0.31 ± 0.15	18.3 ± 1.7
B03SL-726-01	0.32 ± 0.13	3.6 ± 1.0
B03SL-727-01	0.15 ± 0.12	3.1 ± 0.8
B03SL-728-01	0.44 ± 0.19	4.2 ± 0.8
B03SL-729-01	0.39 ± 0.10	3.4 ± 0.8
B03SL-730-01	0.08 ± 0.12	3.2 ± 0.8
B03SL-731-01	0.14 ± 0.13	11.8 ± 1.6
B03SL-732-01	0.18 ± 0.10	3.3 ± 1.0
B03SL-733-01	0.20 ± 0.13	5.8 ± 1.1
B03SL-734-01	0.46 ± 0.16	3.3 ± 0.9
B03SL-735-01	0.22 ± 0.10	4.2 ± 0.9
B03SL-736-01	0.35 ± 0.13	3.8 ± 0.7
B03SL-737-01	0.27 ± 0.13	7.7 ± 0.9
B03SL-738-01	0.29 ± 0.09	8.4 ± 1.0
B03SL-739-01	0.42 ± 0.11	2.3 ± 0.7
B04&B09SL-001-01	1.16 ± 0.19	1.2 ± 0.6
B04&B09SL-001-02	1.13 ± 0.19	1.0 ± 0.6
B04&B09SL-002-01	0.91 ± 0.18	1.7 ± 0.7
B04&B09SL-002-02	0.9 ± 0.2	0.7 ± 0.5
B04&B09SL-003-01	0.32 ± 0.14	1.8 ± 0.6
B04&B09SL-004-01	0.33 ± 0.13	1.6 ± 0.5
B04&B09SL-005-01	1.1 ± 0.2	2.1 ± 1.0
B04&B09SL-006-01	1.28 ± 0.17	1.9 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B04&B09SL-006-02	1.1 ± 0.2	1.8 ± 0.7
B04&B09SL-007-01	0.8 ± 0.2	2.6 ± 0.8
B04&B09SL-007-05	0.9 ± 0.2	2.2 ± 0.8
B04&B09SL-008-01	0.14 ± 0.10	1.0 ± 0.5
B04&B09SL-008-03	0.19 ± 0.20	1.0 ± 0.7
B04&B09SL-009-01	1.3 ± 0.2	2.2 ± 0.7
B04&B09SL-009-02	1.4 ± 0.3	1.8 ± 0.6
B04&B09SL-009-06	0.85 ± 0.17	1.1 ± 0.6
B04&B09SL-010-01	0.85 ± 0.19	3.1 ± 0.7
B04&B09SL-010-05	1.2 ± 0.2	0.9 ± 0.7
B04&B09SL-011-01	1.3 ± 0.2	2.0 ± 0.7
B04&B09SL-012-01	0.95 ± 0.19	1.5 ± 0.6
B04&B09SL-012-02	0.9 ± 0.2	0.7 ± 0.7
B04&B09SL-013-01	0.82 ± 0.16	3.9 ± 0.8
B04&B09SL-014-01	1.17 ± 0.19	2.9 ± 0.7
B04&B09SL-015-01	0.7 ± 0.2	10.4 ± 1.5
B04&B09SL-015-02	0.84 ± 0.19	7.0 ± 1.5
B04&B09SL-016-01	0.20 ± 0.12	0.31 ± 0.18
B04&B09SL-017-01	1.43 ± 0.20	3.5 ± 0.9
B04&B09SL-017-02	0.40 ± 0.14	7.7 ± 1.2
B04&B09SL-018-01	1.3 ± 0.3	5.3 ± 1.0
B04&B09SL-018-02	1.8 ± 0.3	3.2 ± 0.9
B04&B09SL-019-01	0.14 ± 0.10	1.1 ± 0.5
B04&B09SL-019-07	0.41 ± 0.10	0.8 ± 0.6
B04&B09SL-020-01	1.4 ± 0.3	3.6 ± 0.8
B04&B09SL-020-02	1.03 ± 0.18	2.1 ± 0.7
B04&B09SL-021-01	0.8 ± 0.2	1.4 ± 0.5
B04&B09SL-021-05	0.84 ± 0.19	1.4 ± 0.6
B04&B09SL-022-01	0.90 ± 0.18	1.5 ± 0.6
B04&B09SL-022-05	0.94 ± 0.18	1.3 ± 0.7
B04&B09SL-023-01	0.37 ± 0.16	0.7 ± 0.5
B04&B09SL-024-01	1.4 ± 0.3	3.3 ± 0.8
B04&B09SL-025-01	0.66 ± 0.20	0.6 ± 0.5
B04&B09SL-025-02	1.2 ± 0.3	3.2 ± 0.9
B04&B09SL-026-01	0.27 ± 0.15	7.4 ± 1.3
B04&B09SL-026-02	0.06 ± 0.09	2.4 ± 0.7
B04&B09SL-026-05	0.46 ± 0.13	3.1 ± 0.9
B04&B09SL-026-06	0.02 ± 0.01	0.9 ± 0.3
B04&B09SL-027-01	1.42 ± 0.18	3.5 ± 0.8
B04&B09SL-027-02	0.85 ± 0.17	1.3 ± 0.5
B04&B09SL-028-01	0.72 ± 0.16	3.3 ± 0.8
B04&B09SL-029-01	0.85 ± 0.16	3.1 ± 0.7

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B04&B09SL-029-05	1.0 ± 0.2	1.3 ± 0.6
B04&B09SL-030-01	0.48 ± 0.14	12.2 ± 1.6
B04&B09SL-030-02	0.42 ± 0.13	1.0 ± 0.6
B04&B09SL-031-01	1.3 ± 0.2	2.2 ± 0.8
B04&B09SL-031-05	0.60 ± 0.20	0.9 ± 0.6
B04&B09SL-032-01	1.5 ± 0.3	2.4 ± 1.0
B04&B09SL-032-02	0.28 ± 0.14	0.7 ± 0.4
B04&B09SL-033-01	0.57 ± 0.17	0.8 ± 0.5
B04&B09SL-033-02	1.3 ± 0.2	1.7 ± 0.7
B04&B09SL-034-01	1.3 ± 0.2	4.4 ± 0.9
B04&B09SL-035-01	0.8 ± 0.2	1.1 ± 0.8
B04&B09SL-035-02	1.2 ± 0.2	1.4 ± 0.6
B04&B09SL-036-01	0.48 ± 0.16	1.0 ± 0.5
B04&B09SL-036-02	1.42 ± 0.20	3.1 ± 0.8
B04&B09SL-037-01	1.4 ± 0.3	1.9 ± 0.7
B04&B09SL-037-02	0.91 ± 0.19	1.2 ± 0.6
B04&B09SL-038-01	0.91 ± 0.19	1.2 ± 0.6
B04&B09SL-038-02	1.4 ± 0.2	1.5 ± 0.7
B04&B09SL-038-03	1.5 ± 0.2	2.6 ± 0.7
B04&B09SL-039-01	0.92 ± 0.18	2.7 ± 0.8
B04&B09SL-039-06	1.06 ± 0.19	1.3 ± 0.7
B04&B09SL-040-01	1.3 ± 0.2	2.9 ± 0.8
B04&B09SL-040-02	0.94 ± 0.19	1.6 ± 0.8
B04&B09SL-041-01	1.10 ± 0.20	2.0 ± 1.0
B04&B09SL-041-02	0.91 ± 0.17	1.4 ± 0.6
B04&B09SL-041-03	0.89 ± 0.18	1.0 ± 0.6
B04&B09SL-041-04	0.82 ± 0.20	1.3 ± 0.6
B04&B09SL-301-01	0.7 ± 0.2	2.9 ± 0.6
B04&B09SL-301-02	0.9 ± 0.2	2.4 ± 0.7
B04&B09SL-302-01	0.6 ± 0.3	2.5 ± 1.1
B04&B09SL-302-02	1.2 ± 0.3	3.2 ± 1.3
B04&B09SL-302-05	0.35 ± 0.16	0.8 ± 0.5
B04&B09SL-303-01	0.7 ± 0.3	1.3 ± 0.8
B04&B09SL-303-02	0.8 ± 0.2	0.8 ± 0.7
B04&B09SL-304-01	0.8 ± 0.3	3.7 ± 0.9
B04&B09SL-304-02	1.2 ± 0.3	3.0 ± 1.2
B04&B09SL-304-06	1.1 ± 0.3	2.6 ± 1.0
B04&B09SL-305-01	1.3 ± 0.3	3.6 ± 1.3
B04&B09SL-305-02	1.6 ± 0.3	3.1 ± 1.3
B04&B09SL-305-03	0.51 ± 0.20	2.0 ± 0.9
B04&B09SL-702-01	0.15 ± 0.12	8.5 ± 1.0
B04&B09SL-703-01	0.36 ± 0.13	15.7 ± 1.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B04&B09SL-704-01	0.19 ± 0.13	7.8 ± 0.8
B04&B09SL-705-01	0.16 ± 0.11	1.1 ± 0.4
B04&B09SL-707-01	0.32 ± 0.15	24.2 ± 1.5
B04&B09SL-708-01	0.16 ± 0.11	1.7 ± 0.4
B04&B09SL-710-01	0.17 ± 0.15	4.3 ± 0.9
B04&B09SL-711-01	0.53 ± 0.12	28.2 ± 1.8
B04&B09SL-712-01	0.11 ± 0.07	2.9 ± 0.5
B04&B09SL-713-01	0.11 ± 0.13	3.1 ± 0.6
B04&B09SL-714-01	0.09 ± 0.13	5.7 ± 0.8
B04&B09SL-715-01	1.08 ± 0.19	8.3 ± 1.2
B04&B09SL-716-01	0.29 ± 0.13	10.0 ± 1.3
B04&B09SL-717-01	1.13 ± 0.16	4.6 ± 0.7
B04&B09SL-719-01	0.12 ± 0.10	0.7 ± 0.4
B04&B09SL-720-01	0.08 ± 0.12	2.3 ± 0.7
B04&B09SL-721-01	0.25 ± 0.12	3.5 ± 0.9
B04&B09SL-722-01	0.40 ± 0.12	9.2 ± 1.3
B04&B09SL-723-01	0.34 ± 0.12	16.0 ± 1.0
B04&B09SL-724-01	0.38 ± 0.13	12.3 ± 1.4
B04&B09SL-725-01	0.24 ± 0.11	9.1 ± 1.0
B04&B09SL-727-01	0.05 ± 0.05	2.0 ± 0.6
B04&B09SL-728-01	0.16 ± 0.10	2.2 ± 0.5
B04&B09SL-729-01	0.15 ± 0.11	17.4 ± 1.7
B04&B09SL-730-01	0.37 ± 0.15	48 ± 3
B04&B09SL-731-01	0.15 ± 0.11	10.9 ± 1.2
B04&B09SL-732-01	0.01 ± 0.01	2.8 ± 0.6
B04&B09SL-733-01	0.11 ± 0.15	3.6 ± 0.7
B04&B09SL-734-01	0.15 ± 0.11	10.9 ± 1.2
B04&B09SL-736-01	0.22 ± 0.12	5.7 ± 0.9
B04&B09SL-738-01	0.06 ± 0.05	0.7 ± 0.4
B04&B09SL-739-01	0.09 ± 0.10	2.2 ± 0.6
B04&B09SL-740-01	0.07 ± 0.13	2.7 ± 0.5
B04&B09SL-741-01	0.25 ± 0.12	12.4 ± 1.2
B06SL-001-01	0.46 ± 0.20	1.8 ± 0.6
B06SL-001-02	0.82 ± 0.16	0.6 ± 0.4
B06SL-002-01	0.74 ± 0.16	2.1 ± 0.8
B06SL-002-02	1.04 ± 0.19	1.8 ± 0.6
B06SL-003-01	0.31 ± 0.15	8.8 ± 1.4
B06SL-003-03	0.71 ± 0.20	1.6 ± 0.5
B06SL-004-01	0.15 ± 0.12	4.4 ± 0.9
B06SL-004-05	0.50 ± 0.15	27.8 ± 1.7
B06SL-005-01	0.43 ± 0.16	43 ± 2
B06SL-005-03	0.63 ± 0.14	1.2 ± 0.5

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B06SL-006-01	0.57 ± 0.16	14.4 ± 1.7
B06SL-006-02	1.43 ± 0.19	67 ± 3
B06SL-007-01	0.41 ± 0.16	2.0 ± 0.7
B06SL-007-02	1.26 ± 0.18	2.3 ± 0.7
B06SL-008-01	0.19 ± 0.15	1.6 ± 0.4
B06SL-008-14	0.93 ± 0.17	1.6 ± 0.5
B06SL-009-01	0.9 ± 0.2	2.1 ± 0.8
B06SL-009-06	0.99 ± 0.18	1.3 ± 0.6
B06SL-010-01	0.48 ± 0.20	1.1 ± 0.5
B06SL-010-02	0.31 ± 0.20	0 ± 186
B06SL-011-01	0.94 ± 0.18	2.0 ± 0.6
B06SL-011-02	0.95 ± 0.20	2.3 ± 0.7
B06SL-011-05	1.7 ± 0.3	28 ± 2
B06SL-012-01	0.69 ± 0.14	1.6 ± 0.6
B06SL-012-06	0.9 ± 0.2	2.0 ± 0.6
B06SL-013-01	0.36 ± 0.13	1.4 ± 0.5
B06SL-013-02	0.32 ± 0.12	0.6 ± 0.4
B06SL-014-01	0.46 ± 0.16	0.9 ± 0.5
B06SL-014-05	0.83 ± 0.16	1.0 ± 0.7
B06SL-015-01	0.28 ± 0.11	0.06 ± 0.06
B06SL-015-06	0.94 ± 0.19	1.2 ± 0.6
B06SL-016-01	0.49 ± 0.16	4.1 ± 0.9
B06SL-016-05	0.48 ± 0.18	4.9 ± 1.5
B06SL-017-01	0.47 ± 0.13	2.4 ± 0.6
B06SL-017-02	0.38 ± 0.15	0.6 ± 0.8
B06SL-018-01	0.55 ± 0.16	2.2 ± 0.6
B06SL-019-01	0.5 ± 0.2	1.5 ± 0.4
B06SL-020-01	0.34 ± 0.13	1.5 ± 0.6
B06SL-020-02	0.39 ± 0.16	2.2 ± 0.6
B06SL-021-01	22.3 ± 0.9	11 ± 2
B06SL-021-05	18.5 ± 0.8	8.6 ± 1.8
B06SL-021-06	3.1 ± 0.3	2.2 ± 1.3
B06SL-021-07	1.3 ± 0.2	0.9 ± 0.8
B06SL-022-01	0.52 ± 0.15	3.2 ± 0.9
B06SL-022-06	1.17 ± 0.17	3.5 ± 0.7
B06SL-023-01	0.44 ± 0.14	1.1 ± 0.6
B06SL-023-03	0.65 ± 0.15	1.7 ± 0.6
B06SL-024-01	1.6 ± 0.3	10.1 ± 1.9
B06SL-024-04	0.79 ± 0.18	1.2 ± 1.0
B06SL-301-01	0.38 ± 0.15	0.8 ± 0.7
B06SL-301-02	0.4 ± 0.2	0.4 ± 0.5
B06SL-302-01	0.30 ± 0.17	1.5 ± 0.6

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B06SL-702-01	0.5 ± 0.3	46 ± 4
B06SL-707-01	0.41 ± 0.19	36 ± 3
B06SL-708-01	1.5 ± 0.2	45 ± 3
B06SL-709-01	0.23 ± 0.19	17 ± 3
B06SL-717-01	0.9 ± 0.3	19 ± 2
B08SL-001-01	1.5 ± 0.3	15.9 ± 1.8
B08SL-001-02	1.3 ± 0.2	1.5 ± 0.7
B08SL-002-01	0.24 ± 0.13	17.9 ± 1.7
B08SL-002-02	0.80 ± 0.18	28 ± 2
B08SL-003-01	1.2 ± 0.6	1944 ± 19
B08SL-003-05	0.6 ± 0.3	530 ± 10
B08SL-004-01	1.06 ± 0.19	8.8 ± 1.0
B08SL-004-02	0.59 ± 0.17	2.0 ± 0.6
B08SL-005-01	0.7 ± 0.2	3.9 ± 1.1
B08SL-005-02	1.05 ± 0.19	1.4 ± 0.7
B08SL-006-01	0.36 ± 0.16	4.5 ± 1.2
B08SL-006-02	0.9 ± 0.2	4.4 ± 1.0
B08SL-007-01	0.73 ± 0.17	9.8 ± 1.2
B08SL-007-02	0.92 ± 0.19	4.6 ± 1.5
B08SL-008-01	0.36 ± 0.16	11.7 ± 1.5
B08SL-008-02	0.77 ± 0.20	5.6 ± 1.2
B08SL-009-01	0.50 ± 0.17	11.0 ± 1.5
B08SL-009-02	1.2 ± 0.2	7.6 ± 1.3
B08SL-010-01	0.41 ± 0.14	15.4 ± 1.6
B08SL-010-02	1.0 ± 0.2	2.7 ± 1.0
B08SL-011-01	0.42 ± 0.15	3.0 ± 0.7
B08SL-011-03	1.1 ± 0.3	1.9 ± 0.9
B08SL-012-01	0.54 ± 0.18	15.8 ± 1.8
B08SL-012-02	1.3 ± 0.3	4.0 ± 1.0
B08SL-013-01	1.00 ± 0.19	2.6 ± 1.1
B08SL-013-02	1.0 ± 0.2	2.4 ± 0.8
B08SL-014-01	1.1 ± 0.3	225 ± 6
B08SL-014-05	0.8 ± 0.2	90 ± 4
B08SL-015-01	0.5 ± 0.3	369 ± 8
B08SL-015-09	1.3 ± 0.5	1001 ± 12
B08SL-015-10	0.9 ± 0.2	11.3 ± 1.9
B08SL-016-01	0.15 ± 0.14	21.1 ± 1.8
B08SL-016-06	0.89 ± 0.20	4.1 ± 0.7
B08SL-017-01	1.2 ± 1.2	5417 ± 31
B08SL-017-05	0.6 ± 0.8	2311 ± 26
B08SL-018-01	0.43 ± 0.16	8.3 ± 1.6
B08SL-018-02	0.6 ± 0.3	2.9 ± 0.8

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B08SL-019-01	0.46 ± 0.15	3.1 ± 1.0
B08SL-019-03	0.7 ± 0.2	1.5 ± 0.8
B08SL-020-01	1.0 ± 0.3	95 ± 4
B08SL-021-01	0.84 ± 0.18	74 ± 4
B08SL-021-06	0.6 ± 0.3	306 ± 6
B08SL-022-01	2.2 ± 0.3	122 ± 4
B08SL-022-02	1.4 ± 0.2	17.6 ± 1.9
B08SL-023-01	5.2 ± 0.4	232 ± 6
B08SL-023-03	8.1 ± 0.6	338 ± 8
B08SL-023-07	1.2 ± 0.3	57 ± 3
B08SL-023-08	0.7 ± 0.2	17.1 ± 1.8
B08SL-024-01	0.58 ± 0.20	2.7 ± 0.7
B08SL-024-03	0.89 ± 0.20	1.0 ± 0.6
B08SL-025-01	0.85 ± 0.16	1.9 ± 0.7
B08SL-026-01	3.2 ± 0.3	81 ± 3
B08SL-026-02	3.5 ± 0.4	126 ± 4
B08SL-027-01	0.77 ± 0.19	97 ± 4
B08SL-027-02	1.07 ± 0.19	68 ± 3
B08SL-028-01	0.63 ± 0.20	13.2 ± 2.0
B08SL-028-05	1.6 ± 0.2	6.5 ± 1.2
B08SL-028-06	0.62 ± 0.17	1.7 ± 0.5
B08SL-301-01	0.7 ± 0.2	28.5 ± 2.0
B08SL-301-02	0.69 ± 0.19	1.6 ± 0.8
B08SL-302-01	0.6 ± 0.3	1.4 ± 0.8
B08SL-302-03	0.28 ± 0.13	4.9 ± 0.9
B08SL-304-01	23.3 ± 1.2	19 ± 4
B08SL-304-06	0.6 ± 0.2	2.2 ± 0.8
B08SL-305-01	0.29 ± 0.17	42 ± 3
B08SL-725-01	0.6 ± 0.3	18 ± 2
B24SL-001-01	0.16 ± 0.11	0.7 ± 0.4
B24SL-001-03	0.42 ± 0.18	0.7 ± 0.5
B24SL-002-01	0.42 ± 0.13	0.9 ± 0.4
B24SL-003-01	0.45 ± 0.16	0.8 ± 0.4
B24SL-003-02	0.48 ± 0.16	0.8 ± 0.5
B24SL-004-01	0.46 ± 0.16	0.9 ± 0.6
B24SL-005-01	0.38 ± 0.14	0.7 ± 0.4
B24SL-005-02	0.43 ± 0.15	0.7 ± 0.5
B24SL-006-01	0.58 ± 0.14	3.1 ± 0.7
B24SL-007-01	0.56 ± 0.19	0.7 ± 0.5
B24SL-008-01	0.43 ± 0.20	0.3 ± 0.8
B24SL-008-02	0.52 ± 0.14	1.1 ± 0.4
B24SL-009-01	0.57 ± 0.18	0.8 ± 0.4

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B24SL-009-02	0.63 ± 0.15	0.5 ± 0.4
B24SL-010-01	0.47 ± 0.14	0.6 ± 0.5
B24SL-010-02	0.53 ± 0.13	0.9 ± 0.5
B24SL-011-01	0.54 ± 0.19	0.7 ± 0.8
B24SL-011-02	0.47 ± 0.14	0.4 ± 0.4
B24SL-012-01	0.50 ± 0.15	0.5 ± 0.4
B24SL-013-01	0.51 ± 0.20	0.9 ± 0.7
B24SL-014-01	0.42 ± 0.15	0.6 ± 0.5
B24SL-014-02	0.66 ± 0.16	1.2 ± 0.4
B24SL-015-01	0.70 ± 0.18	0.7 ± 0.6
B24SL-016-01	0.56 ± 0.15	0.9 ± 0.5
B24SL-017-01	0.43 ± 0.17	1.9 ± 0.7
B24SL-018-01	0.84 ± 0.19	2.3 ± 0.7
B24SL-018-02	1.3 ± 0.2	1.5 ± 0.6
B24SL-018-03	1.4 ± 0.3	1.0 ± 0.6
B24SL-019-01	1.4 ± 0.3	3.1 ± 0.7
B24SL-019-02	2.0 ± 0.2	3.0 ± 0.8
B24SL-021-01	0.68 ± 0.16	20.5 ± 1.7
B24SL-021-02	1.1 ± 0.2	3.4 ± 1.2
B24SL-022-01	1.2 ± 0.2	4.9 ± 1.3
B24SL-023-01	0.72 ± 0.17	1.8 ± 0.7
B24SL-023-02	1.4 ± 0.3	2.6 ± 0.9
B24SL-025-01	1.10 ± 0.20	1.7 ± 0.9
B24SL-025-02	1.6 ± 0.3	1.9 ± 0.8
B24SL-026-01	0.90 ± 0.19	5.6 ± 1.4
B24SL-026-02	1.16 ± 0.18	2.8 ± 0.6
B24SL-027-01	1.2 ± 0.3	1.4 ± 1.0
B24SL-027-02	0.95 ± 0.19	1.0 ± 0.6
B24SL-028-01	1.2 ± 0.2	3.6 ± 1.3
B24SL-028-02	0.72 ± 0.17	1.6 ± 0.5
B24SL-029-01	0.18 ± 0.09	3.7 ± 0.8
B24SL-029-02	0.59 ± 0.17	3.5 ± 0.9
B24SL-030-01	0.95 ± 0.19	4.9 ± 1.0
B24SL-030-02	0.66 ± 0.17	1.7 ± 0.6
B24SL-031-01	0.71 ± 0.17	2.2 ± 0.8
B24SL-031-02	0.83 ± 0.17	1.4 ± 0.6
B24SL-032-01	1.02 ± 0.20	4.7 ± 0.7
B24SL-033-01	0.56 ± 0.17	13.4 ± 1.4
B24SL-034-01	0.83 ± 0.20	7.9 ± 1.6
B24SL-034-02	0.8 ± 0.2	2.9 ± 0.7
B24SL-301-01	0.66 ± 0.15	8.0 ± 1.3
B24SL-301-02	1.7 ± 0.2	35 ± 2

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B24SL-302-01	0.5 ± 0.3	5.1 ± 1.5
B24SL-302-05	0.6 ± 0.3	1.9 ± 0.9
B24SL-303-01	0.72 ± 0.20	12.9 ± 1.8
B24SL-303-02	0.7 ± 0.3	1.0 ± 1.1
B24SL-304-01	0.64 ± 0.18	2.9 ± 0.5
B24SL-305-01	0.6 ± 0.2	1.6 ± 0.9
B24SL-305-03	0.40 ± 0.16	1.0 ± 0.6
B24SL-601-01	14.8 ± 0.8	1697 ± 12
B24SL-602-01	17.8 ± 1.1	1795 ± 12
B24SL-603-01	3.6 ± 0.7	470 ± 8
B24SL-701-01	0.04 ± 0.07	0.8 ± 0.4
B24SL-704-01	0.27 ± 0.13	1.0 ± 0.4
B24SL-715-01	0.18 ± 0.10	1.3 ± 0.4
B24SL-716-01	0.07 ± 0.05	0.20 ± 0.14
B24SL-718-01	0.6 ± 0.2	8.3 ± 1.2
B24SL-720-01	0.11 ± 0.11	0.8 ± 0.3
B24SL-722-01	0.31 ± 0.13	2.6 ± 0.6
B24SL-723-01	0.37 ± 0.18	25.9 ± 2.0
B24SL-731-01	0.92 ± 0.19	58 ± 3
B24SL-732-01	1.0 ± 0.2	39 ± 2
B35SL-001-01	1.2 ± 0.2	4.9 ± 0.8
B35SL-001-05	3.3 ± 0.3	6.1 ± 1.0
B35SL-001-07	0.7 ± 0.2	1.3 ± 0.5
B35SL-002-01	1.7 ± 0.2	2.2 ± 0.8
B35SL-002-06	0.83 ± 0.20	1.4 ± 0.8
B35SL-002-07	0.66 ± 0.19	0.9 ± 0.7
B35SL-003-01	1.7 ± 0.3	3.0 ± 0.8
B35SL-003-07	2.2 ± 0.3	2.0 ± 0.6
B35SL-003-09	0.53 ± 0.17	1.1 ± 0.5
B35SL-004-01	0.86 ± 0.18	1.1 ± 0.6
B35SL-004-06	3.1 ± 0.3	1.4 ± 0.8
B35SL-004-07	0.83 ± 0.17	0.9 ± 0.6
B35SL-301-01	0.37 ± 0.13	0.5 ± 0.4
B35SL-301-07	2.7 ± 0.3	0.8 ± 0.6
B35SL-302-01	0.8 ± 0.2	0.6 ± 0.8
B35SL-302-06	2.2 ± 0.3	2.7 ± 0.8
B35SL-303-01	0.6 ± 0.2	1.6 ± 0.7
B35SL-303-03	1.47 ± 0.20	2.0 ± 0.8
B35SL-303-05	0.96 ± 0.17	2.2 ± 0.9
B35SL-304-01	0.29 ± 0.15	5.1 ± 1.0
B35SL-304-07	1.8 ± 0.2	4.8 ± 0.8
B35SL-305-01	0.65 ± 0.17	0.8 ± 0.5

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
B35SL-305-03	1.6 ± 0.2	2.5 ± 1.0
B35SL-305-05	0.64 ± 0.19	1.0 ± 0.6
BKGSL-001-01	0.79 ± 0.20	1.5 ± 0.9
BKGSL-001-02	0.7 ± 0.2	1.4 ± 0.8
BKGSL-001-03	1.0 ± 0.3	1.3 ± 0.8
BKGSL-001-04	0.74 ± 0.19	0.7 ± 0.7
BKGSL-001-05	0.50 ± 0.17	0.8 ± 0.6
BKGSL-001-06	0.67 ± 0.19	1.3 ± 0.5
BKGSL-001-07	0.40 ± 0.18	1.0 ± 0.7
BKGSL-001-08	0.73 ± 0.19	0.9 ± 0.6
BKGSL-001-09	0.6 ± 0.2	1.0 ± 0.7
BKGSL-001-10	0.57 ± 0.20	0.9 ± 0.7
BKGSL-002-01	0.85 ± 0.17	1.4 ± 0.6
BKGSL-002-02	0.7 ± 0.2	1.5 ± 0.8
BKGSL-002-03	0.84 ± 0.20	0.9 ± 0.7
BKGSL-002-04	0.68 ± 0.19	1.3 ± 0.8
BKGSL-002-05	0.45 ± 0.19	0.5 ± 0.6
BKGSL-002-06	0.50 ± 0.17	0.7 ± 0.6
BKGSL-002-07	0.68 ± 0.17	0.9 ± 0.5
BKGSL-003-01	0.9 ± 0.2	1.9 ± 0.8
BKGSL-003-02	0.94 ± 0.18	1.3 ± 0.6
BKGSL-003-03	1.0 ± 0.2	1.2 ± 0.7
BKGSL-003-04	0.8 ± 0.2	0.5 ± 0.5
BKGSL-003-05	0.57 ± 0.18	0.6 ± 0.5
BKGSL-003-06	0.47 ± 0.16	0.7 ± 0.5
BKGSL-003-07	0.59 ± 0.17	0.8 ± 0.5
BKGSL-003-08	0.62 ± 0.19	0.8 ± 0.5
BKGSL-003-09	0.94 ± 0.20	1.3 ± 0.7
BKGSL-003-10	0.6 ± 0.2	1.0 ± 0.6
BKGSL-003-11	0.6 ± 0.2	1.0 ± 0.6
BKGSL-003-12	0.41 ± 0.16	0.8 ± 0.6
BKGSL-004-01	1.2 ± 0.2	0.9 ± 0.8
BKGSL-004-02	0.71 ± 0.17	1.6 ± 1.0
BKGSL-004-03	0.7 ± 0.2	0.9 ± 0.6
BKGSL-004-04	0.65 ± 0.17	1.0 ± 0.6
BKGSL-004-05	0.6 ± 0.2	0.6 ± 0.7
BKGSL-004-06	0.46 ± 0.17	0.7 ± 0.6
BKGSL-005-01	0.66 ± 0.18	1.4 ± 0.6
BKGSL-005-02	0.86 ± 0.18	1.5 ± 0.6
BKGSL-005-03	0.57 ± 0.20	0.8 ± 0.6
BKGSL-005-04	0.54 ± 0.15	0.4 ± 0.6
BKGSL-005-05	0.48 ± 0.17	0.9 ± 0.7

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
BKGSL-005-06	0.44 ± 0.15	0.7 ± 0.6
BKGSL-005-07	0.52 ± 0.16	1.0 ± 0.6
BKGSL-005-08	0.61 ± 0.16	0.7 ± 0.6
BKGSL-005-09	0.36 ± 0.18	0.9 ± 0.5
BKGSL-005-10	0.49 ± 0.17	0.6 ± 0.4
BKGSL-006-01	1.05 ± 0.19	0.9 ± 0.8
BKGSL-006-02	1.0 ± 0.2	1.9 ± 0.8
BKGSL-006-03	1.1 ± 0.2	1.5 ± 0.7
BKGSL-006-04	0.71 ± 0.16	0.7 ± 0.6
BKGSL-006-05	0.54 ± 0.14	0.6 ± 0.4
BKGSL-006-06	0.39 ± 0.18	1.0 ± 0.7
BKGSL-006-07	0.57 ± 0.17	0.6 ± 0.6
BKGSL-006-08	0.47 ± 0.17	0.4 ± 0.3
BKGSL-006-09	0.42 ± 0.15	0.7 ± 0.5
BKGSL-007-01	1.0 ± 0.2	1.0 ± 0.5
BKGSL-007-02	1.3 ± 0.2	1.3 ± 0.6
BKGSL-007-03	0.9 ± 0.2	0.8 ± 0.8
BKGSL-007-04	0.85 ± 0.17	1.6 ± 0.3
BKGSL-007-05	0.7 ± 0.2	1.0 ± 0.8
BKGSL-007-06	0.55 ± 0.16	0.9 ± 0.5
BKGSL-008-01	1.06 ± 0.18	0.9 ± 0.6
BKGSL-008-02	0.50 ± 0.16	0.6 ± 0.5
BKGSL-008-03	0.83 ± 0.20	1.8 ± 0.8
BKGSL-008-04	0.6 ± 0.2	0.9 ± 0.7
BKGSL-008-05	0.44 ± 0.18	0.7 ± 0.5
BKGSL-008-06	0.46 ± 0.15	0.7 ± 0.5
BKGSL-008-07	1.1 ± 0.2	1.4 ± 0.6
BKGSL-008-08	0.54 ± 0.18	0.7 ± 0.4
BKGSL-008-09	0.39 ± 0.18	1.0 ± 0.7
BKGSL-008-10	0.61 ± 0.18	0.7 ± 0.5
BKGSL-008-11	0.69 ± 0.20	0.6 ± 0.6
BKGSL-009-01	0.9 ± 0.4	1.5 ± 0.9
BKGSL-009-02	0.9 ± 0.3	1.2 ± 0.7
BKGSL-009-03	0.8 ± 0.2	1.7 ± 0.8
BKGSL-009-04	0.46 ± 0.19	0.9 ± 0.7
BKGSL-009-05	0.36 ± 0.17	0.7 ± 0.6
BKGSL-009-06	0.42 ± 0.14	0.3 ± 0.4
BKGSL-009-07	0.46 ± 0.14	0.7 ± 0.6
BKGSL-009-08	0.48 ± 0.17	0.9 ± 0.7
BKGSL-009-09	0.61 ± 0.18	0.18 ± 0.16
BKGSL-009-10	0.66 ± 0.20	1.0 ± 0.7
BKGSL-010-01	0.8 ± 0.2	0.8 ± 0.7

TABLE 3-5
ON-SITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR ^{232}TH AND ^{238}U CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{232}Th	^{238}U
BKGSL-010-02	0.99 ± 0.18	1.1 ± 0.7
BKGSL-010-03	1.4 ± 0.3	1.2 ± 0.6
BKGSL-010-04	0.86 ± 0.16	0.8 ± 0.4
BKGSL-010-05	0.57 ± 0.16	0.5 ± 0.6
BKGSL-010-06	0.73 ± 0.16	0.7 ± 0.5
BKGSL-010-07	0.56 ± 0.19	0.7 ± 0.5
BKGSL-010-08	0.53 ± 0.13	0.6 ± 0.5
BKGSL-010-09	0.54 ± 0.15	0.9 ± 0.5
BKGSL-011-01	0.6 ± 0.2	1.6 ± 0.7
BKGSL-011-02	1.1 ± 0.2	0.9 ± 0.6
BKGSL-011-03	0.8 ± 0.2	1.2 ± 0.6
BKGSL-011-04	0.6 ± 0.2	1.7 ± 0.7
BKGSL-011-05	0.69 ± 0.20	1.0 ± 0.6
BKGSL-011-06	0.50 ± 0.16	0.7 ± 0.9
BKGSL-011-07	0.33 ± 0.16	0.7 ± 0.5
BKGSL-011-08	1.0 ± 0.2	1.7 ± 1.0
BKGSL-011-09	0.46 ± 0.20	1.2 ± 0.6
BKGSL-011-10	0.44 ± 0.16	0.7 ± 0.5
BKGSL-012-01	0.74 ± 0.17	1.2 ± 0.7
BKGSL-012-02	0.8 ± 0.2	1.4 ± 0.7
BKGSL-012-03	1.4 ± 0.2	1.1 ± 0.6
BKGSL-012-04	0.7 ± 0.2	1.4 ± 0.8
BKGSL-012-05	0.54 ± 0.15	0.8 ± 0.5

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

TABLE 3-6
OFFSITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR COPCS IN SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)				
	^{226}Ra	^{228}Ra [b]	^{232}Th [b]	^{235}U	^{238}U [c]
A02SL-009-04	1.21 ± 0.19	1.1 ± 0.3	1.1 ± 0.3	0.2 ± 0.3	2.8 ± 1.1
A02SL-012-02	0.33 ± 0.12	0.47 ± 0.15	0.47 ± 0.15	0.2 ± 0.2	2.4 ± 0.6
A02SL-013-01	0.29 ± 0.13	0.18 ± 0.13	0.18 ± 0.13	0.03 ± 0.13	0.0 ± 0.5
A02SL-018-03	1.6 ± 0.3	1.1 ± 0.3	1.1 ± 0.3	0.1 ± 0.4	5 ± 2
A02SL-019-06	1.2 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	-0.1 ± 0.4	1.7 ± 0.9
A02SL-020-02	2.4 ± 0.4	1.2 ± 0.3	1.2 ± 0.3	0.0 ± 0.4	1.7 ± 0.9
A02SL-020-03	1.8 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	0.1 ± 0.3	0.7 ± 1.2
A02SL-028-01	0.13 ± 0.16	1.6 ± 0.3	1.6 ± 0.3	5.3 ± 0.7	114 ± 9
A02SL-037-06	1.0 ± 0.2	1.2 ± 0.3	1.2 ± 0.3	0.2 ± 0.4	1.0 ± 1.3
A03SL-009-01	0.81 ± 0.14	1.0 ± 0.2	1.0 ± 0.2	0.05 ± 0.20	1.0 ± 0.4
A03SL-015-02	0.86 ± 0.17	0.9 ± 0.2	0.9 ± 0.2	0.2 ± 0.2	1.1 ± 0.9
A03SL-018-01	1.4 ± 0.3	0.8 ± 0.2	0.8 ± 0.2	0.4 ± 0.3	3.0 ± 1.0
A03SL-036-01	0.9 ± 0.3	0.5 ± 0.3	0.5 ± 0.3	0.0 ± 0.5	5.8 ± 1.6
A03SL-217-13	0.15 ± 0.11	0.27 ± 0.19	0.27 ± 0.19	4.4 ± 0.8	37 ± 4
A03SL-226-01	0.52 ± 0.12	0.42 ± 0.14	0.42 ± 0.14	0.22 ± 0.18	3.2 ± 0.6
A03SL-232-06	0.61 ± 0.12	0.61 ± 0.12	0.61 ± 0.12	0.30 ± 0.18	3.9 ± 0.6
A03SL-233-07	0.42 ± 0.14	2.1 ± 0.3	2.1 ± 0.3	0.2 ± 0.3	2.0 ± 0.6
A04ASL-003-01	0.77 ± 0.11	0.87 ± 0.12	0.87 ± 0.12	0.29 ± 0.18	4.3 ± 0.6
A04ASL-038-01	—	0.73 ± 0.19	0.73 ± 0.19	0.1 ± 0.3	4.7 ± 1.0
A04ASL-051-01	0.48 ± 0.14	1.3 ± 0.3	1.3 ± 0.3	4.4 ± 0.7	30 ± 3
A04ASL-203-01	0.51 ± 0.13	0.42 ± 0.17	0.42 ± 0.17	0.3 ± 0.2	2.7 ± 0.7
A04ASL-214-05	0.61 ± 0.16	0.66 ± 0.19	0.66 ± 0.19	6.4 ± 0.8	58 ± 5
A04ASL-239-03	0.97 ± 0.16	0.93 ± 0.20	0.93 ± 0.20	0.3 ± 0.3	4.7 ± 1.7
A04ASL-243-03	1.0 ± 0.3	0.8 ± 0.3	0.8 ± 0.3	0.3 ± 0.3	5.1 ± 1.1
A04ASL-244-01	0.78 ± 0.13	0.95 ± 0.16	0.95 ± 0.16	0.2 ± 0.2	4.7 ± 0.7
A04ASL-249-03	1.3 ± 0.2	1.3 ± 0.2	1.3 ± 0.2	0.1 ± 0.3	2 ± 3
A04ASL-274-02	0.74 ± 0.15	0.51 ± 0.19	0.51 ± 0.19	0.2 ± 0.3	5 ± 3
A04ASL-278-10	0.60 ± 0.17	0.7 ± 0.2	0.7 ± 0.2	10.4 ± 1.2	121 ± 10
A04ASL-303-03	1.9 ± 0.3	1.0 ± 0.3	1.0 ± 0.3	0.0 ± 0.9	4.2 ± 1.4
A04ASL-318-01	0.48 ± 0.12	0.47 ± 0.20	0.47 ± 0.20	0.3 ± 0.2	6.0 ± 0.9
A04ASL-322-09	0.47 ± 0.14	0.48 ± 0.17	0.48 ± 0.17	0.02 ± 0.20	0.7 ± 1.0
A04BSL-007-06	0.89 ± 0.18	0.9 ± 0.3	0.9 ± 0.3	0.2 ± 0.4	4.1 ± 1.9
A04BSL-013-07	0.76 ± 0.20	1.1 ± 0.3	1.1 ± 0.3	0.1 ± 0.4	4.9 ± 1.2
A04BSL-016-01	1.30 ± 0.18	0.83 ± 0.16	0.83 ± 0.16	0.1 ± 0.2	1 ± 3
A04BSL-018-06	1.0 ± 0.2	0.9 ± 0.3	0.9 ± 0.3	0.2 ± 0.3	1.4 ± 1.1
A04BSL-042-02	1.00 ± 0.19	0.6 ± 0.3	0.6 ± 0.3	0.1 ± 0.2	1.3 ± 0.7
A04BSL-301-01	0.19 ± 0.10	0.09 ± 0.16	0.09 ± 0.16	0.02 ± 0.12	-0.1 ± 0.8
A04CSL-013-02	1.05 ± 0.12	0.89 ± 0.15	0.89 ± 0.15	0.20 ± 0.20	3.6 ± 0.5
A04CSL-313-01	0.07 ± 0.06	0.07 ± 0.10	0.07 ± 0.10	0.10 ± 0.11	0.3 ± 0.4
A04DSL-014-01	0.26 ± 0.11	0.07 ± 0.17	0.07 ± 0.17	0.08 ± 0.13	0.1 ± 0.5
A04DSL-021-01	1.11 ± 0.12	1.32 ± 0.15	1.32 ± 0.15	0.14 ± 0.17	1.1 ± 0.4

TABLE 3-6
OFFSITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR COPCS IN SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)				
	^{226}Ra	^{228}Ra [b]	^{232}Th [b]	^{235}U	^{238}U [c]
A04DSL-026-01	1.6 ± 0.3	1.0 ± 0.3	1.0 ± 0.3	0.3 ± 0.4	3.0 ± 1.0
A04DSL-028-02	1.3 ± 0.3	1.0 ± 0.3	1.0 ± 0.3	0.2 ± 0.3	1.3 ± 0.7
A04DSL-029-01	1.2 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	0.0 ± 1.3	2.0 ± 0.9
A04DSL-210-02	1.2 ± 0.2	1.0 ± 0.2	1.0 ± 0.2	0.2 ± 0.3	2.2 ± 0.9
A04DSL-214-02	0.92 ± 0.19	0.9 ± 0.2	0.9 ± 0.2	0.3 ± 0.4	2.7 ± 1.0
A04DSL-223-02	1.1 ± 0.2	1.1 ± 0.3	1.1 ± 0.3	0.3 ± 0.3	2.8 ± 1.0
A04DSL-307-01	1.05 ± 0.17	1.5 ± 0.2	1.5 ± 0.2	0.06 ± 0.18	1.9 ± 0.7
A04DSL-308-01	1.04 ± 0.14	0.98 ± 0.18	0.98 ± 0.18	0.1 ± 0.2	3.1 ± 0.6
A04DSL-314-02	1.4 ± 0.3	1.2 ± 0.4	1.2 ± 0.4	0.2 ± 0.4	3.5 ± 1.2
A04DSL-315-02	1.6 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	0.0 ± 0.4	2.3 ± 0.8
A04DSL-318-02	1.2 ± 0.2	1.2 ± 0.3	1.2 ± 0.3	0.2 ± 0.3	1.3 ± 0.7
A04DSL-326-01	1.1 ± 0.2	3.6 ± 0.4	3.6 ± 0.4	0.4 ± 0.4	9 ± 2
A05ASL-004-01	0.9 ± 0.2	0.8 ± 0.3	0.8 ± 0.3	0.3 ± 0.3	3.3 ± 1.0
A05ASL-019-01	0.99 ± 0.18	0.9 ± 0.3	0.9 ± 0.3	0.0 ± 0.3	4.1 ± 0.7
A05ASL-211-01	1.6 ± 0.3	1.3 ± 0.3	1.3 ± 0.3	-0.2 ± 0.5	0.7 ± 1.4
A05ASL-219-02	0.68 ± 0.19	1.2 ± 0.4	1.2 ± 0.4	0.4 ± 0.4	4.5 ± 1.1
A05ASL-301-01	1.3 ± 0.6	48 ± 4	48 ± 4	183 ± 12	2570 ± 190
A05ASL-301-02	0.7 ± 0.5	16.1 ± 1.4	16.1 ± 1.4	79 ± 6	1200 ± 89
A05ASL-301-06	0.6 ± 0.2	3.7 ± 0.5	3.7 ± 0.5	15.2 ± 1.7	212 ± 16
A05ASL-305-03	0.66 ± 0.09	1.11 ± 0.14	1.11 ± 0.14	0.14 ± 0.17	2.9 ± 0.6
A05ASL-308-01	1.5 ± 0.3	1.3 ± 0.4	1.3 ± 0.4	0.2 ± 0.3	1.1 ± 0.6
A05BSL-001-03	0.82 ± 0.19	—	—	—	—
A05BSL-001-13	—	0.6 ± 0.2	0.6 ± 0.2	0.1 ± 0.3	0.9 ± 1.4
A05BSL-002-11	0.87 ± 0.14	0.80 ± 0.17	0.80 ± 0.17	0.1 ± 0.2	0.7 ± 0.7
A05BSL-005-01	1.0 ± 0.2	0.6 ± 0.3	0.6 ± 0.3	0.2 ± 0.4	2.0 ± 0.9
A05BSL-011-01	0.82 ± 0.20	0.6 ± 0.2	0.6 ± 0.2	0.1 ± 0.3	0.7 ± 1.3
A10SL-301-01	0.65 ± 0.17	0.7 ± 0.2	0.7 ± 0.2	0.2 ± 0.4	4.9 ± 1.1
A10SL-302-01	0.40 ± 0.11	0.17 ± 0.16	0.17 ± 0.16	0.07 ± 0.16	0.0 ± 0.6
B02SL-012-02	0.78 ± 0.16	1.0 ± 0.2	1.0 ± 0.2	0.1 ± 0.4	4.9 ± 1.0
B02SL-053-02	0.51 ± 0.19	0.3 ± 0.3	0.3 ± 0.3	0.0 ± 0.2	0.0 ± 0.8
B02SL-055-02	1.2 ± 0.3	1.6 ± 0.4	1.6 ± 0.4	0.1 ± 0.4	1.5 ± 1.5
B02SL-059-02	1.0 ± 0.2	1.0 ± 0.3	1.0 ± 0.3	0.1 ± 0.3	3.8 ± 1.0
B03SL-014-05	0.04 ± 0.17	0.6 ± 0.2	0.6 ± 0.2	14.9 ± 1.5	85 ± 7
B03SL-016-05	1.16 ± 0.19	0.95 ± 0.19	0.95 ± 0.19	2.1 ± 0.5	19 ± 2
B03SL-027-03	1.5 ± 0.3	1.2 ± 0.2	1.2 ± 0.2	0.2 ± 0.3	-2 ± 8
B03SL-033-01	1.3 ± 0.3	0.8 ± 0.3	0.8 ± 0.3	0.2 ± 0.4	4.1 ± 1.3
B03SL-034-01	0.21 ± 0.07	0.15 ± 0.09	0.15 ± 0.09	0.03 ± 0.12	0.1 ± 0.4
B03SL-036-01	1.8 ± 0.3	0.8 ± 0.3	0.8 ± 0.3	0.3 ± 0.4	3.6 ± 1.0
B03SL-036-02	1.6 ± 0.3	1.4 ± 0.3	1.4 ± 0.3	0.1 ± 0.3	1.5 ± 0.7
B03SL-037-01	0.53 ± 0.13	0.32 ± 0.16	0.32 ± 0.16	0.2 ± 0.2	1.8 ± 0.8
B04&B09SL-024-01	0.74 ± 0.17	1.1 ± 0.2	1.1 ± 0.2	0.2 ± 0.3	2.3 ± 1.3

TABLE 3-6
OFFSITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR COPCS IN SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)				
	^{226}Ra	^{228}Ra [b]	^{232}Th [b]	^{235}U	^{238}U [c]
B04&B09SL-025-02	1.4 ± 0.3	1.3 ± 0.4	1.3 ± 0.4	0.4 ± 0.5	2.9 ± 1.2
B04&B09SL-032-01	1.50 ± 0.18	1.1 ± 0.2	1.1 ± 0.2	0.2 ± 0.2	2.1 ± 0.7
B04&B09SL-032-02	0.30 ± 0.14	0.17 ± 0.13	0.17 ± 0.13	0.08 ± 0.17	0.2 ± 0.7
B04&B09SL-036-02	1.29 ± 0.18	1.4 ± 0.2	1.4 ± 0.2	0.14 ± 0.18	1.6 ± 0.8
B04&B09SL-037-01	1.3 ± 0.2	0.9 ± 0.3	0.9 ± 0.3	0.2 ± 0.3	0.9 ± 0.9
B04&B09SL-038-03	0.9 ± 0.2	0.9 ± 0.3	0.9 ± 0.3	0.3 ± 0.3	0.4 ± 1.2
B04&B09SL-040-01	2.1 ± 0.3	0.7 ± 0.3	0.7 ± 0.3	0.0 ± 1.2	2.7 ± 0.8
B06SL-013-02	0.33 ± 0.14	0.27 ± 0.15	0.27 ± 0.15	0.1 ± 0.2	0.6 ± 0.8
B06SL-021-01	0.4 ± 0.3	22.9 ± 1.6	22.9 ± 1.6	0.6 ± 0.9	10 ± 2
B06SL-021-05	0.4 ± 0.4	17.6 ± 1.7	17.6 ± 1.7	0.5 ± 1.0	10 ± 5
B08SL-003-01	0.7 ± 0.3	1.1 ± 0.5	1.1 ± 0.5	98 ± 7	983 ± 74
B08SL-003-05	1.0 ± 0.3	0.4 ± 0.3	0.4 ± 0.3	23 ± 2	337 ± 26
B08SL-012-02	0.80 ± 0.20	1.0 ± 0.3	1.0 ± 0.3	0.4 ± 0.4	4.5 ± 1.2
B08SL-014-01	0.22 ± 0.16	1.2 ± 0.3	1.2 ± 0.3	12.3 ± 1.1	99 ± 8
B08SL-015-01	-0.03 ± 0.16	0.62 ± 0.18	0.62 ± 0.18	22.7 ± 1.3	180 ± 10
B08SL-015-09	0.3 ± 0.2	1.3 ± 0.5	1.3 ± 0.5	47 ± 4	430 ± 33
B08SL-017-01	1.3 ± 0.3	0.6 ± 0.9	0.6 ± 0.9	273 ± 17	2210 ± 160
B08SL-017-05	0.7 ± 0.4	0.6 ± 0.6	0.6 ± 0.6	130 ± 9	1570 ± 120
B08SL-021-06	0.24 ± 0.18	0.4 ± 0.3	0.4 ± 0.3	12.0 ± 1.3	148 ± 11
B08SL-022-01	0.10 ± 0.12	1.4 ± 0.3	1.4 ± 0.3	7.4 ± 0.9	48 ± 4
B08SL-023-01	0.9 ± 0.4	5.3 ± 0.6	5.3 ± 0.6	8.0 ± 1.1	128 ± 11
B08SL-023-03	1.1 ± 0.3	6.6 ± 0.6	6.6 ± 0.6	10.3 ± 1.0	153 ± 12
B08SL-026-02	0.12 ± 0.14	3.3 ± 0.4	3.3 ± 0.4	8.3 ± 1.2	51 ± 5
B24SL-012-01	0.64 ± 0.17	0.3 ± 0.3	0.3 ± 0.3	0.1 ± 0.2	0.7 ± 0.8
B24SL-019-01	0.78 ± 0.14	0.76 ± 0.16	0.76 ± 0.16	0.35 ± 0.19	2.9 ± 0.6
B24SL-023-02	1.2 ± 0.3	1.0 ± 0.4	1.0 ± 0.4	0.0 ± 0.3	2.3 ± 0.9
B24SL-025-02	1.4 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	0.0 ± 0.5	3.9 ± 1.5
B24SL-026-01	0.8 ± 0.2	1.0 ± 0.3	1.0 ± 0.3	0.5 ± 0.4	4.6 ± 1.2
B24SL-028-01	1.3 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	0.2 ± 0.4	4.5 ± 1.3
B24SL-032-01	1.0 ± 0.2	1.0 ± 0.3	0.74 ± 0.15	0.6 ± 0.3	2.9 ± 1.0
B24SL-033-01	0.73 ± 0.16	0.61 ± 0.18	—	—	11.3 ± 1.5
B35SL-001-01	0.36 ± 0.11	0.7 ± 0.2	0.7 ± 0.2	0.2 ± 0.2	3.1 ± 0.8
B35SL-003-07	1.9 ± 0.3	1.4 ± 0.3	1.4 ± 0.3	0.1 ± 0.5	3.4 ± 1.5
BKGSL-001-01	0.76 ± 0.14	0.66 ± 0.15	0.66 ± 0.15	0.1 ± 0.2	2.2 ± 0.6
BKGSL-001-02	0.66 ± 0.18	0.9 ± 0.2	0.9 ± 0.2	0.2 ± 0.3	2.7 ± 1.0
BKGSL-002-01	0.9 ± 0.2	0.8 ± 0.3	0.8 ± 0.3	0.1 ± 0.4	0.7 ± 1.3
BKGSL-002-04	1.1 ± 0.2	0.7 ± 0.2	0.7 ± 0.2	0.1 ± 0.3	0.1 ± 1.2
BKGSL-003-01	1.1 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	0.1 ± 0.4	0.9 ± 0.7
BKGSL-003-09	0.67 ± 0.18	0.7 ± 0.2	0.7 ± 0.2	0.0 ± 0.3	0.9 ± 0.5
BKGSL-004-01	0.9 ± 0.2	0.7 ± 0.3	0.7 ± 0.3	0.1 ± 0.4	1 ± 2
BKGSL-004-02	0.9 ± 0.2	1.0 ± 0.3	1.0 ± 0.3	0.2 ± 0.3	0.9 ± 1.2

TABLE 3-6
OFFSITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR COPCS IN SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)				
	^{226}Ra	^{228}Ra [b]	^{232}Th [b]	^{235}U	^{238}U [c]
BKGSL-005-01	0.9 ± 0.2	0.7 ± 0.3	0.7 ± 0.3	0.0 ± 1.6	1.6 ± 0.9
BKGSL-005-02	0.7 ± 0.2	0.8 ± 0.3	0.8 ± 0.3	0.0 ± 0.3	1.2 ± 1.1
BKGSL-006-01	1.10 ± 0.20	0.8 ± 0.3	0.8 ± 0.3	-0.1 ± 1.1	0.7 ± 1.1
BKGSL-006-03	1.2 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	0.2 ± 0.4	1.1 ± 1.4
BKGSL-007-01	0.67 ± 0.20	0.8 ± 0.3	0.8 ± 0.3	0.0 ± 1.3	0 ± 3
BKGSL-007-04	0.51 ± 0.14	0.6 ± 0.2	0.6 ± 0.2	0.1 ± 0.3	0.3 ± 0.9
BKGSL-008-01	0.8 ± 0.2	1.0 ± 0.4	1.0 ± 0.4	0 ± 12	3.0 ± 1.4
BKGSL-008-03	0.8 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	0.1 ± 0.4	2.4 ± 1.0
BKGSL-009-01	1.2 ± 0.3	0.7 ± 0.3	0.7 ± 0.3	0.1 ± 0.3	1.4 ± 1.0
BKGSL-009-03	0.8 ± 0.2	1.1 ± 0.3	1.1 ± 0.3	0.2 ± 0.4	2.4 ± 1.3
BKGSL-010-01	0.84 ± 0.15	0.9 ± 0.2	0.9 ± 0.2	0.2 ± 0.2	1.7 ± 0.7
BKGSL-010-03	0.7 ± 0.2	0.8 ± 0.3	0.8 ± 0.3	-0.1 ± 0.6	2.6 ± 1.0
BKGSL-011-01	1.37 ± 0.19	1.0 ± 0.2	1.0 ± 0.2	0.1 ± 0.4	2.4 ± 1.0
BKGSL-011-08	0.56 ± 0.19	0.7 ± 0.3	0.7 ± 0.3	0.1 ± 0.3	1 ± 2
BKGSL-012-01	0.54 ± 0.19	0.7 ± 0.2	0.7 ± 0.2	0.0 ± 1.0	0.3 ± 1.3
BKGSL-012-04	1.1 ± 0.3	0.8 ± 0.3	0.8 ± 0.3	-0.2 ± 0.6	0.4 ± 1.3

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] The laboratory assumed that ^{228}Ra and ^{232}Th are in secular equilibrium.
[c] Gamma spectroscopy concentrations from the offsite laboratory for ^{238}U are not used in this report because of concerns about their accuracy. They are shown for information purposes only.

TABLE 3-7
OFFSITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR COPCS IN SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)				
	^{226}Ra	^{228}Ra [b]	^{232}Th [b]	^{235}U	^{238}U [c]
A03-SD-001	0.7 ± 0.2	0.9 ± 0.5	0.9 ± 0.5	-0.1 ± 1.3	4.9 ± 1.4
A03-SD-002	1.03 ± 0.17	0.9 ± 0.2	0.9 ± 0.2	0.0 ± 0.7	2.3 ± 1.0
A03-SD-003	1.1 ± 0.3	0.7 ± 0.3	0.7 ± 0.3	0.2 ± 0.4	0.6 ± 1.4
A03-SD-004	0.39 ± 0.17	0.7 ± 0.3	0.7 ± 0.3	0.1 ± 0.3	2.7 ± 1.1
A03-SD-005	1.6 ± 0.3	1.3 ± 0.4	1.3 ± 0.4	0.1 ± 0.4	3.6 ± 1.2
A03-SD-006	0.38 ± 0.13	0.31 ± 0.16	0.31 ± 0.16	0.0 ± 0.7	2.6 ± 0.8
A08-A01-SD-001R	0.06 ± 0.08	0.07 ± 0.17	0.07 ± 0.17	0.24 ± 0.16	4.5 ± 0.7
A08-A01-SD-002	0.49 ± 0.14	0.3 ± 0.3	0.3 ± 0.3	-0.1 ± 0.4	1.7 ± 0.6
A08-A01-SD-003	0.17 ± 0.10	0.27 ± 0.20	0.27 ± 0.20	0.0 ± 0.9	1.3 ± 0.6
A08-A01-SD-004	0.5 ± 0.3	0.5 ± 0.4	0.5 ± 0.4	0.3 ± 0.5	9 ± 2
A08-A01-SD-005	0.12 ± 0.11	0.18 ± 0.18	0.18 ± 0.18	0.0 ± 0.2	1.0 ± 0.3
A08-A01-SD-006	0.06 ± 0.18	0.34 ± 0.19	0.34 ± 0.19	0.2 ± 0.3	2.9 ± 0.9
A08-A01-SD-007	0.14 ± 0.07	0.14 ± 0.10	0.14 ± 0.10	0.37 ± 0.19	3.8 ± 0.8
A08-A01-SD-008	0.76 ± 0.19	0.5 ± 0.2	0.5 ± 0.2	0.8 ± 0.3	7.8 ± 1.8
A08-A01-SD-009	0.38 ± 0.11	0.27 ± 0.11	0.27 ± 0.11	0.08 ± 0.16	1.2 ± 0.4
A08-A01-SD-010	0.14 ± 0.12	0.3 ± 0.2	0.3 ± 0.2	0.3 ± 0.3	4.8 ± 1.2
A08-A01-SD-011	0.18 ± 0.16	0.3 ± 0.3	0.3 ± 0.3	2.6 ± 0.6	27 ± 3
A08-A01-SD-012	0.58 ± 0.16	0.13 ± 0.19	0.13 ± 0.19	0.2 ± 0.3	4.2 ± 1.1
A08-A01-SD-013	0.47 ± 0.14	0.57 ± 0.17	0.57 ± 0.17	0.0 ± 0.4	1.5 ± 0.7
A08-B04&B09-SD-001	0.26 ± 0.11	0.22 ± 0.14	0.22 ± 0.14	0.4 ± 0.2	7.8 ± 0.9
A08-B04&B09-SD-002	0.34 ± 0.12	0.11 ± 0.17	0.11 ± 0.17	0.7 ± 0.3	11.7 ± 1.2
A08-B04&B09-SD-003	0.10 ± 0.16	0.2 ± 0.2	0.2 ± 0.2	1.2 ± 0.5	16 ± 3
A08-B04&B09-SD-004	0.11 ± 0.10	0.09 ± 0.18	0.09 ± 0.18	0.3 ± 0.2	4.9 ± 0.9
A08-B04&B09-SD-005	0.05 ± 0.17	0.3 ± 0.4	0.3 ± 0.4	1.0 ± 0.4	11 ± 2
A08-B1-SD-001	0.31 ± 0.10	0.20 ± 0.15	0.20 ± 0.15	0.23 ± 0.20	2.6 ± 0.8
A08-B1-SD-002	0.24 ± 0.09	0.25 ± 0.14	0.25 ± 0.14	0.13 ± 0.16	3.2 ± 0.6
A08-B1-SD-003	0.33 ± 0.17	0.3 ± 0.3	0.3 ± 0.3	3.2 ± 0.6	37 ± 3
A08-B1-SD-004	1.5 ± 0.3	0.9 ± 0.4	0.9 ± 0.4	5.4 ± 1.1	66 ± 6
A08-B1-SD-005	0.23 ± 0.09	0.18 ± 0.14	0.18 ± 0.14	0.8 ± 0.2	9.3 ± 1.4
A08-B1-SD-006	0.20 ± 0.12	0.32 ± 0.15	0.32 ± 0.15	0.3 ± 0.3	6.8 ± 1.9
A08-B24-SD-001	0.19 ± 0.07	0.25 ± 0.09	0.25 ± 0.09	0.73 ± 0.16	6.7 ± 0.8
A08-B24-SD-002	0.32 ± 0.13	0.40 ± 0.15	0.40 ± 0.15	0.9 ± 0.3	10.3 ± 1.4
A08-B24-SD-003	0.23 ± 0.13	0.43 ± 0.15	0.43 ± 0.15	0.9 ± 0.3	8.9 ± 1.3
A08-B24-SD-004	0.33 ± 0.13	0.08 ± 0.17	0.08 ± 0.17	0.1 ± 0.2	1.5 ± 0.6
A08-B24-SD-005	0.12 ± 0.06	0.04 ± 0.09	0.04 ± 0.09	0.12 ± 0.12	0.7 ± 0.3
A08-B24-SD-006	1.9 ± 0.3	1.8 ± 0.3	1.8 ± 0.3	0.0 ± 0.4	2.7 ± 0.7
A08-B24-SD-007	0.35 ± 0.12	0.52 ± 0.17	0.52 ± 0.17	1.9 ± 0.5	16.2 ± 1.8
A08-B2-SD-001	0.65 ± 0.09	1.77 ± 0.17	1.77 ± 0.17	0.07 ± 0.18	0.4 ± 0.4
A08-B2-SD-002	0.25 ± 0.09	0.27 ± 0.14	0.27 ± 0.14	0.24 ± 0.17	1.0 ± 0.6
A08-B2-SD-003	1.09 ± 0.17	1.0 ± 0.2	1.0 ± 0.2	0.3 ± 0.3	4.0 ± 0.9
A08-B3-SD-002	0.04 ± 0.06	0.17 ± 0.12	0.17 ± 0.12	0.06 ± 0.11	0.6 ± 0.2

TABLE 3-7
OFFSITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR COPCS IN SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)				
	^{226}Ra	^{228}Ra [b]	^{232}Th [b]	^{235}U	^{238}U [c]
A08-B3-SD-003	0.36 ± 0.09	0.29 ± 0.13	0.29 ± 0.13	0.8 ± 0.3	6.2 ± 1.1
A08-B3-SD-004	0.08 ± 0.10	0.50 ± 0.17	0.50 ± 0.17	0.9 ± 0.3	9.0 ± 1.7
A08-B3-SD-005	0.06 ± 0.10	0.13 ± 0.19	0.13 ± 0.19	0.8 ± 0.3	8.0 ± 1.8
A08-B3-SD-006	0.15 ± 0.08	0.23 ± 0.12	0.23 ± 0.12	0.6 ± 0.2	9.7 ± 1.0
A08-B3-SD-007	0.15 ± 0.11	0.17 ± 0.17	0.17 ± 0.17	0.3 ± 0.3	3.7 ± 1.4
A08-B3-SD-008	0.16 ± 0.10	0.13 ± 0.14	0.13 ± 0.14	5.6 ± 0.7	59 ± 4
A08-B3-SD-009	0.40 ± 0.08	0.28 ± 0.09	0.28 ± 0.09	0.38 ± 0.18	4.3 ± 0.7
A08-B3-SD-010	2.1 ± 0.5	0.7 ± 0.6	0.7 ± 0.6	0.8 ± 0.7	13 ± 3
A08-B3-SD-011	0.31 ± 0.09	0.36 ± 0.13	0.36 ± 0.13	0.24 ± 0.16	2.4 ± 0.5
A08-B3-SD-012	0.09 ± 0.07	0.06 ± 0.11	0.06 ± 0.11	0.44 ± 0.16	6.6 ± 0.8
A08-B3-SD-013	1.6 ± 0.2	2.6 ± 0.4	2.6 ± 0.4	0.0 ± 0.9	3.2 ± 1.3
A08-B3-SD-014	2.3 ± 0.3	1.5 ± 0.4	1.5 ± 0.4	0.4 ± 0.4	5.5 ± 1.3
A08-B3-SD-015	2.0 ± 0.3	3.0 ± 0.4	3.0 ± 0.4	0.4 ± 0.4	6.1 ± 1.2
A08-B6-SD-001	0.41 ± 0.13	1.7 ± 0.3	1.7 ± 0.3	3.0 ± 0.5	35 ± 3
A08-B6-SD-002	0.21 ± 0.07	0.31 ± 0.11	0.31 ± 0.11	0.63 ± 0.18	9.5 ± 0.8
A08-B8-SD-001	0.14 ± 0.11	1.43 ± 0.19	1.43 ± 0.19	5.1 ± 0.6	56 ± 4
A08-B8-SD-002	0.1 ± 0.2	1.5 ± 0.4	1.5 ± 0.4	11.4 ± 1.8	151 ± 12
A09-SD-001	0.9 ± 0.3	0.7 ± 0.3	0.7 ± 0.3	0 ± 14	0.7 ± 1.0
A09-SD-002	0.9 ± 0.3	0.5 ± 0.3	0.5 ± 0.3	0.1 ± 0.4	0 ± 2
A09-SD-003	0.33 ± 0.15	0.5 ± 0.2	0.5 ± 0.2	0 ± 2	0.4 ± 1.0
A09-SD-004	0.65 ± 0.20	0.6 ± 0.2	0.6 ± 0.2	0.2 ± 0.4	1.8 ± 0.9
A09-SD-005	0.5 ± 0.2	0.7 ± 0.3	0.7 ± 0.3	0.1 ± 0.3	0.3 ± 1.3
A09-SD-006	0.9 ± 0.2	0.7 ± 0.3	0.7 ± 0.3	0 ± 3	0.4 ± 1.2
A09-SD-007	0.7 ± 0.2	0.5 ± 0.3	0.5 ± 0.3	0.2 ± 0.3	1.3 ± 1.1
A09-SD-008	1.11 ± 0.19	0.50 ± 0.18	0.50 ± 0.18	0.1 ± 0.2	0.8 ± 0.8
A09-SD-009	1.2 ± 0.3	0.8 ± 0.3	0.8 ± 0.3	0.1 ± 0.3	0.5 ± 1.4
A09-SD-010	0.9 ± 0.3	0.5 ± 0.3	0.5 ± 0.3	0.1 ± 0.3	1.8 ± 0.9
A09-SD-011	0.78 ± 0.14	0.67 ± 0.16	0.67 ± 0.16	0.14 ± 0.19	1.0 ± 0.7
A09-SD-012	1.1 ± 0.2	0.7 ± 0.3	0.7 ± 0.3	-0.1 ± 1.0	1.0 ± 1.1

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] The laboratory assumed that ^{228}Ra and ^{232}Th are in secular equilibrium.
[c] Gamma spectroscopy concentrations from the offsite laboratory for ^{238}U are not used in this report because of concerns about their accuracy. They are shown for information purposes only.

TABLE 3-8
OFFSITE LABORATORY GAMMA SPECTROSCOPY RESULTS
FOR COPCS IN BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)				
	^{226}Ra	^{228}Ra [b]	^{232}Th [b]	^{235}U	^{238}U [c]
B01-BM-001	0.45 ± 0.11	0.26 ± 0.13	0.26 ± 0.13	-0.03 ± 0.19	0.2 ± 0.6
B01-BM-002	0.0 ± 1.3	-0.03 ± 0.11	-0.03 ± 0.11	0.05 ± 0.10	-0.1 ± 0.4
B01-BM-003	0.0 ± 0.3	0.00 ± 0.16	0.00 ± 0.16	0.1 ± 0.5	3 ± 2
B02-BM-001	61 ± 4	11.6 ± 1.4	11.6 ± 1.4	2.5 ± 1.1	13.3 ± 1.8
B02-BM-002	0.53 ± 0.15	0.30 ± 0.16	0.30 ± 0.16	0.1 ± 0.2	1.1 ± 0.7
B02-BM-003	0.60 ± 0.15	0.20 ± 0.18	0.20 ± 0.18	0.2 ± 0.3	1.3 ± 0.6
B02-BM-004	0.17 ± 0.10	0.09 ± 0.15	0.09 ± 0.15	-0.1 ± 0.3	0.3 ± 0.7
B02-BM-005	0.26 ± 0.12	0.24 ± 0.19	0.24 ± 0.19	0.04 ± 0.19	-0.1 ± 1.1
B02-BM-006	0.66 ± 0.16	0.25 ± 0.19	0.25 ± 0.19	0.2 ± 0.2	1.1 ± 0.6
B02-BM-007	0.30 ± 0.13	0.40 ± 0.17	0.40 ± 0.17	0.0 ± 0.2	0.3 ± 0.3
B02-BM-008	1.02 ± 0.18	1.7 ± 0.3	1.7 ± 0.3	0.1 ± 0.4	0.6 ± 1.2
B02-BM-009	0.9 ± 0.2	1.2 ± 0.3	1.2 ± 0.3	0.0 ± 0.3	1.6 ± 1.3
B02-BM-010	0.5 ± 0.5	0.2 ± 0.9	0.2 ± 0.9	0.2 ± 0.6	4 ± 2
B03-BM-001	0.15 ± 0.09	0.13 ± 0.13	0.13 ± 0.13	0.20 ± 0.17	3.8 ± 0.7
B03-BM-002	0.48 ± 0.13	0.23 ± 0.13	0.23 ± 0.13	0.1 ± 0.2	2.4 ± 0.8
B03-BM-003	-0.1 ± 0.6	0 ± 27	0 ± 27	0 ± 73	0 ± 3
B03-BM-004	1.3 ± 0.2	1.6 ± 0.3	1.6 ± 0.3	0.0 ± 0.4	2.6 ± 1.7
B03-BM-005	0.27 ± 0.15	0.2 ± 0.3	0.2 ± 0.3	0.1 ± 0.2	1.1 ± 0.6
B03-BM-006	0.07 ± 0.06	0.06 ± 0.07	0.06 ± 0.07	0.01 ± 0.07	0.44 ± 0.19
B03-BM-007	1.6 ± 0.2	2.2 ± 0.3	2.2 ± 0.3	0.0 ± 0.7	2.7 ± 1.7
B04&B09-BM-001	1.29 ± 0.18	1.4 ± 0.2	1.4 ± 0.2	0.2 ± 0.3	2.9 ± 0.9
B04&B09-BM-002	0.40 ± 0.11	0.27 ± 0.12	0.27 ± 0.12	0.1 ± 0.2	1.3 ± 0.6
B04&B09-BM-003	0.26 ± 0.11	0.16 ± 0.15	0.16 ± 0.15	0.1 ± 0.2	0.8 ± 0.7
B04&B09-BM-004	0.82 ± 0.19	0.5 ± 0.2	0.5 ± 0.2	0.0 ± 0.4	0.4 ± 1.0
B05-BM-001	0.46 ± 0.12	0.41 ± 0.17	0.41 ± 0.17	0.07 ± 0.13	1.6 ± 0.8
B05-BM-002	1.0 ± 0.2	1.0 ± 0.3	1.0 ± 0.3	-0.1 ± 1.2	0.9 ± 0.7
B06-BM-001	1.27 ± 0.16	1.8 ± 0.2	1.8 ± 0.2	0.1 ± 0.3	0.5 ± 1.3
B06-BM-002	1.40 ± 0.18	1.3 ± 0.2	1.3 ± 0.2	0.1 ± 0.4	2.0 ± 0.8
B06-BM-003	0.2 ± 0.4	-0.3 ± 1.0	-0.3 ± 1.0	0.6 ± 0.7	7 ± 3
B06-BM-004	0.0 ± 2.0	0.00 ± 0.14	0.00 ± 0.14	0.03 ± 0.11	0.7 ± 0.4
B06-BM-005	2.5 ± 0.3	1.5 ± 0.4	1.5 ± 0.4	0.2 ± 0.4	4.9 ± 1.3
B06-BM-006	-0.1 ± 0.9	-1 ± 18	-1 ± 18	0.2 ± 1.5	9 ± 5
B08-BM-001	0.54 ± 0.16	0.07 ± 0.20	0.07 ± 0.20	0.3 ± 0.3	5.5 ± 1.0
B08-BM-002	1.3 ± 0.3	1.5 ± 0.3	1.5 ± 0.3	0.2 ± 0.4	3.4 ± 1.2
B24-BM-001	0.26 ± 0.11	0.19 ± 0.19	0.19 ± 0.19	-0.1 ± 1.1	1.4 ± 0.9
B24-BM-002	0.61 ± 0.14	0.24 ± 0.18	0.24 ± 0.18	0.3 ± 0.3	2.2 ± 0.7
B24-BM-003	0.20 ± 0.11	0.0 ± 0.6	0.0 ± 0.6	0.05 ± 0.16	0.8 ± 0.4
B24-BM-004	0.37 ± 0.11	0.08 ± 0.13	0.08 ± 0.13	0.07 ± 0.16	-0.2 ± 1.4
B24SL-603-01 [d]	1.1 ± 0.6	3.3 ± 0.6	3.3 ± 0.6	24 ± 2	294 ± 24
B35-BM-001	0.16 ± 0.10	0.19 ± 0.14	0.19 ± 0.14	0.1 ± 0.2	1.1 ± 1.0
B35-BM-002	0.73 ± 0.13	0.66 ± 0.15	0.66 ± 0.15	0.1 ± 0.2	0.8 ± 0.3

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] The laboratory assumed that ^{228}Ra and ^{232}Th are in secular equilibrium.
[c] Gamma spectroscopy concentrations from the offsite laboratory for ^{238}U are not used in this report because of concerns about their accuracy. They are shown for information purposes only.
[d] Sample B24SL-603-01 inadvertently labeled “SL”; material collected from dust on roof truss.

TABLE 3-9
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A02SL-001-01	0.56 ± 0.18	0.33 ± 0.13	0.53 ± 0.17	6.6 ± 0.8	0.30 ± 0.13	7.1 ± 0.8
A02SL-002-01	1.1 ± 0.3	1.0 ± 0.3	0.7 ± 0.2	9.8 ± 1.1	0.52 ± 0.17	11.1 ± 1.2
A02SL-003-01	0.26 ± 0.09	0.31 ± 0.10	0.31 ± 0.10	7.5 ± 0.6	0.38 ± 0.10	6.8 ± 0.6
A02SL-004-07	1.5 ± 0.3	1.3 ± 0.3	1.3 ± 0.3	1.1 ± 0.2	0.06 ± 0.05	1.3 ± 0.3
A02SL-005-01	0.61 ± 0.18	0.8 ± 0.2	0.64 ± 0.19	5.6 ± 0.7	0.23 ± 0.11	5.8 ± 0.7
A02SL-005-02	0.8 ± 0.2	0.71 ± 0.20	0.58 ± 0.18	8.0 ± 0.9	0.41 ± 0.15	8.7 ± 0.9
A02SL-006-03	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	11.6 ± 1.2	0.63 ± 0.19	12.6 ± 1.3
A02SL-007-01	0.33 ± 0.12	0.30 ± 0.11	0.24 ± 0.10	22 ± 2	1.0 ± 0.3	22 ± 2
A02SL-007-05	0.51 ± 0.17	0.8 ± 0.2	0.47 ± 0.16	11.7 ± 1.2	0.65 ± 0.19	11.9 ± 1.2
A02SL-009-04	1.4 ± 0.3	1.4 ± 0.3	1.1 ± 0.3	0.91 ± 0.20	0.04 ± 0.05	1.0 ± 0.2
A02SL-011-01	0.8 ± 0.2	0.8 ± 0.2	0.66 ± 0.19	1.9 ± 0.3	0.09 ± 0.07	2.1 ± 0.3
A02SL-012-02	0.56 ± 0.20	0.48 ± 0.19	0.57 ± 0.20	3.5 ± 0.5	0.16 ± 0.09	3.8 ± 0.5
A02SL-014-01	0.48 ± 0.17	0.71 ± 0.20	0.50 ± 0.16	10.9 ± 1.1	0.47 ± 0.16	11.6 ± 1.2
A02SL-015-01	1.2 ± 0.3	1.1 ± 0.2	1.1 ± 0.2	3.1 ± 0.4	0.17 ± 0.09	3.3 ± 0.5
A02SL-015-10	2.0 ± 0.4	1.6 ± 0.3	2.0 ± 0.4	2.0 ± 0.3	0.19 ± 0.10	2.3 ± 0.4
A02SL-015-11	2.2 ± 0.4	2.0 ± 0.4	1.9 ± 0.3	1.6 ± 0.3	0.08 ± 0.06	1.6 ± 0.3
A02SL-016-01	1.0 ± 0.3	1.3 ± 0.3	1.0 ± 0.3	3.1 ± 0.5	0.06 ± 0.06	3.0 ± 0.4
A02SL-016-02	1.2 ± 0.3	1.4 ± 0.3	1.2 ± 0.3	2.7 ± 0.4	0.07 ± 0.06	2.6 ± 0.4
A02SL-016-03	1.8 ± 0.3	1.6 ± 0.3	1.8 ± 0.3	4.4 ± 0.6	0.21 ± 0.10	4.3 ± 0.5
A02SL-018-03	1.2 ± 0.2	1.6 ± 0.3	1.3 ± 0.3	1.9 ± 0.3	0.05 ± 0.05	1.9 ± 0.3
A02SL-019-02	2.1 ± 0.4	1.5 ± 0.3	1.9 ± 0.3	1.8 ± 0.3	0.05 ± 0.05	2.1 ± 0.3
A02SL-019-06	1.4 ± 0.3	1.2 ± 0.3	1.0 ± 0.2	2.0 ± 0.3	0.07 ± 0.06	1.7 ± 0.3
A02SL-020-01	1.28 ± 0.20	1.34 ± 0.20	1.18 ± 0.19	1.52 ± 0.19	0.08 ± 0.04	1.47 ± 0.19
A02SL-020-02	1.2 ± 0.3	2.0 ± 0.4	1.2 ± 0.3	1.5 ± 0.3	0.09 ± 0.07	1.4 ± 0.3
A02SL-020-03	1.3 ± 0.3	2.1 ± 0.5	1.5 ± 0.4	1.6 ± 0.3	0.08 ± 0.06	1.7 ± 0.3
A02SL-021-03	1.9 ± 0.3	2.8 ± 0.3	2.0 ± 0.3	2.7 ± 0.3	0.06 ± 0.04	2.6 ± 0.3
A02SL-021-04	1.7 ± 0.3	1.4 ± 0.3	1.7 ± 0.3	1.2 ± 0.2	0.03 ± 0.04	1.4 ± 0.3
A02SL-022-01	1.0 ± 0.3	0.8 ± 0.2	0.9 ± 0.2	6.0 ± 0.7	0.30 ± 0.13	6.0 ± 0.7
A02SL-022-04	1.6 ± 0.3	1.5 ± 0.3	1.5 ± 0.3	1.3 ± 0.3	0.09 ± 0.07	1.3 ± 0.2
A02SL-023-01	0.9 ± 0.2	1.3 ± 0.3	0.9 ± 0.2	2.7 ± 0.4	0.12 ± 0.08	2.9 ± 0.4
A02SL-023-02	1.1 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	3.0 ± 0.4	0.20 ± 0.10	3.2 ± 0.4
A02SL-024-01	0.9 ± 0.3	0.5 ± 0.3	0.5 ± 0.3	18.4 ± 1.8	1.0 ± 0.2	20.4 ± 2.0
A02SL-024-07	1.4 ± 0.3	1.4 ± 0.3	1.3 ± 0.3	2.2 ± 0.4	0.07 ± 0.06	2.3 ± 0.4
A02SL-025-01	0.9 ± 0.3	0.43 ± 0.18	0.8 ± 0.3	5.5 ± 0.7	0.29 ± 0.12	6.7 ± 0.8
A02SL-026-01	0.6 ± 0.3	0.5 ± 0.2	0.6 ± 0.3	5.6 ± 0.7	0.43 ± 0.15	6.9 ± 0.8
A02SL-027-01	1.03 ± 0.18	0.48 ± 0.12	1.00 ± 0.18	5.1 ± 0.4	0.28 ± 0.08	6.7 ± 0.5
A02SL-028-01	2.5 ± 0.2	0.72 ± 0.10	2.4 ± 0.2	64 ± 5	5.50 ± 0.19	247 ± 14
A02SL-028-02	0.37 ± 0.13	0.25 ± 0.11	0.33 ± 0.12	5.2 ± 0.5	0.49 ± 0.12	20.3 ± 1.4
A02SL-029-01	0.7 ± 0.2	0.7 ± 0.2	0.6 ± 0.2	8.7 ± 0.9	0.51 ± 0.16	10.3 ± 1.1
A02SL-030-01	0.28 ± 0.12	0.40 ± 0.14	0.45 ± 0.15	3.9 ± 0.5	0.25 ± 0.12	3.8 ± 0.5
A02SL-030-06	2.2 ± 0.4	1.7 ± 0.3	2.1 ± 0.3	1.1 ± 0.2	0.08 ± 0.07	1.0 ± 0.2
A02SL-031-06	1.8 ± 0.3	1.2 ± 0.2	1.7 ± 0.3	1.5 ± 0.3	0.14 ± 0.09	1.8 ± 0.3
A02SL-032-01	0.55 ± 0.18	0.50 ± 0.16	0.38 ± 0.14	16.6 ± 1.6	1.0 ± 0.2	16.7 ± 1.6
A02SL-033-01	0.33 ± 0.13	0.51 ± 0.16	0.34 ± 0.13	7.1 ± 0.8	0.28 ± 0.13	7.7 ± 0.9
A02SL-034-01	0.46 ± 0.15	0.72 ± 0.19	0.51 ± 0.16	3.0 ± 0.4	0.26 ± 0.11	3.0 ± 0.4
A02SL-035-01	1.1 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	6.0 ± 0.7	0.33 ± 0.14	5.8 ± 0.7
A02SL-035-02	1.6 ± 0.3	2.0 ± 0.3	1.5 ± 0.3	4.3 ± 0.6	0.24 ± 0.11	4.1 ± 0.5
A02SL-037-05	2.1 ± 0.4	1.9 ± 0.3	2.3 ± 0.4	1.7 ± 0.3	0.16 ± 0.10	2.1 ± 0.4
A02SL-037-06	0.90 ± 0.20	1.2 ± 0.2	1.0 ± 0.2	0.72 ± 0.18	0.04 ± 0.04	0.67 ± 0.17
A02SL-038-01	0.57 ± 0.17	0.80 ± 0.20	0.39 ± 0.14	2.9 ± 0.4	0.14 ± 0.08	3.0 ± 0.4
A02SL-039-03	1.0 ± 0.2	0.9 ± 0.2	1.0 ± 0.2	28 ± 3	1.4 ± 0.3	32 ± 3
A02SL-041-01	1.1 ± 0.3	1.0 ± 0.2	1.0 ± 0.2	10.7 ± 1.1	0.53 ± 0.17	11.4 ± 1.2
A02SL-042-01	0.70 ± 0.19	0.65 ± 0.18	0.70 ± 0.19	2.7 ± 0.4	0.10 ± 0.07	2.8 ± 0.4
A02SL-043-01	1.0 ± 0.2	0.75 ± 0.20	0.76 ± 0.20	9.8 ± 1.0	0.56 ± 0.18	10.1 ± 1.1
A02SL-215-01	1.3 ± 0.3	1.4 ± 0.3	1.3 ± 0.3	2.4 ± 0.4	0.09 ± 0.07	2.0 ± 0.3

TABLE 3-9
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A02SL-216-01	1.0 ± 0.2	1.0 ± 0.2	1.1 ± 0.2	3.9 ± 0.5	0.19 ± 0.09	4.0 ± 0.5
A02SL-216-13	2.0 ± 0.3	2.1 ± 0.4	2.1 ± 0.3	2.5 ± 0.4	0.13 ± 0.08	2.2 ± 0.3
A02SL-229-02	0.43 ± 0.14	0.31 ± 0.12	0.46 ± 0.14	6.4 ± 0.7	0.55 ± 0.17	14.5 ± 1.4
A02SL-234-01	0.8 ± 0.2	0.53 ± 0.17	0.66 ± 0.19	29 ± 3	1.7 ± 0.4	44 ± 4
A02SL-234-02	0.45 ± 0.17	0.49 ± 0.17	0.37 ± 0.15	11.2 ± 1.2	0.57 ± 0.19	14.0 ± 1.4
A03SL-002-01	0.8 ± 0.3	1.4 ± 0.4	1.1 ± 0.3	1.4 ± 0.3	0.07 ± 0.06	1.3 ± 0.3
A03SL-009-01	1.4 ± 0.3	1.3 ± 0.3	1.1 ± 0.3	2.1 ± 0.4	0.10 ± 0.07	2.3 ± 0.4
A03SL-009-02	1.2 ± 0.3	1.2 ± 0.3	0.9 ± 0.2	2.2 ± 0.3	0.14 ± 0.08	2.5 ± 0.4
A03SL-011-01	1.5 ± 0.3	1.5 ± 0.3	1.7 ± 0.3	2.6 ± 0.4	0.10 ± 0.08	2.6 ± 0.4
A03SL-011-02	1.9 ± 0.4	1.8 ± 0.3	1.9 ± 0.4	1.6 ± 0.3	0.07 ± 0.06	1.9 ± 0.3
A03SL-015-02	1.1 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	1.9 ± 0.3	0.04 ± 0.04	2.1 ± 0.3
A03SL-018-01	1.2 ± 0.3	1.0 ± 0.2	1.0 ± 0.2	3.2 ± 0.5	0.11 ± 0.08	3.5 ± 0.5
A03SL-018-03	0.7 ± 0.2	0.51 ± 0.18	0.8 ± 0.2	9.4 ± 1.0	0.62 ± 0.18	9.3 ± 1.0
A03SL-021-01	0.45 ± 0.17	2.6 ± 0.4	0.58 ± 0.19	4.7 ± 0.6	0.25 ± 0.11	4.4 ± 0.6
A03SL-022-02	0.68 ± 0.19	1.4 ± 0.3	0.71 ± 0.19	6.3 ± 0.7	0.39 ± 0.14	7.6 ± 0.8
A03SL-026-01	0.46 ± 0.16	0.8 ± 0.2	0.52 ± 0.17	10.6 ± 1.1	0.48 ± 0.17	11.0 ± 1.2
A03SL-027-01	0.46 ± 0.17	0.64 ± 0.20	0.61 ± 0.19	4.4 ± 0.6	0.19 ± 0.10	4.8 ± 0.6
A03SL-028-01	0.41 ± 0.11	0.49 ± 0.12	0.39 ± 0.10	6.2 ± 0.5	0.33 ± 0.09	6.1 ± 0.5
A03SL-028-03	2.8 ± 0.6	1.4 ± 0.4	2.9 ± 0.6	3.1 ± 0.4	0.13 ± 0.08	2.9 ± 0.4
A03SL-028-05	1.0 ± 0.3	0.9 ± 0.2	0.8 ± 0.2	6.0 ± 0.7	0.32 ± 0.14	7.3 ± 0.8
A03SL-029-01	0.60 ± 0.18	0.9 ± 0.2	0.44 ± 0.15	5.6 ± 0.7	0.18 ± 0.09	6.2 ± 0.7
A03SL-030-02	0.26 ± 0.11	2.2 ± 0.4	0.39 ± 0.14	7.5 ± 0.8	0.34 ± 0.13	7.6 ± 0.8
A03SL-031-01	0.53 ± 0.16	0.9 ± 0.2	0.45 ± 0.15	24 ± 2	1.0 ± 0.2	24 ± 2
A03SL-031-02	0.48 ± 0.16	1.0 ± 0.2	0.35 ± 0.13	18.7 ± 1.8	1.1 ± 0.3	19.0 ± 1.8
A03SL-033-01	0.56 ± 0.17	0.9 ± 0.2	0.42 ± 0.14	5.9 ± 0.7	0.26 ± 0.11	6.2 ± 0.7
A03SL-035-01	0.46 ± 0.20	0.47 ± 0.19	0.20 ± 0.12	6.9 ± 0.8	0.31 ± 0.13	7.6 ± 0.9
A03SL-035-02	0.65 ± 0.20	0.37 ± 0.14	0.48 ± 0.17	76 ± 7	3.7 ± 0.6	79 ± 7
A03SL-036-01	0.72 ± 0.18	1.0 ± 0.2	0.73 ± 0.18	3.5 ± 0.5	0.13 ± 0.08	3.7 ± 0.5
A03SL-037-01	1.3 ± 0.3	0.82 ± 0.20	1.0 ± 0.2	7.5 ± 0.9	0.30 ± 0.13	7.4 ± 0.8
A03SL-038-01	0.50 ± 0.16	0.75 ± 0.20	0.28 ± 0.12	56 ± 5	3.2 ± 0.5	58 ± 5
A03SL-038-10	0.82 ± 0.19	1.0 ± 0.2	0.66 ± 0.17	5.9 ± 0.7	0.32 ± 0.13	5.7 ± 0.7
A03SL-039-02	0.61 ± 0.18	0.61 ± 0.18	0.52 ± 0.16	7.2 ± 0.8	0.43 ± 0.15	7.2 ± 0.8
A03SL-040-01	0.56 ± 0.17	0.65 ± 0.18	0.40 ± 0.14	5.8 ± 0.7	0.34 ± 0.13	5.8 ± 0.7
A03SL-042-01	1.1 ± 0.2	1.2 ± 0.2	1.0 ± 0.2	4.1 ± 0.5	0.26 ± 0.12	4.2 ± 0.5
A03SL-042-02	0.36 ± 0.15	0.36 ± 0.15	0.18 ± 0.10	3.5 ± 0.5	0.11 ± 0.08	3.9 ± 0.5
A03SL-203-01	1.6 ± 0.3	1.1 ± 0.3	1.4 ± 0.3	1.4 ± 0.3	0.04 ± 0.05	1.4 ± 0.3
A03SL-209-01	0.66 ± 0.18	1.0 ± 0.2	0.52 ± 0.16	14.5 ± 1.4	0.8 ± 0.2	15.9 ± 1.5
A03SL-214-06	0.67 ± 0.14	1.11 ± 0.18	0.56 ± 0.12	4.4 ± 0.4	0.28 ± 0.08	5.3 ± 0.5
A03SL-216-10	0.83 ± 0.19	1.0 ± 0.2	0.87 ± 0.20	6.5 ± 0.7	0.30 ± 0.12	6.3 ± 0.7
A03SL-217-01	0.58 ± 0.17	0.75 ± 0.19	0.63 ± 0.17	3.3 ± 0.5	0.11 ± 0.08	3.3 ± 0.5
A03SL-217-13	0.38 ± 0.15	0.28 ± 0.12	0.26 ± 0.12	119 ± 9	3.7 ± 0.2	122 ± 9
A03SL-217-14	0.48 ± 0.16	0.62 ± 0.18	0.42 ± 0.15	35 ± 3	1.9 ± 0.4	39 ± 4
A03SL-221-01	0.58 ± 0.17	0.65 ± 0.18	0.73 ± 0.19	3.7 ± 0.5	0.12 ± 0.08	3.9 ± 0.5
A03SL-222-10	0.37 ± 0.14	1.0 ± 0.3	0.43 ± 0.15	5.3 ± 0.6	0.48 ± 0.16	7.6 ± 0.8
A03SL-223-05	0.70 ± 0.20	1.1 ± 0.3	0.59 ± 0.18	7.2 ± 0.8	0.34 ± 0.13	8.1 ± 0.9
A03SL-224-01	0.77 ± 0.20	1.0 ± 0.2	1.1 ± 0.2	11.1 ± 1.1	0.68 ± 0.19	11.9 ± 1.2
A03SL-224-02	2.3 ± 0.4	0.9 ± 0.2	2.5 ± 0.4	6.7 ± 0.8	0.39 ± 0.15	6.4 ± 0.7
A03SL-224-05	0.84 ± 0.20	1.0 ± 0.2	0.80 ± 0.19	6.1 ± 0.7	0.22 ± 0.11	6.4 ± 0.7
A03SL-226-01	0.56 ± 0.16	1.0 ± 0.2	0.68 ± 0.18	5.7 ± 0.7	0.18 ± 0.10	6.7 ± 0.8
A03SL-227-04	0.73 ± 0.19	0.73 ± 0.19	0.54 ± 0.17	4.3 ± 0.6	0.22 ± 0.11	4.4 ± 0.6
A03SL-228-01	0.54 ± 0.18	0.52 ± 0.17	0.41 ± 0.15	7.6 ± 0.8	0.35 ± 0.14	7.9 ± 0.9
A03SL-228-06	0.54 ± 0.16	0.8 ± 0.2	0.52 ± 0.16	5.0 ± 0.6	0.23 ± 0.11	5.5 ± 0.7
A03SL-231-01	0.54 ± 0.17	0.9 ± 0.2	0.51 ± 0.16	20.8 ± 2.0	1.0 ± 0.2	20.4 ± 1.9
A03SL-231-02	0.8 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	18.7 ± 1.8	0.8 ± 0.2	18.6 ± 1.8
A03SL-231-05	0.9 ± 0.2	1.0 ± 0.3	0.9 ± 0.2	13.1 ± 1.3	0.71 ± 0.20	13.2 ± 1.3

TABLE 3-9
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A03SL-232-01	0.67 ± 0.19	1.0 ± 0.2	0.53 ± 0.17	4.8 ± 0.6	0.35 ± 0.13	5.2 ± 0.6
A03SL-232-06	0.8 ± 0.2	0.9 ± 0.2	0.59 ± 0.18	6.2 ± 0.7	0.26 ± 0.12	6.4 ± 0.7
A03SL-233-01	0.72 ± 0.19	0.85 ± 0.20	0.83 ± 0.20	4.4 ± 0.6	0.34 ± 0.13	4.8 ± 0.6
A03SL-233-07	1.3 ± 0.3	0.6 ± 0.2	0.9 ± 0.3	4.8 ± 0.6	0.30 ± 0.12	5.2 ± 0.6
A03SL-234-01	0.9 ± 0.2	0.9 ± 0.2	0.8 ± 0.2	3.6 ± 0.5	0.16 ± 0.09	4.4 ± 0.6
A03SL-237-01	1.3 ± 0.3	0.9 ± 0.2	1.0 ± 0.2	5.9 ± 0.7	0.22 ± 0.10	6.3 ± 0.7
A03SL-239-01	0.7 ± 0.2	0.63 ± 0.20	0.54 ± 0.18	7.5 ± 0.8	0.41 ± 0.14	7.4 ± 0.8
A03SL-239-11	3.5 ± 0.5	3.0 ± 0.5	2.8 ± 0.4	4.9 ± 0.6	0.19 ± 0.10	4.6 ± 0.6
A03SL-240-06	0.50 ± 0.18	0.8 ± 0.2	0.61 ± 0.19	15.0 ± 1.5	0.8 ± 0.2	16.3 ± 1.6
A03SL-240-07	0.75 ± 0.14	0.93 ± 0.16	0.72 ± 0.14	22.1 ± 1.5	1.19 ± 0.19	23.2 ± 1.6
A04ASL-003-01	0.80 ± 0.14	0.87 ± 0.15	0.83 ± 0.14	7.9 ± 0.9	0.42 ± 0.15	8.9 ± 1.0
A04ASL-003-03	0.10 ± 0.05	5.3 ± 0.4	0.01 ± 0.02	8.2 ± 0.6	0.41 ± 0.10	8.4 ± 0.6
A04ASL-009-01	0.59 ± 0.19	2.3 ± 0.4	0.41 ± 0.15	11.2 ± 1.2	0.53 ± 0.17	11.4 ± 1.2
A04ASL-014-01	0.8 ± 0.3	0.6 ± 0.2	0.8 ± 0.3	15.4 ± 1.5	0.55 ± 0.18	13.9 ± 1.4
A04ASL-020-01	0.04 ± 0.05	8.7 ± 1.0	0.02 ± 0.04	15.6 ± 1.5	0.8 ± 0.2	15.9 ± 1.6
A04ASL-024-01	0.50 ± 0.19	0.7 ± 0.2	0.30 ± 0.14	7.0 ± 0.8	0.35 ± 0.14	6.5 ± 0.8
A04ASL-031-01	1.0 ± 0.2	1.0 ± 0.2	0.82 ± 0.19	1.1 ± 0.2	0.06 ± 0.06	1.0 ± 0.2
A04ASL-034-01	0.81 ± 0.15	0.92 ± 0.16	0.77 ± 0.14	1.41 ± 0.19	0.09 ± 0.05	1.41 ± 0.19
A04ASL-038-01	0.7 ± 0.2	0.58 ± 0.20	0.44 ± 0.17	6.5 ± 0.8	0.20 ± 0.11	6.1 ± 0.7
A04ASL-044-01	0.7 ± 0.2	1.0 ± 0.3	0.6 ± 0.2	10.1 ± 1.1	0.44 ± 0.16	9.9 ± 1.1
A04ASL-051-01	1.3 ± 0.2	0.69 ± 0.16	1.4 ± 0.2	149 ± 12	8.00 ± 0.14	152 ± 12
A04ASL-051-02	2.3 ± 0.5	0.9 ± 0.3	1.7 ± 0.4	96 ± 9	4.8 ± 0.8	100 ± 9
A04ASL-052-02	1.0 ± 0.2	1.3 ± 0.3	1.0 ± 0.3	2.0 ± 0.4	0.10 ± 0.08	2.1 ± 0.4
A04ASL-054-01	0.9 ± 0.3	0.7 ± 0.2	0.8 ± 0.3	16.6 ± 1.6	0.66 ± 0.20	16.3 ± 1.6
A04ASL-055-01	0.6 ± 0.2	0.5 ± 0.2	0.43 ± 0.20	19.4 ± 1.9	1.2 ± 0.3	20.4 ± 2.0
A04ASL-055-02	0.61 ± 0.18	0.77 ± 0.20	0.50 ± 0.16	15.7 ± 1.6	0.68 ± 0.20	15.1 ± 1.5
A04ASL-056-01	2.0 ± 0.4	1.0 ± 0.2	1.9 ± 0.4	67 ± 6	4.1 ± 0.7	67 ± 6
A04ASL-056-04	0.05 ± 0.06	2.8 ± 0.4	0.02 ± 0.03	3.2 ± 0.4	0.16 ± 0.09	3.5 ± 0.5
A04ASL-056-05	0.8 ± 0.2	0.8 ± 0.2	0.9 ± 0.2	27 ± 3	1.0 ± 0.3	25 ± 2
A04ASL-058-01	0.16 ± 0.08	5.7 ± 0.7	0.01 ± 0.02	7.7 ± 0.9	0.37 ± 0.14	7.6 ± 0.9
A04ASL-058-02	1.0 ± 0.2	0.54 ± 0.17	0.9 ± 0.2	20.5 ± 2.0	1.0 ± 0.3	23 ± 2
A04ASL-059-01	1.1 ± 0.3	1.2 ± 0.3	0.9 ± 0.3	5.2 ± 0.6	0.23 ± 0.11	4.9 ± 0.6
A04ASL-060-01	0.6 ± 0.2	0.6 ± 0.2	0.5 ± 0.2	10.4 ± 1.1	0.51 ± 0.18	9.5 ± 1.0
A04ASL-061-01	0.77 ± 0.13	1.03 ± 0.16	0.86 ± 0.14	4.8 ± 0.4	0.14 ± 0.06	5.1 ± 0.4
A04ASL-062-01	1.1 ± 0.3	0.66 ± 0.19	1.1 ± 0.2	19.3 ± 1.9	1.0 ± 0.3	23 ± 2
A04ASL-062-02	1.9 ± 0.3	1.0 ± 0.2	1.6 ± 0.3	15.0 ± 1.5	0.9 ± 0.2	19.9 ± 1.9
A04ASL-063-03	0.39 ± 0.14	0.42 ± 0.14	0.32 ± 0.13	24 ± 2	1.2 ± 0.3	25 ± 2
A04ASL-067-02	0.57 ± 0.17	1.0 ± 0.2	0.9 ± 0.2	2.0 ± 0.3	0.14 ± 0.08	2.3 ± 0.4
A04ASL-203-01	1.0 ± 0.2	0.77 ± 0.20	0.8 ± 0.2	5.6 ± 0.7	0.21 ± 0.11	5.9 ± 0.7
A04ASL-203-06	1.5 ± 0.3	1.3 ± 0.3	1.2 ± 0.3	13.9 ± 1.4	0.66 ± 0.20	13.4 ± 1.4
A04ASL-209-10	1.0 ± 0.2	1.2 ± 0.3	0.78 ± 0.20	4.4 ± 0.6	0.29 ± 0.14	4.5 ± 0.6
A04ASL-214-01	1.2 ± 0.3	1.0 ± 0.2	0.79 ± 0.20	8.0 ± 0.9	0.45 ± 0.16	7.5 ± 0.8
A04ASL-214-05	0.75 ± 0.16	0.73 ± 0.16	0.59 ± 0.14	199 ± 16	10.08 ± 0.09	202 ± 16
A04ASL-214-06	1.8 ± 0.4	4.1 ± 0.6	1.7 ± 0.4	42 ± 4	2.2 ± 0.5	43 ± 4
A04ASL-214-09	0.8 ± 0.2	0.71 ± 0.19	0.71 ± 0.19	36 ± 3	1.7 ± 0.4	36 ± 3
A04ASL-220-01	0.51 ± 0.15	0.67 ± 0.18	0.45 ± 0.15	15.2 ± 1.5	0.69 ± 0.20	13.6 ± 1.4
A04ASL-220-14	0.9 ± 0.2	0.68 ± 0.18	0.72 ± 0.19	3.9 ± 0.5	0.13 ± 0.09	3.7 ± 0.5
A04ASL-224-10	1.3 ± 0.3	0.78 ± 0.20	1.2 ± 0.3	60 ± 5	2.6 ± 0.5	60 ± 5
A04ASL-224-11	1.04 ± 0.16	0.90 ± 0.15	0.95 ± 0.15	45 ± 3	2.2 ± 0.3	46 ± 3
A04ASL-224-14	1.2 ± 0.3	1.2 ± 0.3	0.74 ± 0.20	3.1 ± 0.5	0.17 ± 0.11	2.5 ± 0.4
A04ASL-230-05	1.0 ± 0.2	1.3 ± 0.3	0.9 ± 0.2	10.4 ± 1.1	0.49 ± 0.17	10.7 ± 1.1
A04ASL-236-09	0.57 ± 0.16	0.64 ± 0.17	0.38 ± 0.13	13.8 ± 1.4	0.72 ± 0.20	11.4 ± 1.2
A04ASL-238-01	1.0 ± 0.2	1.1 ± 0.2	1.0 ± 0.2	2.5 ± 0.4	0.12 ± 0.08	2.5 ± 0.4
A04ASL-238-05	0.55 ± 0.17	0.9 ± 0.2	0.45 ± 0.15	13.2 ± 1.4	0.7 ± 0.2	13.1 ± 1.4
A04ASL-239-03	1.1 ± 0.3	1.0 ± 0.3	1.0 ± 0.3	5.4 ± 0.7	0.25 ± 0.12	5.4 ± 0.7

TABLE 3-9
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A04ASL-241-01	0.60 ± 0.15	0.73 ± 0.16	0.55 ± 0.14	17.1 ± 1.2	0.81 ± 0.16	17.8 ± 1.2
A04ASL-244-01	0.79 ± 0.16	0.85 ± 0.16	0.77 ± 0.15	6.2 ± 0.7	0.23 ± 0.11	6.0 ± 0.7
A04ASL-244-02	0.6 ± 0.3	0.7 ± 0.3	0.8 ± 0.3	42 ± 4	2.4 ± 0.4	43 ± 4
A04ASL-250-04	0.71 ± 0.20	1.1 ± 0.3	0.57 ± 0.17	16.8 ± 1.6	0.9 ± 0.2	16.5 ± 1.6
A04ASL-274-11	0.57 ± 0.18	1.3 ± 0.3	0.72 ± 0.20	2.5 ± 0.4	0.11 ± 0.07	2.6 ± 0.4
A04ASL-276-01	0.64 ± 0.20	0.31 ± 0.14	0.65 ± 0.20	71 ± 6	2.5 ± 1.0	68 ± 6
A04ASL-276-05	0.85 ± 0.20	0.89 ± 0.20	0.83 ± 0.20	12.6 ± 1.3	0.59 ± 0.18	12.5 ± 1.3
A04ASL-278-01	0.49 ± 0.18	0.8 ± 0.2	0.64 ± 0.20	6.3 ± 0.8	0.46 ± 0.16	6.2 ± 0.8
A04ASL-278-10	0.62 ± 0.16	0.91 ± 0.18	0.76 ± 0.17	339 ± 25	17.61 ± 0.07	347 ± 26
A04ASL-309-01	0.9 ± 0.2	0.65 ± 0.20	0.8 ± 0.2	12.7 ± 1.3	0.55 ± 0.18	13.6 ± 1.4
A04ASL-314-03	3.6 ± 0.6	2.7 ± 0.5	3.1 ± 0.5	2.4 ± 0.4	0.11 ± 0.08	2.6 ± 0.4
A04ASL-318-01	0.52 ± 0.18	0.52 ± 0.18	0.51 ± 0.18	11.2 ± 1.2	0.50 ± 0.17	10.6 ± 1.1
A04ASL-318-02	0.23 ± 0.18	0.6 ± 0.3	0.5 ± 0.2	25 ± 2	1.1 ± 0.3	25 ± 2
A04ASL-319-01	0.54 ± 0.16	0.60 ± 0.17	0.62 ± 0.17	7.7 ± 0.8	0.38 ± 0.13	7.7 ± 0.8
A04ASL-320-01	0.8 ± 0.3	0.28 ± 0.14	0.8 ± 0.3	65 ± 8	3.8 ± 1.7	66 ± 8
A04BSL-001-01	0.38 ± 0.10	0.53 ± 0.11	0.35 ± 0.09	0.59 ± 0.12	0.05 ± 0.04	0.68 ± 0.12
A04BSL-002-01	0.46 ± 0.15	0.74 ± 0.19	0.46 ± 0.15	1.2 ± 0.3	0.08 ± 0.06	1.1 ± 0.2
A04BSL-003-01	0.29 ± 0.12	0.43 ± 0.15	0.18 ± 0.09	0.31 ± 0.12	0.05 ± 0.05	0.27 ± 0.11
A04BSL-004-01	0.31 ± 0.13	0.32 ± 0.13	0.34 ± 0.13	0.25 ± 0.10	0.02 ± 0.03	0.33 ± 0.12
A04BSL-005-01	0.66 ± 0.19	0.69 ± 0.19	0.60 ± 0.17	3.2 ± 0.5	0.05 ± 0.05	2.9 ± 0.4
A04BSL-006-01	0.69 ± 0.19	0.75 ± 0.20	0.46 ± 0.15	1.1 ± 0.2	0.05 ± 0.05	0.9 ± 0.2
A04BSL-007-06	1.2 ± 0.3	1.6 ± 0.4	1.0 ± 0.3	2.6 ± 0.4	0.13 ± 0.08	2.8 ± 0.4
A04BSL-008-01	0.49 ± 0.16	0.42 ± 0.14	0.41 ± 0.14	2.2 ± 0.4	0.15 ± 0.09	2.3 ± 0.4
A04BSL-008-03	1.0 ± 0.2	1.1 ± 0.2	0.79 ± 0.19	0.87 ± 0.20	0.05 ± 0.05	1.1 ± 0.2
A04BSL-009-01	0.31 ± 0.12	0.27 ± 0.11	0.19 ± 0.09	0.18 ± 0.09	0.01 ± 0.03	0.23 ± 0.10
A04BSL-010-01	0.42 ± 0.14	0.35 ± 0.13	0.26 ± 0.11	0.38 ± 0.13	0.01 ± 0.03	0.46 ± 0.14
A04BSL-011-01	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	1.2 ± 0.3	0.18 ± 0.10	1.4 ± 0.3
A04BSL-012-06	1.11 ± 0.17	1.19 ± 0.17	0.94 ± 0.16	1.19 ± 0.17	0.06 ± 0.04	1.52 ± 0.19
A04BSL-013-01	0.17 ± 0.10	0.38 ± 0.14	0.31 ± 0.13	0.30 ± 0.12	0.02 ± 0.04	0.39 ± 0.13
A04BSL-013-07	0.8 ± 0.2	1.2 ± 0.3	0.73 ± 0.20	3.8 ± 0.5	0.16 ± 0.09	4.0 ± 0.5
A04BSL-014-01	0.29 ± 0.13	0.33 ± 0.14	0.27 ± 0.12	0.30 ± 0.12	0.03 ± 0.04	0.44 ± 0.14
A04BSL-014-07	0.9 ± 0.2	0.9 ± 0.2	1.0 ± 0.2	0.64 ± 0.18	0.05 ± 0.06	0.84 ± 0.20
A04BSL-015-06	1.2 ± 0.3	1.9 ± 0.4	1.2 ± 0.3	0.80 ± 0.20	0.06 ± 0.06	1.0 ± 0.2
A04BSL-015-07	1.0 ± 0.2	1.2 ± 0.2	0.84 ± 0.20	0.58 ± 0.17	0.05 ± 0.05	0.77 ± 0.19
A04BSL-016-01	0.50 ± 0.16	0.61 ± 0.18	0.64 ± 0.18	2.2 ± 0.4	0.13 ± 0.08	2.4 ± 0.4
A04BSL-016-03	0.9 ± 0.2	0.9 ± 0.2	0.69 ± 0.18	1.0 ± 0.2	0.03 ± 0.04	0.94 ± 0.20
A04BSL-018-06	1.3 ± 0.3	1.4 ± 0.3	1.1 ± 0.2	0.90 ± 0.20	0.02 ± 0.04	1.0 ± 0.2
A04BSL-018-07	1.1 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	0.62 ± 0.17	0.04 ± 0.05	0.9 ± 0.2
A04BSL-019-01	0.58 ± 0.17	0.41 ± 0.15	0.21 ± 0.10	0.66 ± 0.18	0.01 ± 0.03	0.58 ± 0.16
A04BSL-019-02	0.53 ± 0.16	0.71 ± 0.19	0.44 ± 0.15	2.4 ± 0.4	0.12 ± 0.08	2.4 ± 0.4
A04BSL-020-06	0.73 ± 0.19	1.0 ± 0.2	0.71 ± 0.18	0.48 ± 0.14	0.01 ± 0.03	0.58 ± 0.16
A04BSL-021-01	0.69 ± 0.19	1.0 ± 0.2	0.44 ± 0.14	1.2 ± 0.2	0.10 ± 0.07	1.2 ± 0.2
A04BSL-025-01	0.23 ± 0.12	0.47 ± 0.16	0.32 ± 0.14	1.0 ± 0.2	0.01 ± 0.03	1.0 ± 0.2
A04BSL-025-03	0.9 ± 0.2	0.76 ± 0.19	0.60 ± 0.17	9.1 ± 1.0	0.59 ± 0.19	9.4 ± 1.0
A04BSL-026-01	0.73 ± 0.18	0.84 ± 0.20	0.9 ± 0.2	0.55 ± 0.16	0.05 ± 0.05	0.81 ± 0.19
A04BSL-027-01	0.46 ± 0.15	0.46 ± 0.14	0.54 ± 0.15	0.47 ± 0.15	0.02 ± 0.04	0.56 ± 0.16
A04BSL-028-01	0.36 ± 0.13	0.45 ± 0.14	0.36 ± 0.13	0.86 ± 0.20	0.05 ± 0.05	1.1 ± 0.2
A04BSL-031-06	1.15 ± 0.17	1.41 ± 0.19	1.24 ± 0.18	0.91 ± 0.15	0.04 ± 0.04	0.99 ± 0.16
A04BSL-031-07	1.0 ± 0.2	1.1 ± 0.2	1.0 ± 0.2	0.77 ± 0.19	0.08 ± 0.07	0.82 ± 0.20
A04BSL-032-06	1.0 ± 0.2	1.4 ± 0.3	1.2 ± 0.2	1.1 ± 0.2	0.05 ± 0.05	0.9 ± 0.2
A04BSL-032-07	1.3 ± 0.3	1.3 ± 0.3	1.1 ± 0.2	0.79 ± 0.19	0.05 ± 0.05	1.1 ± 0.2
A04BSL-033-01	0.41 ± 0.11	0.52 ± 0.12	0.36 ± 0.10	0.54 ± 0.11	0.015 ± 0.020	0.61 ± 0.11
A04BSL-036-05	1.2 ± 0.3	1.2 ± 0.3	1.1 ± 0.2	3.5 ± 0.5	0.20 ± 0.10	3.5 ± 0.5
A04BSL-038-07	0.9 ± 0.2	1.1 ± 0.2	0.9 ± 0.2	1.1 ± 0.2	0.08 ± 0.07	1.1 ± 0.2
A04BSL-039-01	1.0 ± 0.2	1.3 ± 0.3	1.1 ± 0.2	1.3 ± 0.3	0.05 ± 0.05	1.4 ± 0.3

TABLE 3-9
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A04BSL-040-03	1.7 ± 0.3	1.6 ± 0.3	1.7 ± 0.3	3.4 ± 0.5	0.15 ± 0.09	3.4 ± 0.5
A04BSL-041-05	0.82 ± 0.20	0.77 ± 0.19	0.68 ± 0.17	14.8 ± 1.5	0.8 ± 0.2	14.5 ± 1.4
A04BSL-042-01	0.74 ± 0.19	1.3 ± 0.3	0.76 ± 0.19	1.2 ± 0.3	0.11 ± 0.08	1.4 ± 0.3
A04BSL-042-02	1.0 ± 0.2	1.3 ± 0.3	0.9 ± 0.2	1.0 ± 0.2	0.05 ± 0.05	1.2 ± 0.2
A04BSL-043-01	0.8 ± 0.2	1.0 ± 0.2	0.55 ± 0.17	6.2 ± 0.7	0.32 ± 0.13	9.5 ± 1.0
A04BSL-043-02	0.84 ± 0.20	1.0 ± 0.2	0.70 ± 0.18	2.3 ± 0.4	0.13 ± 0.08	2.4 ± 0.4
A04BSL-219-03	0.82 ± 0.20	1.2 ± 0.3	0.80 ± 0.20	2.3 ± 0.4	0.09 ± 0.07	2.2 ± 0.4
A04BSL-221-01	0.56 ± 0.17	0.71 ± 0.20	0.37 ± 0.14	0.81 ± 0.19	0.04 ± 0.04	0.91 ± 0.20
A04BSL-302-06	1.3 ± 0.3	1.0 ± 0.2	1.4 ± 0.3	1.0 ± 0.2	0.05 ± 0.05	0.84 ± 0.20
A04BSL-303-01	0.33 ± 0.14	0.38 ± 0.15	0.13 ± 0.08	0.30 ± 0.11	0.000 ± 0.012	0.26 ± 0.11
A04BSL-304-03	1.1 ± 0.2	1.2 ± 0.3	0.75 ± 0.19	2.1 ± 0.3	0.10 ± 0.07	2.3 ± 0.4
A04BSL-305-06	0.82 ± 0.20	0.83 ± 0.20	0.72 ± 0.18	0.85 ± 0.20	-0.005 ± 0.007	0.84 ± 0.20
A04BSL-306-03	0.58 ± 0.17	0.81 ± 0.20	0.79 ± 0.20	3.7 ± 0.5	0.20 ± 0.10	3.5 ± 0.5
A04BSL-307-01	0.60 ± 0.17	0.48 ± 0.15	0.66 ± 0.18	1.0 ± 0.2	0.06 ± 0.06	1.0 ± 0.2
A04BSL-308-01	0.45 ± 0.14	0.70 ± 0.18	0.49 ± 0.15	1.3 ± 0.3	0.08 ± 0.07	1.3 ± 0.3
A04BSL-308-02	0.9 ± 0.2	0.80 ± 0.20	1.0 ± 0.2	4.8 ± 0.6	0.33 ± 0.12	5.0 ± 0.6
A04BSL-309-01	0.26 ± 0.12	0.23 ± 0.11	0.28 ± 0.12	0.22 ± 0.10	0.02 ± 0.04	0.21 ± 0.09
A04BSL-310-01	0.43 ± 0.11	0.43 ± 0.10	0.29 ± 0.08	0.38 ± 0.09	0.012 ± 0.021	0.32 ± 0.08
A04BSL-310-06	1.0 ± 0.2	1.1 ± 0.3	1.0 ± 0.2	2.3 ± 0.4	0.06 ± 0.06	2.1 ± 0.3
A04BSL-310-07	1.10 ± 0.17	1.28 ± 0.18	0.92 ± 0.15	0.80 ± 0.14	0.04 ± 0.03	0.99 ± 0.16
A04CSL-001-01	0.91 ± 0.14	1.06 ± 0.16	1.01 ± 0.15	0.74 ± 0.14	-0.002 ± 0.019	0.81 ± 0.14
A04CSL-002-01	1.2 ± 0.2	1.5 ± 0.3	1.1 ± 0.2	0.75 ± 0.20	0.03 ± 0.05	0.9 ± 0.2
A04CSL-003-01	0.90 ± 0.20	1.0 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	0.06 ± 0.05	0.82 ± 0.20
A04CSL-003-02	1.2 ± 0.2	1.1 ± 0.2	1.0 ± 0.2	0.8 ± 0.2	0.04 ± 0.05	1.0 ± 0.2
A04CSL-004-02	1.4 ± 0.3	1.4 ± 0.3	1.2 ± 0.2	0.9 ± 0.2	0.07 ± 0.06	0.9 ± 0.2
A04CSL-005-01	0.88 ± 0.15	0.84 ± 0.15	0.76 ± 0.14	0.52 ± 0.12	0.04 ± 0.03	0.49 ± 0.11
A04CSL-006-01	0.83 ± 0.19	1.2 ± 0.2	1.0 ± 0.2	1.0 ± 0.2	0.09 ± 0.07	1.2 ± 0.3
A04CSL-006-02	1.3 ± 0.3	1.4 ± 0.3	1.2 ± 0.2	1.0 ± 0.2	0.03 ± 0.04	1.0 ± 0.2
A04CSL-006-03	1.2 ± 0.2	1.4 ± 0.3	1.2 ± 0.2	0.80 ± 0.19	0.02 ± 0.04	0.82 ± 0.20
A04CSL-007-01	0.79 ± 0.18	0.85 ± 0.19	0.71 ± 0.17	0.67 ± 0.18	0.01 ± 0.03	0.59 ± 0.17
A04CSL-008-01	0.75 ± 0.18	0.80 ± 0.19	0.51 ± 0.14	0.53 ± 0.16	0.02 ± 0.04	0.74 ± 0.19
A04CSL-009-01	1.2 ± 0.2	1.1 ± 0.2	1.0 ± 0.2	1.1 ± 0.3	0.06 ± 0.06	1.1 ± 0.3
A04CSL-011-01	1.1 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	1.0 ± 0.2	0.06 ± 0.06	1.2 ± 0.3
A04CSL-011-03	1.1 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	1.1 ± 0.3	0.12 ± 0.08	1.0 ± 0.2
A04CSL-011-04	1.1 ± 0.2	1.3 ± 0.3	1.1 ± 0.2	1.2 ± 0.3	0.09 ± 0.07	1.5 ± 0.3
A04CSL-012-01	0.86 ± 0.20	1.1 ± 0.2	0.84 ± 0.19	1.2 ± 0.3	0.07 ± 0.07	1.2 ± 0.3
A04CSL-013-01	0.70 ± 0.17	1.0 ± 0.2	0.73 ± 0.18	2.3 ± 0.4	0.09 ± 0.07	2.1 ± 0.4
A04CSL-013-02	1.1 ± 0.2	1.2 ± 0.2	0.90 ± 0.20	3.4 ± 0.6	0.13 ± 0.09	3.8 ± 0.6
A04CSL-014-01	0.41 ± 0.13	0.55 ± 0.15	0.39 ± 0.12	0.49 ± 0.15	0.03 ± 0.04	0.38 ± 0.13
A04CSL-015-01	0.58 ± 0.16	0.54 ± 0.15	0.61 ± 0.16	0.9 ± 0.2	0.03 ± 0.05	1.1 ± 0.3
A04CSL-301-01	0.73 ± 0.20	1.1 ± 0.3	0.59 ± 0.18	5.3 ± 0.7	0.28 ± 0.13	4.9 ± 0.6
A04CSL-302-05	1.7 ± 0.3	1.6 ± 0.3	1.5 ± 0.3	2.3 ± 0.4	0.08 ± 0.07	2.0 ± 0.3
A04CSL-305-01	0.80 ± 0.14	0.94 ± 0.15	0.85 ± 0.14	2.0 ± 0.3	0.10 ± 0.08	1.7 ± 0.3
A04CSL-307-01	0.8 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	1.8 ± 0.3	0.07 ± 0.06	1.8 ± 0.3
A04CSL-307-02	1.1 ± 0.3	1.2 ± 0.3	1.3 ± 0.3	1.4 ± 0.3	0.07 ± 0.06	1.4 ± 0.3
A04CSL-308-01	1.2 ± 0.3	1.2 ± 0.3	1.0 ± 0.2	0.82 ± 0.20	0.05 ± 0.05	0.76 ± 0.19
A04CSL-308-02	1.2 ± 0.3	1.0 ± 0.2	0.74 ± 0.19	0.73 ± 0.19	0.06 ± 0.06	0.64 ± 0.18
A04CSL-309-01	1.7 ± 0.4	2.0 ± 0.5	1.5 ± 0.4	2.0 ± 0.5	0.18 ± 0.14	2.2 ± 0.5
A04CSL-309-05	0.63 ± 0.17	0.9 ± 0.2	0.67 ± 0.18	0.60 ± 0.17	0.06 ± 0.06	0.49 ± 0.15
A04CSL-310-01	1.0 ± 0.2	1.2 ± 0.3	1.0 ± 0.2	2.8 ± 0.4	0.25 ± 0.12	2.6 ± 0.4
A04CSL-310-02	1.1 ± 0.3	1.3 ± 0.3	1.0 ± 0.2	3.1 ± 0.5	0.19 ± 0.10	3.3 ± 0.5
A04CSL-312-01	0.8 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	1.7 ± 0.3	0.05 ± 0.05	1.8 ± 0.3
A04CSL-312-02	1.0 ± 0.2	1.2 ± 0.3	1.0 ± 0.2	2.4 ± 0.4	0.11 ± 0.07	2.1 ± 0.3
A04DSL-008-05	1.9 ± 0.3	1.8 ± 0.3	1.5 ± 0.3	1.1 ± 0.2	0.05 ± 0.05	1.1 ± 0.2
A04DSL-015-01	1.0 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	0.85 ± 0.19	0.05 ± 0.05	1.1 ± 0.2

TABLE 3-9
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A04DSL-020-01	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	8.5 ± 0.9	0.41 ± 0.14	9.9 ± 1.0
A04DSL-021-01	1.3 ± 0.2	1.2 ± 0.2	1.2 ± 0.2	1.6 ± 0.3	0.02 ± 0.04	1.5 ± 0.3
A04DSL-022-06	1.3 ± 0.3	1.3 ± 0.3	1.3 ± 0.3	0.85 ± 0.19	0.01 ± 0.02	0.91 ± 0.20
A04DSL-023-01	1.0 ± 0.2	1.1 ± 0.2	0.9 ± 0.2	2.3 ± 0.4	0.17 ± 0.10	2.3 ± 0.4
A04DSL-023-03	1.3 ± 0.2	1.8 ± 0.3	1.5 ± 0.2	3.2 ± 0.3	0.16 ± 0.07	3.0 ± 0.3
A04DSL-024-01	0.9 ± 0.2	0.9 ± 0.2	0.67 ± 0.19	1.5 ± 0.3	0.02 ± 0.04	1.4 ± 0.3
A04DSL-026-01	0.9 ± 0.3	1.5 ± 0.4	1.2 ± 0.4	2.8 ± 0.4	0.18 ± 0.10	3.1 ± 0.4
A04DSL-029-01	1.2 ± 0.4	1.0 ± 0.3	1.2 ± 0.4	1.1 ± 0.2	0.04 ± 0.05	1.6 ± 0.3
A04DSL-031-03	1.6 ± 0.4	2.3 ± 0.5	1.7 ± 0.4	3.2 ± 0.5	0.15 ± 0.09	3.4 ± 0.5
A04DSL-210-02	1.0 ± 0.4	1.4 ± 0.4	1.0 ± 0.4	2.6 ± 0.4	0.12 ± 0.08	2.4 ± 0.4
A04DSL-220-01	0.61 ± 0.18	0.53 ± 0.16	0.61 ± 0.17	14.1 ± 1.0	0.71 ± 0.15	15.2 ± 1.1
A04DSL-304-03	1.2 ± 0.3	2.2 ± 0.4	1.2 ± 0.3	1.5 ± 0.3	0.05 ± 0.05	1.3 ± 0.3
A04DSL-306-02	1.27 ± 0.20	1.4 ± 0.2	1.4 ± 0.2	1.2 ± 0.2	0.10 ± 0.07	1.3 ± 0.2
A04DSL-307-01	1.1 ± 0.3	1.5 ± 0.3	1.3 ± 0.3	1.3 ± 0.3	0.03 ± 0.05	1.2 ± 0.3
A04DSL-307-02	1.2 ± 0.3	1.3 ± 0.3	1.6 ± 0.3	1.1 ± 0.2	0.03 ± 0.04	1.1 ± 0.2
A04DSL-308-01	1.2 ± 0.3	1.1 ± 0.3	1.0 ± 0.2	4.3 ± 0.6	0.19 ± 0.10	4.1 ± 0.5
A04DSL-311-02	1.1 ± 0.2	1.2 ± 0.3	0.79 ± 0.20	1.9 ± 0.3	0.03 ± 0.04	1.7 ± 0.3
A04DSL-317-01	1.0 ± 0.2	1.2 ± 0.3	0.8 ± 0.2	1.4 ± 0.3	0.05 ± 0.05	1.6 ± 0.3
A04DSL-320-05	1.6 ± 0.3	2.1 ± 0.4	1.6 ± 0.3	2.0 ± 0.3	0.11 ± 0.08	1.8 ± 0.3
A04DSL-324-03	1.3 ± 0.3	1.2 ± 0.3	1.0 ± 0.2	1.0 ± 0.2	0.02 ± 0.04	0.86 ± 0.20
A04DSL-324-04	1.8 ± 0.4	1.9 ± 0.4	2.0 ± 0.4	1.8 ± 0.3	0.07 ± 0.06	1.9 ± 0.3
A04DSL-326-01	2.4 ± 0.4	1.2 ± 0.3	1.9 ± 0.3	1.8 ± 0.3	0.16 ± 0.08	8.4 ± 0.9
A05ASL-003-01	0.91 ± 0.15	1.22 ± 0.18	0.76 ± 0.13	0.81 ± 0.13	0.04 ± 0.03	0.85 ± 0.14
A05ASL-004-01	1.0 ± 0.2	1.0 ± 0.2	0.63 ± 0.17	2.7 ± 0.4	0.14 ± 0.09	3.1 ± 0.4
A05ASL-004-02	1.1 ± 0.2	0.8 ± 0.2	0.69 ± 0.19	0.67 ± 0.17	0.02 ± 0.03	0.76 ± 0.18
A05ASL-005-01	0.8 ± 0.2	0.69 ± 0.19	0.9 ± 0.2	1.9 ± 0.3	0.07 ± 0.06	2.0 ± 0.3
A05ASL-007-01	0.59 ± 0.15	0.43 ± 0.12	0.49 ± 0.13	0.43 ± 0.14	0.04 ± 0.05	0.35 ± 0.12
A05ASL-007-03	1.2 ± 0.3	1.3 ± 0.3	1.0 ± 0.2	0.84 ± 0.19	0.10 ± 0.07	0.75 ± 0.18
A05ASL-008-01	0.9 ± 0.2	1.0 ± 0.2	1.0 ± 0.2	0.91 ± 0.20	0.05 ± 0.05	1.1 ± 0.2
A05ASL-008-07	0.9 ± 0.2	1.0 ± 0.2	1.0 ± 0.2	1.0 ± 0.2	0.04 ± 0.04	0.86 ± 0.20
A05ASL-009-01	0.60 ± 0.17	0.82 ± 0.20	0.67 ± 0.18	0.92 ± 0.20	0.06 ± 0.05	1.0 ± 0.2
A05ASL-009-07	1.1 ± 0.2	1.0 ± 0.2	1.1 ± 0.2	0.58 ± 0.16	0.03 ± 0.04	0.77 ± 0.19
A05ASL-010-07	1.2 ± 0.3	1.0 ± 0.2	1.0 ± 0.2	0.52 ± 0.15	0.07 ± 0.06	0.71 ± 0.18
A05ASL-010-08	1.2 ± 0.3	1.0 ± 0.2	0.82 ± 0.20	0.73 ± 0.18	0.04 ± 0.04	0.64 ± 0.17
A05ASL-011-01	1.0 ± 0.2	1.0 ± 0.2	0.60 ± 0.17	0.79 ± 0.19	0.02 ± 0.04	0.9 ± 0.2
A05ASL-011-06	0.9 ± 0.2	1.1 ± 0.2	1.1 ± 0.3	0.54 ± 0.15	0.01 ± 0.03	0.62 ± 0.16
A05ASL-012-01	1.1 ± 0.3	1.3 ± 0.3	1.0 ± 0.3	1.1 ± 0.2	0.02 ± 0.04	1.0 ± 0.2
A05ASL-012-06	1.2 ± 0.3	1.1 ± 0.2	1.1 ± 0.2	0.67 ± 0.17	0.05 ± 0.05	0.82 ± 0.19
A05ASL-012-07	1.0 ± 0.2	0.79 ± 0.20	0.9 ± 0.2	0.61 ± 0.16	0.04 ± 0.04	0.57 ± 0.16
A05ASL-017-01	0.9 ± 0.2	1.0 ± 0.2	0.67 ± 0.18	0.9 ± 0.2	0.02 ± 0.04	0.83 ± 0.19
A05ASL-017-03	1.1 ± 0.2	1.1 ± 0.2	0.77 ± 0.20	0.9 ± 0.2	0.08 ± 0.07	0.72 ± 0.19
A05ASL-018-01	0.86 ± 0.20	1.1 ± 0.2	0.78 ± 0.19	1.2 ± 0.2	0.05 ± 0.05	1.3 ± 0.3
A05ASL-018-02	1.30 ± 0.20	1.5 ± 0.2	1.25 ± 0.19	0.83 ± 0.14	0.04 ± 0.03	0.94 ± 0.16
A05ASL-019-01	1.0 ± 0.2	1.2 ± 0.3	1.1 ± 0.3	2.9 ± 0.4	0.25 ± 0.12	7.1 ± 0.8
A05ASL-020-01	0.82 ± 0.16	0.94 ± 0.16	0.86 ± 0.16	1.9 ± 0.2	0.09 ± 0.05	2.2 ± 0.2
A05ASL-021-01	0.82 ± 0.20	1.0 ± 0.2	0.54 ± 0.15	0.43 ± 0.13	0.01 ± 0.03	0.63 ± 0.16
A05ASL-022-01	1.2 ± 0.3	1.1 ± 0.3	1.1 ± 0.3	1.0 ± 0.2	-0.007 ± 0.008	1.0 ± 0.2
A05ASL-022-03	1.2 ± 0.3	1.1 ± 0.3	0.9 ± 0.2	0.79 ± 0.19	0.01 ± 0.03	0.58 ± 0.16
A05ASL-023-01	1.2 ± 0.3	0.9 ± 0.2	0.9 ± 0.2	1.0 ± 0.2	0.06 ± 0.07	0.9 ± 0.2
A05ASL-023-03	1.3 ± 0.3	1.4 ± 0.3	1.1 ± 0.3	1.2 ± 0.3	0.05 ± 0.05	0.9 ± 0.2
A05ASL-024-01	1.0 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	0.57 ± 0.16	0.08 ± 0.06	0.69 ± 0.18
A05ASL-024-02	1.0 ± 0.2	1.2 ± 0.3	1.0 ± 0.2	0.86 ± 0.20	0.03 ± 0.04	0.69 ± 0.18
A05ASL-025-01	1.0 ± 0.2	1.1 ± 0.3	0.71 ± 0.20	0.77 ± 0.19	0.06 ± 0.06	0.9 ± 0.2
A05ASL-026-01	1.0 ± 0.2	1.2 ± 0.3	0.9 ± 0.2	0.87 ± 0.20	0.03 ± 0.04	0.86 ± 0.20
A05ASL-027-03	0.9 ± 0.2	0.9 ± 0.2	0.63 ± 0.18	0.68 ± 0.18	0.02 ± 0.04	0.9 ± 0.2

TABLE 3-9
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A05ASL-029-01	0.9 ± 0.2	0.9 ± 0.2	0.67 ± 0.19	0.70 ± 0.17	0.04 ± 0.05	0.64 ± 0.17
A05ASL-029-03	1.0 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	0.46 ± 0.15	0.02 ± 0.04	0.60 ± 0.17
A05ASL-031-03	1.04 ± 0.17	0.96 ± 0.16	0.90 ± 0.16	0.63 ± 0.12	0.05 ± 0.04	0.57 ± 0.12
A05ASL-209-25	0.9 ± 0.3	1.3 ± 0.3	0.8 ± 0.2	0.44 ± 0.14	0.04 ± 0.05	0.52 ± 0.15
A05ASL-210-01	0.75 ± 0.20	1.3 ± 0.3	0.66 ± 0.18	1.0 ± 0.2	0.01 ± 0.03	1.1 ± 0.2
A05ASL-211-01	1.5 ± 0.3	1.5 ± 0.3	1.6 ± 0.3	1.1 ± 0.2	0.12 ± 0.08	1.1 ± 0.2
A05ASL-219-01	1.3 ± 0.3	1.4 ± 0.3	1.1 ± 0.2	2.3 ± 0.4	0.18 ± 0.10	3.5 ± 0.5
A05ASL-219-02	1.04 ± 0.17	1.04 ± 0.17	0.84 ± 0.15	5.1 ± 0.4	0.27 ± 0.09	5.6 ± 0.5
A05ASL-226-01	0.64 ± 0.18	1.0 ± 0.2	0.71 ± 0.19	1.0 ± 0.2	0.09 ± 0.07	0.9 ± 0.2
A05ASL-301-01	46 ± 4	9.5 ± 1.5	46 ± 4	4083 ± 290	216 ± 39	4357 ± 303
A05ASL-301-02	18.3 ± 1.8	4.3 ± 0.6	17.1 ± 1.7	1746 ± 120	99 ± 17	1871 ± 127
A05ASL-301-06	2.8 ± 0.4	1.2 ± 0.3	2.7 ± 0.4	212 ± 25	10 ± 5	224 ± 26
A05ASL-302-01	0.75 ± 0.19	1.1 ± 0.2	0.66 ± 0.17	9.3 ± 1.0	0.48 ± 0.17	10.5 ± 1.1
A05ASL-303-01	1.1 ± 0.3	1.0 ± 0.3	1.1 ± 0.3	10.7 ± 1.1	0.63 ± 0.18	12.0 ± 1.2
A05ASL-303-13	1.0 ± 0.3	1.9 ± 0.4	1.1 ± 0.3	0.9 ± 0.2	0.04 ± 0.05	1.1 ± 0.2
A05ASL-303-14	1.3 ± 0.3	1.9 ± 0.3	1.1 ± 0.2	1.23 ± 0.17	0.05 ± 0.04	1.6 ± 0.2
A05ASL-304-01	1.4 ± 0.4	1.6 ± 0.4	0.9 ± 0.3	10.1 ± 1.1	0.49 ± 0.16	10.1 ± 1.0
A05ASL-304-02	0.8 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	6.8 ± 0.8	0.28 ± 0.11	7.5 ± 0.8
A05ASL-304-13	0.6 ± 0.5	0.8 ± 0.5	0.5 ± 0.4	3.1 ± 0.5	0.20 ± 0.11	3.3 ± 0.5
A05ASL-304-14	0.8 ± 0.3	0.9 ± 0.3	0.8 ± 0.3	2.0 ± 0.3	0.12 ± 0.08	1.8 ± 0.3
A05ASL-305-01	1.6 ± 0.4	1.5 ± 0.4	1.5 ± 0.4	5.0 ± 0.6	0.20 ± 0.10	5.5 ± 0.7
A05ASL-305-02	1.2 ± 0.4	0.6 ± 0.3	1.0 ± 0.4	2.9 ± 0.4	0.15 ± 0.09	4.3 ± 0.6
A05ASL-305-03	1.1 ± 0.3	1.6 ± 0.4	0.7 ± 0.3	2.7 ± 0.4	0.15 ± 0.09	3.8 ± 0.5
A05ASL-305-13	0.8 ± 0.3	1.0 ± 0.3	1.0 ± 0.3	0.67 ± 0.18	0.01 ± 0.03	0.80 ± 0.20
A05ASL-306-03	0.9 ± 0.3	1.1 ± 0.3	1.2 ± 0.3	1.0 ± 0.2	0.04 ± 0.05	1.0 ± 0.2
A05ASL-307-01	0.8 ± 0.3	0.9 ± 0.3	0.6 ± 0.2	0.42 ± 0.13	0.01 ± 0.02	0.52 ± 0.15
A05ASL-308-01	1.2 ± 0.3	1.5 ± 0.4	1.3 ± 0.4	1.0 ± 0.2	0.01 ± 0.03	1.3 ± 0.3
A05BSL-001-01	0.8 ± 0.2	0.71 ± 0.20	0.8 ± 0.2	0.76 ± 0.20	0.08 ± 0.07	0.74 ± 0.20
A05BSL-001-12	0.58 ± 0.17	0.8 ± 0.2	0.8 ± 0.2	0.35 ± 0.12	0.06 ± 0.05	0.52 ± 0.15
A05BSL-001-13	1.1 ± 0.3	0.9 ± 0.2	0.9 ± 0.2	0.58 ± 0.16	0.02 ± 0.04	0.66 ± 0.18
A05BSL-002-11	1.0 ± 0.3	1.3 ± 0.4	1.1 ± 0.3	0.7 ± 0.2	0.04 ± 0.06	0.7 ± 0.2
A05BSL-003-01	0.7 ± 0.2	0.9 ± 0.3	1.0 ± 0.3	0.8 ± 0.2	0.05 ± 0.06	0.8 ± 0.2
A05BSL-003-03	0.9 ± 0.3	1.1 ± 0.3	1.0 ± 0.3	0.7 ± 0.2	0.04 ± 0.06	0.8 ± 0.2
A05BSL-004-01	1.0 ± 0.3	0.9 ± 0.3	1.2 ± 0.3	0.8 ± 0.2	0.03 ± 0.05	0.62 ± 0.20
A05BSL-004-03	1.12 ± 0.18	0.90 ± 0.15	1.02 ± 0.16	0.73 ± 0.13	0.03 ± 0.03	0.91 ± 0.15
A05BSL-005-01	1.0 ± 0.2	1.1 ± 0.3	0.9 ± 0.2	0.84 ± 0.20	0.03 ± 0.04	0.55 ± 0.15
A05BSL-005-03	1.1 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	0.79 ± 0.19	0.03 ± 0.04	0.58 ± 0.16
A05BSL-006-01	0.9 ± 0.2	1.0 ± 0.2	0.62 ± 0.18	0.89 ± 0.20	0.07 ± 0.06	0.76 ± 0.19
A05BSL-006-11	0.76 ± 0.16	0.88 ± 0.17	0.91 ± 0.18	0.69 ± 0.16	-0.003 ± 0.010	0.59 ± 0.14
A05BSL-007-01	0.8 ± 0.2	0.8 ± 0.3	0.8 ± 0.2	0.8 ± 0.2	0.05 ± 0.06	0.7 ± 0.2
A05BSL-007-03	0.9 ± 0.3	1.1 ± 0.3	0.9 ± 0.3	0.8 ± 0.2	0.03 ± 0.05	0.67 ± 0.20
A05BSL-007-10	0.59 ± 0.17	0.71 ± 0.19	0.70 ± 0.18	0.70 ± 0.18	0.06 ± 0.06	0.46 ± 0.14
A05BSL-008-01	0.8 ± 0.3	0.9 ± 0.3	0.7 ± 0.3	0.8 ± 0.2	0.08 ± 0.08	0.7 ± 0.2
A05BSL-008-02	0.8 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	0.9 ± 0.3	0.05 ± 0.06	0.9 ± 0.3
A05BSL-009-01	1.2 ± 0.3	1.1 ± 0.3	1.1 ± 0.3	0.8 ± 0.2	0.07 ± 0.07	0.7 ± 0.2
A05BSL-010-01	0.8 ± 0.3	0.8 ± 0.2	0.6 ± 0.2	0.7 ± 0.2	0.03 ± 0.05	0.59 ± 0.20
A05BSL-010-03	1.0 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	0.7 ± 0.2	0.03 ± 0.05	0.8 ± 0.2
A05BSL-010-04	1.0 ± 0.3	0.8 ± 0.2	0.9 ± 0.2	0.64 ± 0.19	0.08 ± 0.08	0.8 ± 0.2
A05BSL-011-01	0.7 ± 0.2	0.61 ± 0.20	0.7 ± 0.2	0.7 ± 0.2	0.08 ± 0.08	0.8 ± 0.2
A05BSL-011-03	1.2 ± 0.3	1.1 ± 0.3	1.0 ± 0.3	0.65 ± 0.20	0.04 ± 0.05	0.7 ± 0.2
A10SL-001-01	1.0 ± 0.2	0.9 ± 0.2	0.83 ± 0.20	0.82 ± 0.19	0.02 ± 0.03	1.0 ± 0.2
A10SL-003-01	1.3 ± 0.3	1.2 ± 0.3	0.9 ± 0.2	0.68 ± 0.17	0.03 ± 0.04	0.74 ± 0.18
A10SL-004-01	0.73 ± 0.20	0.73 ± 0.20	1.0 ± 0.2	0.62 ± 0.17	0.05 ± 0.05	0.61 ± 0.16
A10SL-004-02	0.9 ± 0.2	1.1 ± 0.3	1.1 ± 0.3	0.53 ± 0.15	0.03 ± 0.05	0.88 ± 0.20
A10SL-005-01	0.7 ± 0.2	1.4 ± 0.3	0.47 ± 0.17	1.2 ± 0.2	0.04 ± 0.04	1.4 ± 0.3

TABLE 3-9
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A10SL-006-01	0.9 ± 0.2	1.2 ± 0.3	1.0 ± 0.2	0.71 ± 0.18	0.02 ± 0.04	0.89 ± 0.20
A10SL-007-01	0.9 ± 0.2	1.6 ± 0.3	0.7 ± 0.2	1.0 ± 0.2	0.04 ± 0.05	1.0 ± 0.2
A10SL-008-01	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	1.3 ± 0.3	0.06 ± 0.06	1.6 ± 0.3
A10SL-009-01	0.80 ± 0.19	0.57 ± 0.16	0.81 ± 0.20	0.85 ± 0.20	0.07 ± 0.06	0.76 ± 0.19
A10SL-009-02	0.9 ± 0.2	1.1 ± 0.3	1.1 ± 0.3	0.69 ± 0.17	0.06 ± 0.05	0.84 ± 0.19
A10SL-010-01	0.72 ± 0.20	1.2 ± 0.3	0.69 ± 0.19	0.67 ± 0.17	0.07 ± 0.06	0.64 ± 0.17
A10SL-010-02	0.9 ± 0.2	0.9 ± 0.2	0.62 ± 0.18	0.65 ± 0.17	0.06 ± 0.06	0.85 ± 0.20
A10SL-011-02	0.40 ± 0.17	0.31 ± 0.15	0.28 ± 0.14	0.73 ± 0.19	0.05 ± 0.05	0.64 ± 0.17
A10SL-012-01	0.88 ± 0.16	1.04 ± 0.17	0.70 ± 0.14	0.73 ± 0.14	0.03 ± 0.03	0.76 ± 0.14
A10SL-013-01	1.5 ± 0.3	1.3 ± 0.3	1.2 ± 0.3	1.9 ± 0.3	0.05 ± 0.06	2.0 ± 0.3
A10SL-013-02	1.1 ± 0.3	1.2 ± 0.3	1.3 ± 0.3	4.4 ± 0.6	0.15 ± 0.09	4.0 ± 0.5
A10SL-301-01	0.9 ± 0.2	1.0 ± 0.2	0.81 ± 0.20	4.0 ± 0.5	0.23 ± 0.11	4.3 ± 0.5
A10SL-301-02	0.75 ± 0.19	0.79 ± 0.20	0.78 ± 0.20	0.65 ± 0.18	0.03 ± 0.04	0.78 ± 0.20
A10SL-302-02	0.72 ± 0.20	0.9 ± 0.2	0.70 ± 0.19	1.9 ± 0.3	0.08 ± 0.07	1.9 ± 0.3
A10SL-302-13	0.9 ± 0.2	1.1 ± 0.3	0.9 ± 0.2	1.6 ± 0.3	0.09 ± 0.07	1.9 ± 0.3
A10SL-303-01	0.55 ± 0.17	0.47 ± 0.16	0.61 ± 0.18	1.5 ± 0.3	0.11 ± 0.07	1.6 ± 0.3
A10SL-303-02	0.68 ± 0.13	0.77 ± 0.14	0.62 ± 0.13	2.4 ± 0.3	0.08 ± 0.05	2.4 ± 0.3
A10SL-303-13	0.8 ± 0.2	1.0 ± 0.2	0.78 ± 0.20	1.5 ± 0.3	0.09 ± 0.07	1.7 ± 0.3
A10SL-303-18	0.59 ± 0.18	0.76 ± 0.20	0.49 ± 0.16	0.70 ± 0.18	0.05 ± 0.05	0.84 ± 0.20
B02SL-005-01	2.8 ± 0.4	1.4 ± 0.3	2.7 ± 0.4	8.3 ± 0.7	0.37 ± 0.10	8.9 ± 0.7
B02SL-008-01	0.27 ± 0.17	0.40 ± 0.19	0.44 ± 0.19	26 ± 3	1.5 ± 0.3	27 ± 3
B02SL-009-01	0.6 ± 0.3	0.7 ± 0.3	0.5 ± 0.2	15.1 ± 1.5	0.8 ± 0.2	15.1 ± 1.5
B02SL-009-02	1.3 ± 0.4	1.3 ± 0.4	1.0 ± 0.3	10.0 ± 1.1	0.54 ± 0.18	9.5 ± 1.0
B02SL-012-01	0.8 ± 0.3	0.8 ± 0.3	0.7 ± 0.3	11.1 ± 1.2	0.58 ± 0.18	12.1 ± 1.2
B02SL-012-02	0.73 ± 0.19	0.80 ± 0.20	0.78 ± 0.20	3.3 ± 0.5	0.12 ± 0.08	3.6 ± 0.5
B02SL-017-05	0.8 ± 0.3	0.7 ± 0.3	0.5 ± 0.2	25 ± 2	1.4 ± 0.3	26 ± 3
B02SL-018-01	3.0 ± 0.6	2.5 ± 0.5	2.2 ± 0.5	6.8 ± 0.9	0.4 ± 0.2	7.0 ± 0.9
B02SL-018-02	2.6 ± 0.6	2.5 ± 0.6	2.4 ± 0.6	4.7 ± 0.6	0.23 ± 0.12	4.7 ± 0.6
B02SL-018-03	2.4 ± 0.5	1.9 ± 0.5	2.4 ± 0.5	2.9 ± 0.5	0.16 ± 0.10	3.0 ± 0.5
B02SL-020-01	0.8 ± 0.3	1.1 ± 0.3	1.3 ± 0.3	9.2 ± 1.0	0.52 ± 0.18	9.7 ± 1.0
B02SL-022-03	1.5 ± 0.4	1.1 ± 0.3	1.3 ± 0.4	2.3 ± 0.4	0.10 ± 0.07	2.2 ± 0.4
B02SL-025-02	1.1 ± 0.3	1.2 ± 0.3	1.0 ± 0.3	1.5 ± 0.3	0.02 ± 0.04	1.5 ± 0.3
B02SL-037-05	1.2 ± 0.4	1.1 ± 0.3	1.0 ± 0.3	1.7 ± 0.3	0.15 ± 0.08	1.6 ± 0.3
B02SL-045-01	2.2 ± 0.5	3.0 ± 0.6	2.0 ± 0.5	2.4 ± 0.4	0.15 ± 0.09	2.5 ± 0.4
B02SL-046-01	1.2 ± 0.2	1.1 ± 0.2	0.98 ± 0.20	3.7 ± 0.4	0.21 ± 0.08	3.8 ± 0.4
B02SL-049-01	1.3 ± 0.4	1.5 ± 0.4	1.5 ± 0.4	1.7 ± 0.3	0.07 ± 0.06	2.0 ± 0.4
B02SL-049-02	1.8 ± 0.4	1.6 ± 0.4	1.5 ± 0.4	2.4 ± 0.4	0.05 ± 0.05	2.4 ± 0.4
B02SL-052-03	2.0 ± 0.4	2.0 ± 0.4	1.3 ± 0.3	1.6 ± 0.3	0.04 ± 0.05	1.3 ± 0.3
B02SL-052-05	1.4 ± 0.4	1.6 ± 0.4	1.2 ± 0.3	1.5 ± 0.3	0.05 ± 0.06	1.4 ± 0.3
B02SL-055-03	1.4 ± 0.2	1.29 ± 0.20	1.21 ± 0.19	1.0 ± 0.2	0.06 ± 0.06	1.0 ± 0.2
B02SL-059-01	0.9 ± 0.2	0.9 ± 0.2	1.1 ± 0.2	16.2 ± 1.2	0.82 ± 0.16	16.6 ± 1.2
B02SL-302-01	0.7 ± 0.2	1.1 ± 0.3	0.61 ± 0.20	24 ± 2	1.2 ± 0.3	23 ± 2
B02SL-302-05	1.0 ± 0.2	0.9 ± 0.2	1.0 ± 0.2	29 ± 3	1.3 ± 0.3	28 ± 3
B02SL-721-01	0.80 ± 0.15	0.66 ± 0.13	0.80 ± 0.15	16.1 ± 1.6	1.0 ± 0.3	16.7 ± 1.6
B02SL-739-01	2.0 ± 0.4	1.7 ± 0.3	2.0 ± 0.4	5.3 ± 0.7	0.25 ± 0.12	5.3 ± 0.7
B03SL-009-01	0.84 ± 0.15	0.79 ± 0.14	0.66 ± 0.12	13.6 ± 1.0	0.75 ± 0.15	13.4 ± 1.0
B03SL-013-01	0.77 ± 0.19	1.2 ± 0.2	0.81 ± 0.19	8.0 ± 0.9	0.52 ± 0.18	9.2 ± 1.0
B03SL-014-01	0.58 ± 0.17	0.51 ± 0.16	0.42 ± 0.14	31 ± 3	1.6 ± 0.4	33 ± 3
B03SL-014-05	0.52 ± 0.11	0.53 ± 0.11	0.44 ± 0.10	399 ± 43	19.16 ± 0.03	396 ± 43
B03SL-016-01	1.2 ± 0.3	1.4 ± 0.3	1.1 ± 0.2	33 ± 3	1.7 ± 0.4	36 ± 3
B03SL-016-05	1.2 ± 0.2	1.3 ± 0.2	1.15 ± 0.20	61 ± 5	3.3 ± 0.3	64 ± 5
B03SL-018-02	1.0 ± 0.2	1.4 ± 0.3	1.1 ± 0.2	0.82 ± 0.19	0.07 ± 0.06	0.79 ± 0.19
B03SL-020-01	1.3 ± 0.3	1.3 ± 0.3	0.9 ± 0.2	15.7 ± 1.6	0.9 ± 0.2	18.0 ± 1.8
B03SL-023-01	1.7 ± 0.3	1.5 ± 0.3	1.4 ± 0.3	2.6 ± 0.4	0.08 ± 0.07	2.6 ± 0.4
B03SL-025-03	1.8 ± 0.3	2.0 ± 0.3	1.5 ± 0.3	1.7 ± 0.3	0.12 ± 0.08	1.7 ± 0.3

TABLE 3-9
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
B03SL-027-03	1.4 ± 0.3	1.6 ± 0.3	1.1 ± 0.2	1.0 ± 0.2	0.06 ± 0.06	1.1 ± 0.2
B03SL-030-01	0.26 ± 0.11	0.42 ± 0.14	0.31 ± 0.11	13.4 ± 1.3	0.57 ± 0.18	13.0 ± 1.3
B03SL-030-02	0.69 ± 0.18	0.68 ± 0.18	0.47 ± 0.15	30 ± 3	1.1 ± 0.3	31 ± 3
B03SL-035-01	1.0 ± 0.2	1.1 ± 0.3	0.9 ± 0.2	13.9 ± 1.4	0.68 ± 0.20	14.4 ± 1.4
B03SL-036-02	1.6 ± 0.3	1.6 ± 0.3	1.4 ± 0.3	2.4 ± 0.4	0.14 ± 0.09	2.7 ± 0.4
B03SL-037-01	0.82 ± 0.15	0.88 ± 0.15	0.80 ± 0.14	2.1 ± 0.2	0 ± 5	2.2 ± 0.2
B04&B09SL-009-02	1.08 ± 0.17	1.26 ± 0.18	1.22 ± 0.18	0.91 ± 0.14	0.03 ± 0.03	0.90 ± 0.14
B04&B09SL-015-01	1.2 ± 0.2	0.43 ± 0.14	1.0 ± 0.2	16.5 ± 1.6	0.72 ± 0.20	19.9 ± 1.9
B04&B09SL-015-02	1.0 ± 0.2	1.1 ± 0.2	0.9 ± 0.2	5.3 ± 0.7	0.21 ± 0.10	6.0 ± 0.7
B04&B09SL-017-01	1.1 ± 0.2	1.4 ± 0.3	1.4 ± 0.3	2.5 ± 0.4	0.14 ± 0.08	2.5 ± 0.4
B04&B09SL-017-02	0.40 ± 0.14	0.51 ± 0.16	0.37 ± 0.14	7.7 ± 0.9	0.28 ± 0.12	9.2 ± 1.0
B04&B09SL-018-01	1.1 ± 0.2	0.83 ± 0.20	1.0 ± 0.2	3.1 ± 0.4	0.16 ± 0.09	3.1 ± 0.4
B04&B09SL-018-02	1.2 ± 0.3	1.3 ± 0.3	1.2 ± 0.3	2.1 ± 0.3	0.05 ± 0.05	2.2 ± 0.4
B04&B09SL-020-01	1.1 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	2.5 ± 0.4	0.12 ± 0.07	2.5 ± 0.4
B04&B09SL-025-02	1.5 ± 0.3	2.0 ± 0.3	1.3 ± 0.3	1.8 ± 0.3	0.10 ± 0.07	1.6 ± 0.3
B04&B09SL-026-01	0.47 ± 0.16	0.37 ± 0.14	0.29 ± 0.13	9.1 ± 1.0	0.30 ± 0.12	9.2 ± 1.0
B04&B09SL-027-01	1.4 ± 0.3	1.4 ± 0.3	1.2 ± 0.3	2.7 ± 0.4	0.16 ± 0.09	2.6 ± 0.4
B04&B09SL-030-01	0.62 ± 0.17	0.61 ± 0.16	0.49 ± 0.14	3.6 ± 0.5	0.37 ± 0.14	15.1 ± 1.5
B04&B09SL-032-01	1.3 ± 0.3	1.3 ± 0.3	1.1 ± 0.2	1.6 ± 0.3	0.06 ± 0.05	1.7 ± 0.3
B04&B09SL-033-02	1.23 ± 0.18	1.26 ± 0.19	1.18 ± 0.18	0.74 ± 0.14	0.03 ± 0.03	0.98 ± 0.16
B04&B09SL-034-01	1.1 ± 0.2	0.81 ± 0.20	0.9 ± 0.2	4.0 ± 0.5	0.11 ± 0.07	4.4 ± 0.6
B04&B09SL-036-02	1.2 ± 0.3	1.4 ± 0.3	1.2 ± 0.2	1.5 ± 0.3	0.03 ± 0.04	1.5 ± 0.3
B04&B09SL-038-02	1.2 ± 0.3	1.6 ± 0.3	1.2 ± 0.3	1.0 ± 0.2	0.000 ± 0.010	0.9 ± 0.2
B04&B09SL-038-03	1.2 ± 0.3	1.5 ± 0.3	1.2 ± 0.3	0.81 ± 0.19	0.02 ± 0.03	0.9 ± 0.2
B06SL-003-01	0.52 ± 0.17	0.45 ± 0.15	0.31 ± 0.12	8.7 ± 0.9	0.48 ± 0.16	10.4 ± 1.1
B06SL-004-05	0.58 ± 0.17	0.57 ± 0.17	0.67 ± 0.18	31 ± 3	1.7 ± 0.4	33 ± 3
B06SL-005-01	0.8 ± 0.2	0.62 ± 0.19	0.54 ± 0.18	66 ± 6	3.1 ± 0.6	68 ± 6
B06SL-006-01	0.73 ± 0.20	0.77 ± 0.20	0.70 ± 0.19	10.3 ± 1.1	0.57 ± 0.18	13.8 ± 1.4
B06SL-006-02	1.4 ± 0.3	0.9 ± 0.2	1.4 ± 0.3	82 ± 7	4.4 ± 0.8	107 ± 9
B06SL-011-05	1.9 ± 0.4	1.0 ± 0.3	1.7 ± 0.3	55 ± 5	3.4 ± 0.6	34 ± 3
B06SL-021-01	23 ± 2	2.0 ± 0.3	22 ± 2	12.3 ± 1.3	0.62 ± 0.19	13.1 ± 1.3
B06SL-021-05	21.5 ± 2.0	2.5 ± 0.6	19.5 ± 1.9	9.5 ± 0.7	0.49 ± 0.12	10.7 ± 0.8
B06SL-021-06	3.3 ± 0.5	1.0 ± 0.2	3.6 ± 0.5	1.7 ± 0.3	0.11 ± 0.08	1.9 ± 0.3
B06SL-024-01	1.6 ± 0.3	0.71 ± 0.19	1.5 ± 0.3	11.7 ± 1.2	0.53 ± 0.18	12.8 ± 1.3
B08SL-003-01	1.5 ± 0.2	2.3 ± 0.3	1.5 ± 0.2	3226 ± 228	168 ± 31	3232 ± 230
B08SL-003-05	1.2 ± 0.3	1.5 ± 0.3	1.1 ± 0.3	926 ± 65	44 ± 8	944 ± 66
B08SL-014-01	1.6 ± 0.3	0.9 ± 0.2	1.7 ± 0.3	421 ± 45	22 ± 7	471 ± 49
B08SL-015-01	0.8 ± 0.2	0.8 ± 0.2	0.74 ± 0.20	524 ± 57	35 ± 11	601 ± 64
B08SL-015-09	2.3 ± 0.4	1.3 ± 0.3	2.2 ± 0.3	1488 ± 113	64 ± 16	1586 ± 118
B08SL-017-01	0.61 ± 0.14	8.5 ± 0.7	0.48 ± 0.12	18514 ± 1236	1022 ± 148	17919 ± 1196
B08SL-017-05	1.0 ± 0.3	3.2 ± 0.5	1.0 ± 0.2	3440 ± 330	191 ± 44	3330 ± 320
B08SL-021-06	0.70 ± 0.14	0.90 ± 0.15	0.56 ± 0.12	310 ± 20	15 ± 3	303 ± 20
B08SL-022-01	2.3 ± 0.4	0.61 ± 0.17	2.1 ± 0.4	214 ± 26	10 ± 5	245 ± 28
B08SL-023-01	5.1 ± 0.5	1.27 ± 0.19	4.5 ± 0.4	166 ± 22	13 ± 5	281 ± 32
B08SL-023-03	7.6 ± 0.9	2.0 ± 0.4	7.1 ± 0.9	282 ± 32	20 ± 7	525 ± 53
B08SL-026-02	2.2 ± 0.4	0.50 ± 0.17	2.2 ± 0.4	121 ± 13	4.8 ± 1.9	142 ± 15
B24SL-018-02	1.5 ± 0.3	1.1 ± 0.2	1.1 ± 0.2	0.79 ± 0.19	0.06 ± 0.05	0.92 ± 0.20
B24SL-018-03	1.2 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	0.89 ± 0.20	0.07 ± 0.06	0.70 ± 0.18
B24SL-019-01	1.1 ± 0.2	1.0 ± 0.2	1.2 ± 0.3	3.1 ± 0.4	0.12 ± 0.08	3.0 ± 0.4
B24SL-019-02	2.2 ± 0.3	1.7 ± 0.3	2.1 ± 0.3	1.5 ± 0.3	0.10 ± 0.07	1.5 ± 0.3
B24SL-021-01	0.67 ± 0.14	0.49 ± 0.12	0.56 ± 0.12	17.3 ± 1.2	0.65 ± 0.13	17.0 ± 1.2
B24SL-021-02	1.0 ± 0.3	1.0 ± 0.3	0.8 ± 0.2	3.3 ± 0.5	0.15 ± 0.08	3.0 ± 0.4
B24SL-022-01	1.1 ± 0.3	1.1 ± 0.3	0.9 ± 0.3	5.2 ± 0.7	0.34 ± 0.13	4.8 ± 0.6
B24SL-023-02	1.3 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	0.87 ± 0.20	0.03 ± 0.04	1.1 ± 0.2
B24SL-025-02	1.5 ± 0.3	1.6 ± 0.3	1.3 ± 0.3	0.83 ± 0.20	0.06 ± 0.05	1.0 ± 0.2

TABLE 3-9
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
B24SL-026-01	1.2 ± 0.3	1.2 ± 0.2	0.9 ± 0.2	5.5 ± 0.7	0.24 ± 0.10	5.5 ± 0.7
B24SL-026-02	1.2 ± 0.3	1.2 ± 0.3	1.1 ± 0.2	1.9 ± 0.3	0.08 ± 0.07	2.0 ± 0.4
B24SL-028-01	1.2 ± 0.3	0.9 ± 0.2	1.0 ± 0.2	2.2 ± 0.4	0.16 ± 0.10	2.7 ± 0.4
B24SL-033-01	0.9 ± 0.2	0.86 ± 0.20	0.9 ± 0.2	13.6 ± 1.4	0.60 ± 0.17	13.7 ± 1.4
B24SL-034-01	1.0 ± 0.3	1.0 ± 0.3	1.0 ± 0.3	9.2 ± 1.0	0.40 ± 0.14	8.6 ± 0.9
B24SL-601-01	14.4 ± 1.9	3.8 ± 0.6	14.4 ± 1.9	1715 ± 159	85 ± 16	1743 ± 159
B24SL-602-01	16.8 ± 1.6	4.1 ± 0.5	16.4 ± 1.6	2110 ± 198	94 ± 17	2169 ± 205
B24SL-603-01	3.4 ± 0.6	1.5 ± 0.3	3.8 ± 0.6	416 ± 58	24 ± 8	474 ± 65
B35SL-001-01	1.7 ± 0.5	0.5 ± 0.2	1.3 ± 0.4	6.7 ± 1.0	0.30 ± 0.13	6.6 ± 1.0
B35SL-003-07	2.1 ± 0.5	2.5 ± 0.5	2.2 ± 0.5	2.1 ± 0.4	0.16 ± 0.10	1.9 ± 0.4
BKGSL-001-01	0.7 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	0.68 ± 0.09	0.024 ± 0.016	0.71 ± 0.10
BKGSL-001-02	0.9 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	0.66 ± 0.14	0.02 ± 0.02	0.61 ± 0.13
BKGSL-002-01	1.1 ± 0.2	1.2 ± 0.2	0.88 ± 0.20	0.89 ± 0.17	0.03 ± 0.02	0.75 ± 0.15
BKGSL-002-04	0.99 ± 0.20	0.91 ± 0.19	0.83 ± 0.17	0.58 ± 0.12	0.009 ± 0.015	0.71 ± 0.14
BKGSL-003-01	0.84 ± 0.14	1.05 ± 0.16	0.87 ± 0.14	0.80 ± 0.15	0.06 ± 0.04	0.91 ± 0.17
BKGSL-003-09	0.8 ± 0.2	0.8 ± 0.2	0.61 ± 0.19	0.52 ± 0.11	0.03 ± 0.03	0.56 ± 0.12
BKGSL-004-01	0.89 ± 0.19	0.84 ± 0.18	0.89 ± 0.19	0.77 ± 0.15	0.04 ± 0.03	0.84 ± 0.16
BKGSL-004-02	0.9 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	0.73 ± 0.15	0.05 ± 0.04	0.77 ± 0.15
BKGSL-005-01	0.69 ± 0.15	0.68 ± 0.15	0.59 ± 0.13	0.70 ± 0.14	0.06 ± 0.04	0.67 ± 0.13
BKGSL-005-02	0.91 ± 0.18	0.85 ± 0.17	0.76 ± 0.16	0.65 ± 0.13	0.013 ± 0.017	0.63 ± 0.13
BKGSL-006-01	0.81 ± 0.19	0.9 ± 0.2	0.71 ± 0.18	0.74 ± 0.15	0.02 ± 0.02	0.79 ± 0.15
BKGSL-006-03	1.1 ± 0.2	1.1 ± 0.2	1.0 ± 0.2	0.82 ± 0.16	0.04 ± 0.03	0.81 ± 0.16
BKGSL-007-01	0.65 ± 0.16	0.82 ± 0.19	0.79 ± 0.18	0.66 ± 0.13	0.03 ± 0.03	0.77 ± 0.15
BKGSL-007-04	0.70 ± 0.14	0.75 ± 0.15	0.76 ± 0.15	0.49 ± 0.11	0.022 ± 0.021	0.53 ± 0.11
BKGSL-008-01	0.9 ± 0.2	0.81 ± 0.20	0.9 ± 0.2	0.78 ± 0.15	0.013 ± 0.017	0.69 ± 0.14
BKGSL-008-03	0.82 ± 0.20	1.1 ± 0.2	0.9 ± 0.2	0.67 ± 0.15	0.02 ± 0.02	0.56 ± 0.13
BKGSL-009-01	1.0 ± 0.2	1.1 ± 0.2	0.87 ± 0.20	0.79 ± 0.16	0.07 ± 0.04	1.06 ± 0.20
BKGSL-009-03	1.0 ± 0.2	0.8 ± 0.2	0.9 ± 0.2	0.77 ± 0.16	0.06 ± 0.04	0.77 ± 0.16
BKGSL-010-01	1.0 ± 0.2	1.0 ± 0.2	0.95 ± 0.20	0.93 ± 0.18	0.03 ± 0.03	0.86 ± 0.16
BKGSL-010-03	1.1 ± 0.2	1.1 ± 0.2	0.88 ± 0.19	0.64 ± 0.13	0.04 ± 0.03	0.73 ± 0.14
BKGSL-011-01	1.07 ± 0.18	0.97 ± 0.17	1.02 ± 0.17	0.82 ± 0.11	0.05 ± 0.02	0.84 ± 0.11
BKGSL-011-08	0.56 ± 0.15	0.67 ± 0.16	0.59 ± 0.15	0.44 ± 0.10	0.016 ± 0.019	0.46 ± 0.10
BKGSL-012-01	0.81 ± 0.17	0.72 ± 0.16	0.65 ± 0.15	0.75 ± 0.15	0.02 ± 0.02	0.91 ± 0.17
BKGSL-012-04	1.1 ± 0.3	1.0 ± 0.2	1.1 ± 0.2	0.69 ± 0.13	0.04 ± 0.03	0.76 ± 0.14

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] The primary method of alpha spectroscopy analysis for soil matrix samples was "short count." The 24 "BKGSL" background reference area soil samples and a subset of 12 soil samples selected from the 12 highest SORs as determined from onsite gamma spectroscopy data were selected for alpha spectroscopy "long count" analysis. Short count times lasted on the order of 3 hours; "long count" times lasted on the order of 7 hours to 10 hours to meet lower sensitivity requirements. The 12 highest SOR samples selected for long count analysis are listed on Table 3-19.

TABLE 3-10
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS
FOR BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
B01-BM-001	0.39 ± 0.16	0.61 ± 0.19	0.48 ± 0.17	0.39 ± 0.14	0.00 ± 0.03	0.32 ± 0.12
B01-BM-002	0.02 ± 0.06	0.16 ± 0.10	0.00 ± 0.03	0.09 ± 0.06	0.03 ± 0.04	0.11 ± 0.07
B01-BM-003	0.14 ± 0.09	0.15 ± 0.09	0.06 ± 0.05	0.65 ± 0.18	0.03 ± 0.04	0.74 ± 0.19
B02-BM-001	1.3 ± 0.3	4.1 ± 0.7	1.3 ± 0.3	3.4 ± 0.5	0.17 ± 0.09	3.5 ± 0.6
B02-BM-002	0.38 ± 0.15	0.65 ± 0.19	0.29 ± 0.12	0.53 ± 0.16	0.03 ± 0.04	0.44 ± 0.14
B02-BM-003	0.34 ± 0.14	1.0 ± 0.2	0.14 ± 0.08	0.9 ± 0.2	0.02 ± 0.04	0.9 ± 0.2
B02-BM-004	0.23 ± 0.11	0.43 ± 0.14	0.22 ± 0.10	0.26 ± 0.10	0.01 ± 0.03	0.35 ± 0.12
B02-BM-005	0.26 ± 0.11	0.41 ± 0.14	0.29 ± 0.12	0.43 ± 0.14	0.01 ± 0.03	0.47 ± 0.15
B02-BM-006	0.41 ± 0.15	0.53 ± 0.16	0.28 ± 0.11	1.5 ± 0.3	0.08 ± 0.07	1.5 ± 0.3
B02-BM-007	0.51 ± 0.16	0.39 ± 0.13	0.32 ± 0.12	0.29 ± 0.11	0.01 ± 0.03	0.31 ± 0.11
B02-BM-008	1.3 ± 0.3	0.9 ± 0.3	1.2 ± 0.3	0.8 ± 0.2	0.07 ± 0.07	0.7 ± 0.2
B02-BM-009	1.4 ± 0.4	0.9 ± 0.3	1.0 ± 0.3	0.58 ± 0.18	0.03 ± 0.04	0.73 ± 0.20
B02-BM-010	0.25 ± 0.11	0.27 ± 0.12	0.26 ± 0.11	2.2 ± 0.4	0.07 ± 0.06	2.6 ± 0.4
B03-BM-001	0.27 ± 0.11	0.43 ± 0.14	0.13 ± 0.07	3.9 ± 0.6	0.12 ± 0.08	3.9 ± 0.6
B03-BM-002	0.51 ± 0.16	0.66 ± 0.19	0.35 ± 0.13	3.0 ± 0.5	0.16 ± 0.09	3.4 ± 0.6
B03-BM-003	0.10 ± 0.09	0.05 ± 0.06	0.02 ± 0.04	1.3 ± 0.3	0.10 ± 0.08	1.2 ± 0.3
B03-BM-004	1.4 ± 0.3	1.0 ± 0.3	1.6 ± 0.4	1.2 ± 0.3	0.06 ± 0.06	1.3 ± 0.3
B03-BM-005	0.38 ± 0.15	0.57 ± 0.18	0.30 ± 0.13	0.62 ± 0.17	0.06 ± 0.06	0.9 ± 0.2
B03-BM-006	0.14 ± 0.12	0.24 ± 0.14	0.11 ± 0.10	1.9 ± 0.4	0.20 ± 0.10	2.0 ± 0.4
B03-BM-007	1.5 ± 0.4	1.4 ± 0.3	1.6 ± 0.4	1.3 ± 0.3	0.07 ± 0.08	1.4 ± 0.3
B04&B09-BM-001	1.1 ± 0.2	0.93 ± 0.20	1.0 ± 0.2	1.9 ± 0.3	0.07 ± 0.05	1.8 ± 0.3
B04&B09-BM-002	0.51 ± 0.16	0.62 ± 0.18	0.38 ± 0.14	1.3 ± 0.3	0.05 ± 0.05	1.3 ± 0.3
B04&B09-BM-003	0.22 ± 0.11	0.45 ± 0.15	0.39 ± 0.14	0.44 ± 0.13	0.01 ± 0.02	0.40 ± 0.12
B04&B09-BM-004	0.67 ± 0.20	1.1 ± 0.3	0.57 ± 0.18	1.0 ± 0.2	0.03 ± 0.04	1.0 ± 0.2
B05-BM-001	0.35 ± 0.13	0.67 ± 0.19	0.34 ± 0.13	0.47 ± 0.15	0.04 ± 0.05	0.40 ± 0.14
B05-BM-002	1.1 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	0.78 ± 0.20	0.04 ± 0.05	0.80 ± 0.20
B06-BM-001	1.5 ± 0.4	1.4 ± 0.3	1.4 ± 0.3	1.4 ± 0.3	0.08 ± 0.07	1.4 ± 0.3
B06-BM-002	1.3 ± 0.4	1.0 ± 0.3	1.3 ± 0.3	1.4 ± 0.3	0.08 ± 0.07	1.1 ± 0.3
B06-BM-003	0.13 ± 0.08	0.15 ± 0.08	0.12 ± 0.08	4.9 ± 0.7	0.20 ± 0.10	5.0 ± 0.7
B06-BM-004	0.08 ± 0.07	0.18 ± 0.10	0.01 ± 0.03	1.0 ± 0.2	0.06 ± 0.06	0.9 ± 0.2
B06-BM-005	1.7 ± 0.4	2.2 ± 0.5	1.7 ± 0.4	3.8 ± 0.7	0.19 ± 0.12	4.0 ± 0.7
B06-BM-006	0.07 ± 0.07	0.12 ± 0.09	0.04 ± 0.06	4.0 ± 0.7	0.21 ± 0.13	4.5 ± 0.8
B08-BM-001	0.37 ± 0.13	0.46 ± 0.15	0.23 ± 0.10	5.9 ± 0.9	0.31 ± 0.14	6.4 ± 0.9
B08-BM-002	1.3 ± 0.4	1.2 ± 0.3	1.3 ± 0.4	3.1 ± 0.6	0.17 ± 0.11	3.4 ± 0.6
B24-BM-001	0.36 ± 0.14	0.42 ± 0.15	0.34 ± 0.13	0.73 ± 0.19	0.06 ± 0.06	0.79 ± 0.20
B24-BM-002	0.36 ± 0.14	0.8 ± 0.2	0.32 ± 0.13	3.0 ± 0.5	0.15 ± 0.09	2.8 ± 0.5
B24-BM-003	0.26 ± 0.11	0.45 ± 0.15	0.26 ± 0.11	0.26 ± 0.11	—	0.33 ± 0.12
B24-BM-004	0.21 ± 0.12	0.38 ± 0.14	0.19 ± 0.10	0.30 ± 0.12	0.03 ± 0.05	0.29 ± 0.12
B24SL-601-01 [c]	14.4 ± 1.9	3.8 ± 0.6	14.4 ± 1.9	1715 ± 159	85 ± 16	1743 ± 159
B24SL-602-01 [c]	16.8 ± 1.6	4.1 ± 0.5	16.4 ± 1.6	2110 ± 198	94 ± 17	2169 ± 205
B24SL-603-01 [c]	3.4 ± 0.6	1.5 ± 0.3	3.8 ± 0.6	416 ± 58	24 ± 8	474 ± 65
B35-BM-001	0.20 ± 0.10	0.27 ± 0.11	0.22 ± 0.10	0.09 ± 0.06	0.03 ± 0.04	0.12 ± 0.07
B35-BM-002	0.8 ± 0.2	1.8 ± 0.4	0.7 ± 0.2	0.67 ± 0.18	0.06 ± 0.06	1.0 ± 0.2

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Alpha spectroscopy analysis, short count; count times lasted approximately 3 hours.
[c] Samples labeled “B24SL” inadvertently labeled as “SL”; samples collected from dust on roof truss.

TABLE 3-11
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A08-A01-SW-001	0.20 ± 0.09	0.03 ± 0.04	-0.01 ± 0.03	0.15 ± 0.12	0.05 ± 0.09	0.09 ± 0.10
A08-A01-SW-004	0.15 ± 0.10	0.12 ± 0.08	0.06 ± 0.07	0.5 ± 0.2	0.05 ± 0.09	0.29 ± 0.17
A08-A01-SW-005	0.12 ± 0.09	0.12 ± 0.06	0.03 ± 0.03	0.03 ± 0.09	0.02 ± 0.06	0.04 ± 0.08
A08-A01-SW-006	0.13 ± 0.07	0.05 ± 0.03	0.01 ± 0.03	2.7 ± 0.4	0.15 ± 0.10	2.5 ± 0.4
A08-A01-SW-007	0.12 ± 0.07	0.19 ± 0.09	-0.01 ± 0.04	33 ± 4	1.6 ± 0.5	33 ± 4
A08-A01-SW-011	0.05 ± 0.07	0.09 ± 0.05	-0.01 ± 0.03	16 ± 2	0.9 ± 0.3	19 ± 3
A08-A01-SW-012	0.18 ± 0.09	0.16 ± 0.07	0.03 ± 0.04	0.6 ± 0.2	0.05 ± 0.09	0.5 ± 0.2
A08-B04&B09-SW-001	0.04 ± 0.06	0.06 ± 0.06	0.02 ± 0.03	0.6 ± 0.2	0.10 ± 0.11	0.43 ± 0.19
A08-B04&B09-SW-002	0.10 ± 0.06	0.09 ± 0.05	0.05 ± 0.04	2.5 ± 0.5	0.10 ± 0.11	2.7 ± 0.6
A08-B04&B09-SW-003	0.07 ± 0.08	0.30 ± 0.12	-0.02 ± 0.05	4.8 ± 0.9	0.23 ± 0.16	8.9 ± 1.4
A08-B04&B09-SW-004	0.11 ± 0.07	0.05 ± 0.06	-0.01 ± 0.03	0.4 ± 0.2	0.02 ± 0.06	0.6 ± 0.2
A08-B04&B09-SW-005	0.09 ± 0.06	0.07 ± 0.05	-0.02 ± 0.04	1.7 ± 0.4	0.12 ± 0.12	1.4 ± 0.4
A08-B1-SW-001	0.4 ± 0.3	0.4 ± 0.2	-0.01 ± 0.08	11.6 ± 1.8	0.31 ± 0.20	12.4 ± 1.9
A08-B1-SW-002	0.2 ± 0.2	0.21 ± 0.18	0.02 ± 0.09	11.5 ± 1.7	0.8 ± 0.3	12.6 ± 1.9
A08-B1-SW-003	0.11 ± 0.18	0.10 ± 0.14	0.02 ± 0.10	16 ± 2	0.8 ± 0.3	18 ± 3
A08-B1-SW-004	0.4 ± 0.3	0.18 ± 0.16	0.03 ± 0.09	12.7 ± 2.0	0.6 ± 0.3	13.0 ± 2.0
A08-B1-SW-005	0.04 ± 0.17	0.18 ± 0.18	0.02 ± 0.10	27 ± 4	1.4 ± 0.4	28 ± 4
A08-B1-SW-006	0.09 ± 0.12	0.7 ± 0.3	0.06 ± 0.10	28 ± 4	1.0 ± 0.4	31 ± 4
A08-B2-SW-001	0.13 ± 0.06	0.26 ± 0.08	—	4.2 ± 0.8	0.22 ± 0.15	4.7 ± 0.8
A08-B2-SW-003	1.2 ± 0.3	0.7 ± 0.2	0.61 ± 0.19	105 ± 14	4.5 ± 1.0	105 ± 14
A08-B3-SW-003	0.03 ± 0.10	0.16 ± 0.15	0.02 ± 0.07	6.6 ± 1.1	0.29 ± 0.18	7.5 ± 1.2
A08-B3-SW-004	0.05 ± 0.12	0.09 ± 0.14	-0.02 ± 0.09	6.1 ± 1.0	0.26 ± 0.17	6.2 ± 1.1
A08-B3-SW-005	0.00 ± 0.14	0.13 ± 0.15	0.07 ± 0.12	13.5 ± 2.0	0.5 ± 0.2	13.0 ± 1.9
A08-B3-SW-006	0.01 ± 0.08	0.43 ± 0.20	0.01 ± 0.06	18.7 ± 1.8	0.9 ± 0.2	19.6 ± 1.9
A08-B3-SW-007	0.04 ± 0.14	0.3 ± 0.3	0.05 ± 0.13	0.7 ± 0.3	0.07 ± 0.11	0.6 ± 0.3
A08-B3-SW-008	0.04 ± 0.11	0.06 ± 0.10	-0.01 ± 0.08	1.9 ± 0.5	0.05 ± 0.09	2.0 ± 0.5
A08-B3-SW-009	0.0 ± 0.2	0.04 ± 0.12	0.12 ± 0.15	2.8 ± 0.6	0.14 ± 0.14	3.2 ± 0.7
A08-B3-SW-011	0.11 ± 0.14	0.28 ± 0.19	-0.03 ± 0.07	2.2 ± 0.5	0.21 ± 0.16	2.9 ± 0.6
A08-B3-SW-012	0.1 ± 0.2	0.06 ± 0.11	-0.01 ± 0.08	3.1 ± 0.6	0.07 ± 0.09	2.8 ± 0.6
A08-B3-SW-013	0.18 ± 0.14	0.18 ± 0.13	0.05 ± 0.08	24 ± 3	1.3 ± 0.4	26 ± 4
A08-B3-SW-014	0.13 ± 0.15	0.10 ± 0.11	0.03 ± 0.07	21 ± 3	1.0 ± 0.4	25 ± 3
A08-B3-SW-015	0.12 ± 0.14	0.32 ± 0.18	0.10 ± 0.11	30 ± 4	1.8 ± 0.5	33 ± 4
A08-B8-SW-001	0.10 ± 0.15	0.17 ± 0.15	-0.01 ± 0.06	12.9 ± 1.9	0.5 ± 0.2	13.2 ± 1.9
A08-B8-SW-002	0.07 ± 0.13	0.00 ± 0.07	-0.01 ± 0.06	11.1 ± 1.6	0.6 ± 0.3	11.1 ± 1.6
A09-SW-001	0.4 ± 0.3	0.4 ± 0.3	-0.02 ± 0.09	0.14 ± 0.14	—	0.13 ± 0.14
A09-SW-002	0.20 ± 0.17	0.13 ± 0.13	0.02 ± 0.07	0.22 ± 0.16	-0.01 ± 0.06	0.21 ± 0.14
A09-SW-003	0.19 ± 0.17	0.4 ± 0.2	-0.02 ± 0.08	0.02 ± 0.06	-0.01 ± 0.07	0.17 ± 0.13
A09-SW-004	0.23 ± 0.19	0.13 ± 0.13	0.03 ± 0.08	0.24 ± 0.15	-0.01 ± 0.05	0.25 ± 0.15
A09-SW-005	0.25 ± 0.18	0.21 ± 0.16	0.07 ± 0.10	0.16 ± 0.13	-0.01 ± 0.06	0.09 ± 0.09
A09-SW-006	0.14 ± 0.13	0.10 ± 0.11	-0.01 ± 0.05	0.24 ± 0.18	0.00 ± 0.08	0.15 ± 0.14
A09-SW-007	0.27 ± 0.18	0.09 ± 0.11	-0.01 ± 0.05	0.16 ± 0.14	—	0.17 ± 0.13
A09-SW-008	0.26 ± 0.12	0.16 ± 0.09	0.03 ± 0.05	0.16 ± 0.09	0.04 ± 0.06	0.14 ± 0.09
A09-SW-009	0.12 ± 0.12	0.10 ± 0.13	0.01 ± 0.07	0.17 ± 0.14	—	0.13 ± 0.11
A09-SW-010	0.3 ± 0.2	0.18 ± 0.16	0.05 ± 0.08	0.24 ± 0.15	—	0.09 ± 0.10
A09-SW-011	0.07 ± 0.11	0.19 ± 0.14	-0.01 ± 0.06	0.09 ± 0.11	0.02 ± 0.07	0.10 ± 0.11
A09-SW-012	0.17 ± 0.17	0.16 ± 0.17	-0.01 ± 0.07	0.18 ± 0.14	0.06 ± 0.10	0.11 ± 0.11

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Alpha spectroscopy analysis, short count; count times lasted approximately 3 hours.

TABLE 3-12
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a]																	
	^{228}Th			^{230}Th			^{232}Th			^{234}U			^{235}U			^{238}U		
	Aug-07	Nov-07	Weighted Average[b]	Aug-07	Nov-07	Weighted Average[b]	Aug-07	Nov-07	Weighted Average[b]	Aug-07	Nov-07	Weighted Average[b]	Aug-07	Nov-07	Weighted Average[b]	Aug-07	Nov-07	Weighted Average[b]
A02MW06-F	0.035	0.007	0.02 ± 0.06	0.45	0.21	0.30 ± 0.12	-0.013	-0.004	-0.01 ± 0.03	1.3	2.95	1.7 ± 0.3	0.06	0.09	0.07 ± 0.07	1.06	2.62	1.5 ± 0.3
A02MW06-U	0.077	-0.05	0.03 ± 0.07	0.081	0.064	0.07 ± 0.06	0.028	-0.009	0.01 ± 0.04	1.55	3.91	2.1 ± 0.4	0.028	0.15	0.06 ± 0.07	1.29	2.94	1.7 ± 0.3
A02MW08-F	-0.011	-0.019	-0.01 ± 0.05	0.15	0.23	0.18 ± 0.09	-0.004	-0.008	-0.01 ± 0.03	0.39	0.23	0.29 ± 0.11	-0.005	0.045	0.01 ± 0.04	0.18	0.084	0.12 ± 0.08
A02MW08-U	-0.012	0.072	0.02 ± 0.06	0.21	0.15	0.18 ± 0.10	0.038	-0.012	0.01 ± 0.04	0.51	0.41	0.45 ± 0.15	0	0	—	0.26	0.26	0.26 ± 0.11
A02MW09-F	-0.028	0.018	-0.02 ± 0.02	0.12	0.18	0.15 ± 0.08	0	0.016	0.00 ± 0.02	4.74	4.03	4.3 ± 0.6	0.16	0.22	0.18 ± 0.10	5.17	4.11	4.5 ± 0.6
A02MW09-U	0.058	-0.007	0.02 ± 0.05	0.058	0.23	0.09 ± 0.07	-0.0041	0.019	0.00 ± 0.01	4.2	4.22	4.2 ± 0.6	0.27	0.23	0.25 ± 0.12	4.99	4.5	4.7 ± 0.6
A02MW11-F	-0.01	-0.03	-0.02 ± 0.08	0.17	0.21	0.19 ± 0.10	0.015	-0.014	0.00 ± 0.04	1.65	5.32	2.3 ± 0.4	0.1	0.33	0.17 ± 0.10	1.41	5.28	2.0 ± 0.4
A02MW11-U	-0.001	0.025	0.01 ± 0.07	0.046	0.34	0.09 ± 0.07	0.001	0.04	0.02 ± 0.05	1.82	6.8	2.6 ± 0.4	0.13	0.38	0.20 ± 0.11	1.9	5.91	2.6 ± 0.4
A02MW1-F	0.11	-0.007	0.02 ± 0.06	0.23	0.17	0.22 ± 0.08	0.035	0.041	0.04 ± 0.05	1.46	0.83	1.10 ± 0.19	0.07	0.056	0.02 ± 0.05	1.3	0.93	1.07 ± 0.19
A02MW1-U	-0.036	-0.02	-0.01 ± 0.05	0.45	0.2	0.29 ± 0.11	0.005	-0.006	0.00 ± 0.04	1.32	1.03	1.2 ± 0.2	-0.005	0.046	0.02 ± 0.04	1.27	0.72	0.90 ± 0.17
A02MW2-F	0.014	0.018	0.02 ± 0.04	0.083	0.17	0.11 ± 0.08	-0.009	-0.004	-0.01 ± 0.01	6.1	5.85	6.0 ± 0.7	0.3	0.33	0.31 ± 0.13	6.5	7.1	6.8 ± 0.8
A02MW2-U	0.018	0.03	0.02 ± 0.04	0.022	0.2	0.04 ± 0.04	0	0.001	0.00 ± 0.02	6.3	6	6.2 ± 0.7	0.22	0.4	0.27 ± 0.12	7.2	7.1	7.2 ± 0.8
A02MW3-F	0	0.05	0.00 ± 0.02	0.24	0.058	0.10 ± 0.07	-0.012	-0.012	-0.01 ± 0.01	2.2	1.68	1.9 ± 0.3	0.09	0.068	0.08 ± 0.07	2.31	1.62	1.9 ± 0.3
A02MW3-U	-0.024	0.06	-0.02 ± 0.02	0.24	0.21	0.22 ± 0.10	-0.02	0.017	-0.01 ± 0.02	2.38	1.89	2.1 ± 0.3	0.13	-0.01	0.02 ± 0.06	1.8	1.56	1.7 ± 0.3
A02MW4-F	0.07	0.07	0.05 ± 0.06	0.24	0.21	0.23 ± 0.09	-0.004	0.023	0.00 ± 0.04	18.2	17.9	17.9 ± 1.4	0.79	0.76	0.73 ± 0.16	15.9	16.8	16.1 ± 1.3
A02MW4-U	0.2	0.18	0.13 ± 0.08	0.17	0.2	0.21 ± 0.10	-0.01	0.01	0.01 ± 0.05	17.8	17.3	17.9 ± 1.4	0.72	0.66	0.75 ± 0.17	16.2	15.7	16.2 ± 1.3
A02MW5-F	0.11	0.006	0.02 ± 0.06	0.33	0.27	0.30 ± 0.13	-0.009	-0.013	-0.01 ± 0.04	3.19	2.16	2.6 ± 0.4	0.25	0.15	0.19 ± 0.10	2.77	1.82	2.2 ± 0.4
A02MW5-U	0.04	0.07	0.06 ± 0.09	0.34	0.23	0.27 ± 0.12	-0.005	-0.012	-0.01 ± 0.04	3.03	2.2	2.5 ± 0.4	0.25	0.045	0.07 ± 0.07	2.61	2.09	2.3 ± 0.4
A03MW13D-F	0.004	0.1	0.04 ± 0.06	0.072	0.17	0.10 ± 0.07	-0.008	-0.0046	-0.01 ± 0.01	21.4	20.4	20.9 ± 2.0	0.98	1.05	1.0 ± 0.2	20.9	22.3	22 ± 2
A03MW13D-U	0.047	0.028	0.04 ± 0.06	0.17	0.17	0.17 ± 0.09	0.04	0.2	0.06 ± 0.06	19.6	20.3	19.9 ± 1.9	0.82	1	0.9 ± 0.2	21	22.4	22 ± 2
A03MW14-F	0.12	0.23	0.15 ± 0.12	0.14	0.28	0.18 ± 0.09	-0.014	0.024	0.00 ± 0.04	0.87	0.93	0.9 ± 0.2	0.036	0.048	0.04 ± 0.06	0.8	1.17	0.9 ± 0.2
A03MW14-U	0.14	0.18	0.15 ± 0.10	0.19	0.15	0.17 ± 0.08	0.009	-0.008	0.00 ± 0.03	0.92	1.52	1.1 ± 0.2	0.1	0.021	0.04 ± 0.05	0.9	1.08	1.0 ± 0.2
A03MW15-F	0.16	0.06	0.11 ± 0.10	0.25	0.33	0.28 ± 0.12	-0.004	-0.004	0.00 ± 0.04	0.12	5.7	0.19 ± 0.11	-0.005	0.33	0.02 ± 0.06	0.082	7.2	0.12 ± 0.09
A03MW15-U	-0.012	0.08	0.01 ± 0.06	0.32	0.16	0.21 ± 0.11	0.024	0.034	0.03 ± 0.05	0.17	4.13	0.30 ± 0.14	0.06	0.34	0.13 ± 0.10	0.11	4.58	0.21 ± 0.12
A03MW16-F	0.036	0.07	0.04 ± 0.08	0.19	0.24	0.21 ± 0.10	-0.009	0.014	0.00 ± 0.03	5.59	9	6.7 ± 0.8	0.39	0.33	0.36 ± 0.14	6.4	9.7	7.4 ± 0.8
A03MW16-U	0.04	0.2	0.10 ± 0.09	0.23	0.14	0.18 ± 0.10	0.009	-0.026	0.00 ± 0.04	5.55	8.6	6.6 ± 0.8	0.31	0.43	0.36 ± 0.14	6.3	9.6	7.3 ± 0.8
A03MW17-F	0.13	0.24	0.13 ± 0.06	0.43	0.25	0.27 ± 0.08	-0.004	0.056	0.00 ± 0.02	0.78	0.48	0.66 ± 0.13	0.1	0.049	0.04 ± 0.04	0.93	0.54	0.68 ± 0.13
A03MW17-U	0.019	0.17	0.04 ± 0.05	0.12	0.18	0.14 ± 0.08	-0.023	-0.004	-0.01 ± 0.03	0.66	0.61	0.64 ± 0.17	0.071	0.016	0.03 ± 0.05	0.64	0.57	0.60 ± 0.17
A03MW606D-RF	--	0.07	0.07 ± 0.16	--	0.12	0.12 ± 0.12	--	0.011	0.01 ± 0.06	--	2.51	2.5 ± 0.6	--	0.2	0.20 ± 0.17	--	2.4	2.4 ± 0.6
A03MW606D-RU	--	0.051	0.05 ± 0.08	--	0.13	0.13 ± 0.11	--	-0.013	-0.01 ± 0.02	--	2.66	2.7 ± 0.6	--	0.16	0.16 ± 0.14	--	2.9	2.9 ± 0.6
A03MW607D-F	0.012	0.05	0.03 ± 0.07	0.15	0.12	0.13 ± 0.09	0.015	0.022	0.02 ± 0.04	0.064	0.15	0.09 ± 0.07	0.019	-0.009	0.01 ± 0.04	0.027	0.009	0.02 ± 0.04
A03MW607D-U	0.11	0.16	0.13 ± 0.08	0.24	0.13	0.17 ± 0.09	0.016	0.015	0.02 ± 0.03	0.033	0.023	0.03 ± 0.04	-0.008	-0.005	-0.01 ± 0.04	-0.01	0.064	0.01 ± 0.04
A04AMW020-F	0.063	-0.019	0.01 ± 0.06	0.19	0.29	0.22 ± 0.10	-0.008	0.023	0.00 ± 0.04	3.64	3.59	3.8 ± 0.4	0.14	0.19	0.16 ± 0.09	3.78	3.5	3.6 ± 0.5
A04AMW020-U	0.07	-0.014	0.01 ± 0.08	0.22	0.062	0.11 ± 0.06	0.02	0.062	0.04 ± 0.05	3.36	3.84	3.8 ± 0.4	0.22	0.17	0.19 ± 0.11	3.67	3.86	3.8 ± 0.5
A04AMW21-F	0.18	0.05	0.05 ± 0.06	0.19	0.036	0.10 ± 0.05	0.009	-0.012	0.00 ± 0.03	1.69	1.97	1.7 ± 0.2	0.046	0.12	0.07 ± 0.05	1.32	1.75	1.6 ± 0.2
A04AMW21-U	0.24	0.03	0.09 ± 0.08	0.19	0.24	0.16 ± 0.08	-0.007	-0.004	-0.01 ± 0.03	1.91	2	1.7 ± 0.3	0.07	0.02	0.03 ± 0.05	1.65	2.34	1.9 ± 0.3
A04AMW22-F	0.1	0.018	0.04 ± 0.06	0.21	0.062	0.14 ± 0.07	0.016	0.017	0.02 ± 0.03	21.5	4.49	5.7 ± 0.8	1	0.19	0.31 ± 0.13	21.8	4.1	5.2 ± 0.7
A04AMW22-U	0.06	0.004	0.05 ± 0.07	0.11	0.11	0.08 ± 0.06	-0.008	-0.027	-0.01 ± 0.03	23.3	4.85	7.6 ± 0.9	1.24	0.26	0.56 ± 0.16	22.7	4.98	7.9 ± 0.9
A04AMW23-F	0.11	0.09	0.10 ± 0.08	0.11	0.17	0.13 ± 0.09	-0.008	0.037	0.01 ± 0.04	2.71	3.79	3.1 ± 0.5	0.16	0.076	0.10 ± 0.08	2.34	3.36	2.7 ± 0.4
A04AMW23-U	0.13	0.04	0.08 ± 0.10	0.13	0.2	0.17 ± 0.09	0.022	0.009	0.01 ± 0.04	2.06	3.18	2.5 ± 0.4	0.044	0.09	0.06 ± 0.06	1.97	3.5	2.5 ± 0.4
A04AMW601D-F	0.08	-0.018	0.01 ± 0.06	0.39	0.14	0.20 ± 0.10	-0.008	-0.004	-0.01 ± 0.03	6.3	8	6.9 ± 0.8	0.24	0.48	0.31 ± 0.13	6.5	8.4	7.2 ± 0.8
A04AMW601D-U	0.08	0.07	0.08 ± 0.08	0.31	0.2	0.25 ± 0.12	0.015	-0.005	0.01 ± 0.04	5.83	7.1	6.3 ± 0.8	0.4	0.45	0.42 ± 0.15	5.23	7	5.9 ± 0.7
A04AMW602D-F	0.023	0.001	0.01 ± 0.04	0.17	0.24	0.18 ± 0.08	0.021	0.26	0.07 ± 0.05	39.1	27.6	31 ± 2	2.15	1.77	1.6 ± 0.3	39	29.8	31 ± 2
A04AMW602D-U	-0.018	0.033	0.01 ± 0.05	0.15	0.18	0.17 ± 0.09	-0.02	0.019	0.00 ± 0.04	36	25.6	29 ± 3	1.77	1.39	1.6 ± 0.3	37.5	26	30 ± 3
A04AMW603D-F	0.17	0.05	0.10 ± 0.09	0.29	0.29	0.29 ± 0.12	0.042	-0.01	0.01 ± 0.05	1.15	3.92	1.7 ± 0.3	0.02	0.066	0.04 ± 0.06	0.86	3.42	1.3 ± 0.3
A04AMW603D-U	0.15	-0.07	0.04 ± 0.10	0.17	0.16	0.17 ± 0.10	0.001	0	0.00 ± 0.06	4.06	5.06	4.5 ± 0.6	0.2	0.1	0.14 ± 0.10	3.84	4.28	4.0 ± 0.6

TABLE 3-12
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a]																	
	^{228}Th			^{230}Th			^{232}Th			^{234}U			^{235}U			^{238}U		
	Aug-07	Nov-07	Weighted Average[b]	Aug-07	Nov-07	Weighted Average[b]	Aug-07	Nov-07	Weighted Average[b]	Aug-07	Nov-07	Weighted Average[b]	Aug-07	Nov-07	Weighted Average[b]	Aug-07	Nov-07	Weighted Average[b]
A04BMW18-F	0.008	0.054	0.02 ± 0.04	0.15	0.39	0.21 ± 0.10	-0.011	0.026	0.01 ± 0.04	42.6	41.4	42 ± 4	1.66	2.08	1.8 ± 0.4	41.4	44.3	43 ± 4
A04BMW18-U	0.02	-0.003	0.00 ± 0.05	0.037	0.68	0.08 ± 0.07	-0.004	-0.003	0.00 ± 0.04	42	40.4	41 ± 4	2.2	1.61	1.8 ± 0.4	43.2	39.2	41 ± 4
A04BMW19-F	-0.001	0.021	0.01 ± 0.05	0.037	0.16	0.06 ± 0.05	-0.0038	0.02	0.00 ± 0.01	2.45	2.19	2.3 ± 0.4	0.061	0.09	0.07 ± 0.06	1.9	2.27	2.1 ± 0.3
A04BMW19-U	0.057	0.06	0.06 ± 0.01	0.065	0.18	0.10 ± 0.07	-0.009	-0.009	-0.01 ± 0.01	2.22	2.34	2.3 ± 0.4	0.1	0.12	0.11 ± 0.08	2.18	2.31	2.2 ± 0.4
A04BMW26-F	0.1	0.028	0.05 ± 0.08	0.029	0.98	0.08 ± 0.07	0.037	0.002	0.01 ± 0.04	60	82	69 ± 6	2.79	4.17	3.3 ± 0.5	58.7	78	66 ± 6
A04BMW26-U	0.15	-0.022	0.00 ± 0.05	0.086	0.64	0.15 ± 0.09	-0.02	0.016	0.00 ± 0.04	65.8	80	72 ± 7	2.65	5.3	3.5 ± 0.6	65.6	77.9	71 ± 7
A04BMW605D-F	0.1	0.07	0.08 ± 0.08	0.064	0.28	0.11 ± 0.08	0.022	0.018	0.02 ± 0.04	68	70	69 ± 7	3.6	3.4	3.4 ± 0.7	64	64.2	64 ± 6
A04BMW605D-U	0.17	0.008	0.05 ± 0.06	0.25	0.26	0.25 ± 0.09	-0.004	0.011	0.00 ± 0.03	67	66.9	69 ± 6	4.9	3.23	3.4 ± 0.6	63	68.2	66 ± 6
A04DMW24-F	0.09	0.024	0.04 ± 0.08	0.27	0.056	0.09 ± 0.07	-0.009	-0.02	-0.01 ± 0.04	0.37	3.45	0.58 ± 0.17	0	0.16	0.16 ± 0.13	0.26	3.37	0.44 ± 0.16
A04DMW24-U	0.08	0.027	0.04 ± 0.06	0.042	0.2	0.07 ± 0.06	-0.009	0.03	0.01 ± 0.04	0.28	2.18	0.47 ± 0.15	0.025	0.13	0.05 ± 0.06	0.26	1.83	0.43 ± 0.14
A04DMW604D-F	0.15	-0.041	-0.03 ± 0.03	0.31	0.14	0.20 ± 0.10	0	0.058	0.06 ± 0.09	22.8	43.2	28 ± 3	1.55	1.81	1.7 ± 0.4	24.7	42.3	30 ± 3
A04DMW604D-U	0.07	0.1	0.09 ± 0.09	0.15	0.14	0.14 ± 0.09	0.013	0.045	0.03 ± 0.04	23.5	39	29 ± 3	0.96	1.92	1.4 ± 0.3	23.7	38.2	29 ± 3
A05BMW600D-F	0.062	0.006	0.02 ± 0.05	0.64	0.14	0.25 ± 0.12	0.017	-0.012	0.01 ± 0.04	3.78	0.86	1.2 ± 0.3	0.17	0.043	0.07 ± 0.07	3.3	0.86	1.2 ± 0.3
A05BMW600D-U	0.2	0.06	0.12 ± 0.10	0.15	0.13	0.14 ± 0.09	0.017	-0.026	0.00 ± 0.04	1.17	0.66	0.81 ± 0.20	0.08	0	0.08 ± 0.12	0.69	0.66	0.67 ± 0.18

Notes:

Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri

[a]Alpha spectroscopy analysis, short count: count times lasted approximately 3 hours.

[b]Laboratory duplicate and field duplicate results are combined with original sample results for two rounds of groundwater sample data using weighted averaging.

F = filtered sample

U = unfiltered sample

pCi/L = picocuries per liter

Aug-07 = July/August 2007 sampling event

Nov-07 = November 2007 sampling event

-- = No sample collected.

TABLE 3-13
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A03-SD-001	0.6 ± 0.2	1.1 ± 0.3	0.6 ± 0.2	2.8 ± 0.5	0.17 ± 0.09	2.8 ± 0.5
A03-SD-002	1.0 ± 0.3	1.2 ± 0.3	1.0 ± 0.3	1.1 ± 0.3	0.10 ± 0.07	1.6 ± 0.3
A03-SD-003	0.5 ± 0.3	0.9 ± 0.4	0.7 ± 0.3	1.4 ± 0.3	0.09 ± 0.07	1.5 ± 0.3
A03-SD-004	0.79 ± 0.20	1.2 ± 0.2	0.71 ± 0.18	0.80 ± 0.20	0.04 ± 0.05	1.0 ± 0.2
A03-SD-005	0.9 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	2.0 ± 0.4	0.10 ± 0.07	2.5 ± 0.4
A03-SD-006	0.55 ± 0.19	0.8 ± 0.2	0.52 ± 0.18	2.7 ± 0.5	0.13 ± 0.08	3.0 ± 0.5
A08-A01-SD-001R	0.29 ± 0.09	0.40 ± 0.10	0.23 ± 0.07	6.2 ± 0.6	0.31 ± 0.09	6.7 ± 0.7
A08-A01-SD-002	0.55 ± 0.16	0.55 ± 0.16	0.38 ± 0.13	1.6 ± 0.3	0.11 ± 0.08	1.8 ± 0.3
A08-A01-SD-003	0.46 ± 0.16	0.72 ± 0.20	0.48 ± 0.15	1.2 ± 0.3	0.01 ± 0.05	1.0 ± 0.2
A08-A01-SD-004	0.6 ± 0.3	0.5 ± 0.3	0.5 ± 0.3	10.3 ± 1.7	0.7 ± 0.3	10.7 ± 1.8
A08-A01-SD-005	0.35 ± 0.14	0.31 ± 0.12	0.26 ± 0.11	1.8 ± 0.4	0.16 ± 0.10	1.8 ± 0.4
A08-A01-SD-006	0.57 ± 0.18	0.68 ± 0.19	0.36 ± 0.13	1.9 ± 0.4	0.06 ± 0.06	2.0 ± 0.4
A08-A01-SD-007	0.26 ± 0.11	0.43 ± 0.15	0.18 ± 0.09	18 ± 2	0.8 ± 0.2	18 ± 2
A08-A01-SD-008	0.42 ± 0.15	0.59 ± 0.18	0.46 ± 0.15	20 ± 3	1.0 ± 0.3	19 ± 3
A08-A01-SD-009	0.43 ± 0.16	0.45 ± 0.15	0.30 ± 0.12	2.1 ± 0.4	0.13 ± 0.09	2.2 ± 0.4
A08-A01-SD-010	0.50 ± 0.16	0.40 ± 0.14	0.37 ± 0.13	6.4 ± 0.9	0.34 ± 0.14	6.6 ± 1.0
A08-A01-SD-011	0.51 ± 0.17	0.39 ± 0.14	0.40 ± 0.15	36 ± 5	2.2 ± 0.5	41 ± 5
A08-A01-SD-012	0.21 ± 0.10	0.9 ± 0.2	0.26 ± 0.11	6.0 ± 0.9	0.23 ± 0.11	5.5 ± 0.8
A08-A01-SD-013	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	2.6 ± 0.5	0.13 ± 0.09	2.5 ± 0.5
A08-B04&B09-SD-001	0.35 ± 0.09	0.31 ± 0.09	0.25 ± 0.08	6.9 ± 0.7	0.28 ± 0.09	7.3 ± 0.7
A08-B04&B09-SD-002	0.29 ± 0.09	0.36 ± 0.09	0.23 ± 0.07	5.7 ± 0.6	0.31 ± 0.09	6.5 ± 0.7
A08-B04&B09-SD-003	0.28 ± 0.13	0.45 ± 0.16	0.19 ± 0.10	18 ± 2	0.8 ± 0.2	21 ± 3
A08-B04&B09-SD-004	0.22 ± 0.10	0.23 ± 0.10	0.13 ± 0.08	4.0 ± 0.6	0.22 ± 0.11	4.5 ± 0.7
A08-B04&B09-SD-005	0.16 ± 0.10	0.32 ± 0.13	0.15 ± 0.09	14.8 ± 1.9	0.8 ± 0.2	17 ± 2
A08-B1-SD-001	0.25 ± 0.11	0.38 ± 0.15	0.24 ± 0.11	7.5 ± 1.0	0.34 ± 0.13	8.4 ± 1.1
A08-B1-SD-002	0.24 ± 0.14	0.28 ± 0.14	0.18 ± 0.11	3.0 ± 0.5	0.08 ± 0.07	3.6 ± 0.6
A08-B1-SD-003	0.40 ± 0.14	0.36 ± 0.13	0.35 ± 0.13	48 ± 7	2.8 ± 1.2	52 ± 8
A08-B1-SD-004	1.2 ± 0.3	0.8 ± 0.2	0.8 ± 0.2	69 ± 7	3.3 ± 0.9	78 ± 8
A08-B1-SD-005	0.27 ± 0.10	0.36 ± 0.11	0.28 ± 0.10	23 ± 2	1.2 ± 0.2	25 ± 2
A08-B1-SD-006	0.36 ± 0.14	0.60 ± 0.18	0.41 ± 0.14	12.3 ± 1.7	0.7 ± 0.2	13.8 ± 1.8
A08-B1-SL-001	0.31 ± 0.09	0.34 ± 0.10	0.37 ± 0.10	1.5 ± 0.2	0.09 ± 0.05	1.7 ± 0.2
A08-B24-SD-001	0.46 ± 0.11	0.44 ± 0.11	0.44 ± 0.11	21.5 ± 1.9	1.18 ± 0.20	22.5 ± 2.0
A08-B24-SD-002	0.31 ± 0.10	0.39 ± 0.11	0.28 ± 0.09	20 ± 3	0.8 ± 0.2	20 ± 3
A08-B24-SD-003	0.53 ± 0.17	0.61 ± 0.18	0.60 ± 0.18	17 ± 2	0.8 ± 0.2	17 ± 2
A08-B24-SD-004	0.36 ± 0.15	0.51 ± 0.17	0.38 ± 0.14	3.1 ± 0.5	0.17 ± 0.10	3.2 ± 0.5
A08-B24-SD-005	0.09 ± 0.09	0.35 ± 0.15	0.03 ± 0.04	1.6 ± 0.3	0.02 ± 0.04	1.8 ± 0.3
A08-B24-SD-006	2.1 ± 0.5	1.3 ± 0.4	2.1 ± 0.5	2.1 ± 0.4	0.06 ± 0.06	2.8 ± 0.5
A08-B24-SD-007	0.8 ± 0.2	0.57 ± 0.18	0.8 ± 0.2	30 ± 4	1.4 ± 0.3	31 ± 4
A08-B2-SD-001	1.5 ± 0.3	0.84 ± 0.19	1.4 ± 0.3	1.18 ± 0.19	0.04 ± 0.04	1.33 ± 0.20
A08-B2-SD-002	0.5 ± 0.2	0.6 ± 0.2	0.37 ± 0.19	5.6 ± 0.8	0.24 ± 0.12	5.6 ± 0.8
A08-B2-SD-003	0.54 ± 0.18	0.69 ± 0.20	0.70 ± 0.20	5.5 ± 0.8	0.22 ± 0.11	5.7 ± 0.8
A08-B3-SD-002	0.28 ± 0.13	0.31 ± 0.13	0.21 ± 0.11	1.9 ± 0.4	0.14 ± 0.09	1.9 ± 0.4
A08-B3-SD-003	0.7 ± 0.2	0.59 ± 0.19	0.53 ± 0.18	20 ± 3	1.1 ± 0.3	24 ± 3
A08-B3-SD-004	0.9 ± 0.2	0.52 ± 0.16	0.8 ± 0.2	30 ± 4	1.3 ± 0.3	33 ± 4
A08-B3-SD-005	0.25 ± 0.12	0.46 ± 0.15	0.20 ± 0.10	19 ± 2	1.2 ± 0.3	20 ± 3
A08-B3-SD-006	0.29 ± 0.13	0.28 ± 0.12	0.17 ± 0.09	18 ± 2	1.0 ± 0.3	19 ± 3
A08-B3-SD-007	0.20 ± 0.11	0.33 ± 0.14	0.14 ± 0.09	5.4 ± 0.8	0.35 ± 0.14	6.6 ± 0.9
A08-B3-SD-008	0.19 ± 0.12	0.46 ± 0.15	0.18 ± 0.09	278 ± 26	14 ± 3	289 ± 27
A08-B3-SD-009	0.59 ± 0.12	0.62 ± 0.13	0.51 ± 0.11	9.9 ± 1.0	0.57 ± 0.13	10.3 ± 1.0

TABLE 3-13
OFFSITE LABORATORY ALPHA SPECTROSCOPY RESULTS FOR SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A08-B3-SD-010	0.67 ± 0.20	2.4 ± 0.5	0.59 ± 0.18	10.2 ± 1.4	0.53 ± 0.17	10.5 ± 1.4
A08-B3-SD-011	0.35 ± 0.15	0.23 ± 0.12	0.25 ± 0.12	3.5 ± 0.6	0.12 ± 0.08	3.5 ± 0.6
A08-B3-SD-012	0.17 ± 0.07	0.15 ± 0.06	0.10 ± 0.05	8.1 ± 0.8	0.40 ± 0.11	7.9 ± 0.8
A08-B3-SD-013	1.8 ± 0.4	1.1 ± 0.3	1.7 ± 0.4	3.6 ± 0.6	0.17 ± 0.10	4.0 ± 0.6
A08-B3-SD-014	2.2 ± 0.4	2.1 ± 0.4	2.2 ± 0.4	5.6 ± 0.8	0.25 ± 0.12	6.1 ± 0.9
A08-B3-SD-015	1.8 ± 0.4	1.8 ± 0.4	2.0 ± 0.4	8.6 ± 1.2	0.54 ± 0.18	9.0 ± 1.2
A08-B6-SD-001	2.1 ± 0.3	0.72 ± 0.15	2.0 ± 0.3	49 ± 5	2.6 ± 0.9	51 ± 5
A08-B6-SD-002	0.37 ± 0.09	0.37 ± 0.09	0.33 ± 0.09	15.4 ± 1.0	0.88 ± 0.16	16.4 ± 1.1
A08-B8-SD-001	1.8 ± 0.4	0.64 ± 0.19	1.7 ± 0.4	92 ± 10	4.2 ± 1.4	92 ± 10
A08-B8-SD-002	2.6 ± 0.5	1.1 ± 0.3	2.6 ± 0.5	199 ± 29	11 ± 5	224 ± 32
A09-SD-001	0.69 ± 0.20	0.67 ± 0.20	0.55 ± 0.18	0.59 ± 0.17	0.02 ± 0.04	0.58 ± 0.17
A09-SD-002	0.54 ± 0.17	0.9 ± 0.2	0.61 ± 0.18	0.61 ± 0.17	0.02 ± 0.04	0.68 ± 0.18
A09-SD-003	0.9 ± 0.2	0.9 ± 0.2	0.77 ± 0.20	0.60 ± 0.17	0.09 ± 0.07	0.74 ± 0.19
A09-SD-004	0.8 ± 0.2	0.8 ± 0.2	0.7 ± 0.2	0.72 ± 0.19	0.05 ± 0.06	0.56 ± 0.16
A09-SD-005	0.8 ± 0.2	0.9 ± 0.2	0.68 ± 0.20	0.65 ± 0.18	0.04 ± 0.05	0.54 ± 0.16
A09-SD-006	0.63 ± 0.19	0.8 ± 0.2	0.63 ± 0.18	0.52 ± 0.16	—	0.64 ± 0.18
A09-SD-007	0.65 ± 0.19	1.0 ± 0.3	0.69 ± 0.19	0.65 ± 0.18	0.02 ± 0.04	0.47 ± 0.15
A09-SD-008	0.74 ± 0.20	0.60 ± 0.18	0.65 ± 0.19	0.8 ± 0.2	0.08 ± 0.07	0.58 ± 0.18
A09-SD-009	1.1 ± 0.3	1.0 ± 0.3	1.1 ± 0.3	0.9 ± 0.2	0.06 ± 0.06	0.77 ± 0.20
A09-SD-010	0.8 ± 0.2	0.7 ± 0.2	0.7 ± 0.2	0.76 ± 0.20	0.03 ± 0.04	0.73 ± 0.19
A09-SD-011	0.7 ± 0.2	0.9 ± 0.2	0.7 ± 0.2	0.67 ± 0.19	0.07 ± 0.06	0.54 ± 0.16
A09-SD-012	1.0 ± 0.4	0.8 ± 0.3	0.8 ± 0.3	0.8 ± 0.3	0.05 ± 0.08	0.7 ± 0.3

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Alpha spectroscopy analysis, short count; count times lasted approximately 3 hours.

TABLE 3-14
OFFSITE LABORATORY GAS FLOW PROPORTIONAL COUNTER RESULTS
FOR RADIUM COPCS IN SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{226}Ra	^{228}Ra
A02SL-002-01	1.2 ± 0.3	0.7 ± 0.3
A02SL-004-07	1.2 ± 0.3	1.5 ± 0.3
A02SL-005-01	0.7 ± 0.19	0.4 ± 0.2
A02SL-006-03	0.9 ± 0.2	1.0 ± 0.3
A02SL-009-04	1.33 ± 0.16	1.33 ± 0.16
A02SL-011-01	1.2 ± 0.3	0.8 ± 0.3
A02SL-012-01	0.8 ± 0.2	1.1 ± 0.4
A02SL-015-01	1.5 ± 0.3	1.7 ± 0.4
A02SL-015-10	2.3 ± 0.4	1.6 ± 0.4
A02SL-016-01	1.2 ± 0.3	1.3 ± 0.3
A02SL-016-02	2.3 ± 0.4	1.8 ± 0.4
A02SL-018-03	2.1 ± 0.4	1.2 ± 0.4
A02SL-019-06	1.3 ± 0.3	1.3 ± 0.4
A02SL-020-02	2.3 ± 0.4	1.0 ± 0.3
A02SL-020-03	2.0 ± 0.3	1.2 ± 0.3
A02SL-021-03	3.2 ± 0.3	1.8 ± 0.3
A02SL-022-01	1.3 ± 0.3	1.1 ± 0.4
A02SL-022-04	2.0 ± 0.4	1.9 ± 0.4
A02SL-023-02	1.6 ± 0.3	1.4 ± 0.4
A02SL-024-07	1.6 ± 0.3	1.4 ± 0.4
A02SL-025-01	0.59 ± 0.19	0.9 ± 0.3
A02SL-026-01	0.69 ± 0.19	0.8 ± 0.4
A02SL-028-01	0.67 ± 0.16	2.3 ± 0.4
A02SL-030-06	1.35 ± 0.18	1.7 ± 0.3
A02SL-037-06	1.4 ± 0.3	1.1 ± 0.4
A02SL-038-01	0.53 ± 0.17	0.8 ± 0.4
A02SL-041-01	1.2 ± 0.3	1.2 ± 0.4
A02SL-043-01	0.9 ± 0.2	0.7 ± 0.4
A02SL-215-01	1.5 ± 0.3	1.4 ± 0.4
A02SL-216-01	1.1 ± 0.2	0.6 ± 0.4
A03SL-009-01	1.8 ± 0.3	1.3 ± 0.5
A03SL-009-02	1.6 ± 0.3	1.2 ± 0.4
A03SL-015-02	1.1 ± 0.2	0.5 ± 0.3
A03SL-018-01	0.85 ± 0.15	0.85 ± 0.15
A03SL-028-03	1.7 ± 0.2	2.1 ± 0.3
A03SL-031-02	0.72 ± 0.20	0.08 ± 0.19
A03SL-035-02	0.33 ± 0.14	0.6 ± 0.3
A03SL-036-01	1.0 ± 0.2	0.6 ± 0.3
A03SL-038-01	0.67 ± 0.20	0.2 ± 0.2
A03SL-039-02	0.61 ± 0.19	0.6 ± 0.3
A03SL-040-01	0.4 ± 0.15	0.3 ± 0.2
A03SL-203-01	1.9 ± 0.3	1.5 ± 0.4
A03SL-209-01	0.77 ± 0.20	0.2 ± 0.19
A03SL-216-10	1.0 ± 0.3	0.7 ± 0.4
A03SL-217-13	0.31 ± 0.11	0.4 ± 0.2
A03SL-217-14	0.9 ± 0.2	0.4 ± 0.2
A03SL-221-01	1.1 ± 0.3	0.7 ± 0.4
A03SL-224-01	0.8 ± 0.2	0.3 ± 0.3
A03SL-227-04	0.1 ± 0.07	0.7 ± 0.3

Sample ID [a]	Concentration (pCi/g)	
	^{226}Ra	^{228}Ra
A03SL-228-01	0.9 ± 0.2	0.6 ± 0.3
A03SL-228-06	0.8 ± 0.15	0.8 ± 0.16
A03SL-231-01	0.67 ± 0.18	0.8 ± 0.3
A03SL-231-02	0.82 ± 0.19	0.9 ± 0.4
A03SL-232-01	0.73 ± 0.18	0.8 ± 0.3
A03SL-232-06	0.68 ± 0.18	0.8 ± 0.3
A03SL-233-01	0.84 ± 0.20	0.8 ± 0.4
A03SL-234-01	0.85 ± 0.20	0.8 ± 0.4
A03SL-237-01	1.0 ± 0.2	1.2 ± 0.4
A03SL-240-06	0.9 ± 0.2	0.9 ± 0.4
A03SL-240-07	1.0 ± 0.2	0.7 ± 0.3
A04ASL-003-01	0.75 ± 0.11	0.9 ± 0.2
A04ASL-003-03	1.8 ± 0.3	1.5 ± 0.4
A04ASL-014-01	0.6 ± 0.15	0.6 ± 0.3
A04ASL-024-01	0.62 ± 0.16	0.7 ± 0.4
A04ASL-031-01	1.2 ± 0.3	0.9 ± 0.5
A04ASL-038-01	0.64 ± 0.16	0.8 ± 0.3
A04ASL-051-01	0.63 ± 0.15	1.0 ± 0.3
A04ASL-051-02	1.2 ± 0.2	1.8 ± 0.4
A04ASL-054-01	0.61 ± 0.15	0.7 ± 0.3
A04ASL-055-01	0.51 ± 0.11	0.51 ± 0.11
A04ASL-055-02	1.2 ± 0.2	0.8 ± 0.3
A04ASL-056-01	1.2 ± 0.2	2.0 ± 0.4
A04ASL-056-04	0.8 ± 0.17	1.0 ± 0.3
A04ASL-056-05	1.03 ± 0.20	1.0 ± 0.3
A04ASL-058-02	0.79 ± 0.17	0.9 ± 0.3
A04ASL-061-01	0.76 ± 0.16	0.8 ± 0.3
A04ASL-062-01	0.62 ± 0.15	1.4 ± 0.4
A04ASL-062-02	1.06 ± 0.20	1.5 ± 0.4
A04ASL-063-03	0.4 ± 0.12	0.7 ± 0.3
A04ASL-209-10	0.78 ± 0.19	0.7 ± 0.2
A04ASL-214-05	0.66 ± 0.15	0.63 ± 0.16
A04ASL-224-11	0.7 ± 0.2	1.0 ± 0.3
A04ASL-236-09	0.63 ± 0.19	2.1 ± 0.4
A04ASL-238-01	0.59 ± 0.16	0.3 ± 0.2
A04ASL-238-05	0.80 ± 0.20	0.4 ± 0.2
A04ASL-239-03	1 ± 0.17	0.8 ± 0.3
A04ASL-241-01	0.84 ± 0.16	1.0 ± 0.3
A04ASL-244-01	0.87 ± 0.1	0.9 ± 0.3
A04ASL-250-04	0.9 ± 0.2	0.7 ± 0.4
A04ASL-276-01	0.59 ± 0.20	0.5 ± 0.4
A04ASL-278-10	1.0 ± 0.2	0.7 ± 0.2
A04ASL-318-01	0.67 ± 0.20	0.6 ± 0.4
A04BSL-002-01	0.57 ± 0.16	0.3 ± 0.2
A04BSL-005-01	0.88 ± 0.20	0.2 ± 0.2
A04BSL-006-01	0.79 ± 0.20	0.4 ± 0.2
A04BSL-007-06	1.2 ± 0.2	0.5 ± 0.2

TABLE 3-14
OFFSITE LABORATORY GAS FLOW PROPORTIONAL COUNTER RESULTS
FOR RADIUM COPCS IN SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{226}Ra	^{228}Ra
A04BSL-011-01	1.2 ± 0.2	0.4 ± 0.2
A04BSL-013-07	1.1 ± 0.18	0.6 ± 0.2
A04BSL-015-06	1.3 ± 0.3	0.9 ± 0.4
A04BSL-016-01	0.65 ± 0.18	0.7 ± 0.3
A04BSL-018-06	1.4 ± 0.3	0.8 ± 0.3
A04BSL-019-02	0.59 ± 0.17	0.8 ± 0.4
A04BSL-021-01	0.53 ± 0.16	0.5 ± 0.3
A04BSL-025-01	0.36 ± 0.14	0.8 ± 0.4
A04BSL-025-03	1.1 ± 0.2	0.6 ± 0.3
A04BSL-026-01	1.2 ± 0.3	0.4 ± 0.3
A04BSL-027-01	0.54 ± 0.13	0.54 ± 0.13
A04BSL-028-01	0.41 ± 0.15	0.2 ± 0.3
A04BSL-032-06	1.2 ± 0.2	0.7 ± 0.3
A04BSL-032-07	1.4 ± 0.2	0.9 ± 0.3
A04BSL-036-05	0.9 ± 0.16	0.7 ± 0.2
A04BSL-039-01	1.1 ± 0.3	1.0 ± 0.4
A04BSL-041-05	0.9 ± 0.2	0.8 ± 0.4
A04BSL-042-01	1.5 ± 0.3	1.1 ± 0.3
A04BSL-042-02	1.0 ± 0.3	1.1 ± 0.4
A04BSL-043-01	0.7 ± 0.2	1.2 ± 0.4
A04BSL-219-03	1.3 ± 0.3	1.0 ± 0.4
A04BSL-221-01	0.57 ± 0.19	0.6 ± 0.3
A04BSL-304-03	1.11 ± 0.19	1.11 ± 0.19
A04BSL-306-03	0.60 ± 0.20	0.9 ± 0.3
A04BSL-307-01	0.6 ± 0.2	0.7 ± 0.3
A04BSL-310-06	0.9 ± 0.2	0.9 ± 0.4
A04CSL-001-01	1.16 ± 0.18	1.1 ± 0.3
A04CSL-002-01	1.2 ± 0.3	0.9 ± 0.4
A04CSL-003-01	1.1 ± 0.3	0.8 ± 0.4
A04CSL-003-02	1.3 ± 0.3	0.5 ± 0.4
A04CSL-004-02	1.7 ± 0.3	1.3 ± 0.5
A04CSL-006-02	1.7 ± 0.3	1.3 ± 0.5
A04CSL-006-03	1.7 ± 0.3	1.4 ± 0.4
A04CSL-011-03	1.17 ± 0.15	1.17 ± 0.15
A04CSL-013-01	1.0 ± 0.3	0.7 ± 0.4
A04CSL-013-02	1.3 ± 0.3	1.3 ± 0.4
A04CSL-014-01	0.60 ± 0.20	0.8 ± 0.4
A04CSL-015-01	0.9 ± 0.2	-0.3 ± 0.4
A04DSL-020-01	0.7 ± 0.2	0.7 ± 0.2
A04DSL-023-01	1.6 ± 0.3	1.2 ± 0.3
A04DSL-023-03	1.7 ± 0.3	1.2 ± 0.3
A04DSL-024-01	0.80 ± 0.20	0.7 ± 0.2
A04DSL-026-01	1.16 ± 0.17	0.65 ± 0.17
A04DSL-031-03	2.2 ± 0.4	1.0 ± 0.3
A04DSL-204-01	0.48 ± 0.12	0.2 ± 0.3
A04DSL-210-02	1.2 ± 0.3	0.6 ± 0.2
A04DSL-307-01	1.3 ± 0.3	1.3 ± 0.3

Sample ID [a]	Concentration (pCi/g)	
	^{226}Ra	^{228}Ra
A04DSL-311-02	1.5 ± 0.3	1.1 ± 0.3
A04DSL-320-05	2.1 ± 0.4	1.9 ± 0.4
A04DSL-324-03	1.2 ± 0.3	1.1 ± 0.3
A05ASL-003-01	1.2 ± 0.2	0.6 ± 0.2
A05ASL-004-01	0.89 ± 0.19	0.5 ± 0.2
A05ASL-004-02	0.8 ± 0.18	0.3 ± 0.2
A05ASL-007-03	1.1 ± 0.2	0.7 ± 0.2
A05ASL-008-07	1.1 ± 0.2	0.8 ± 0.3
A05ASL-011-01	1.1 ± 0.2	0.5 ± 0.2
A05ASL-012-01	1.4 ± 0.2	0.6 ± 0.2
A05ASL-018-01	0.99 ± 0.16	0.99 ± 0.16
A05ASL-019-01	0.75 ± 0.18	1.0 ± 0.3
A05ASL-020-01	1.0 ± 0.2	0.9 ± 0.3
A05ASL-025-01	0.84 ± 0.19	0.5 ± 0.3
A05ASL-027-03	0.89 ± 0.20	0.6 ± 0.3
A05ASL-210-01	1.1 ± 0.2	0.7 ± 0.3
A05ASL-211-01	1.5 ± 0.3	1.1 ± 0.4
A05ASL-219-01	1.5 ± 0.3	0.7 ± 0.3
A05ASL-219-02	1.0 ± 0.2	0.8 ± 0.3
A05ASL-301-01	11.3 ± 1.2	41 ± 4
A05ASL-301-02	2.8 ± 0.4	13.5 ± 1.4
A05ASL-301-06	1.11 ± 0.17	2.9 ± 0.3
A05ASL-303-01	0.74 ± 0.20	1.1 ± 0.4
A05ASL-303-13	1.0 ± 0.2	0.7 ± 0.3
A05ASL-303-14	2.0 ± 0.3	1.1 ± 0.3
A05ASL-304-01	1.3 ± 0.3	1.4 ± 0.4
A05ASL-304-02	1.2 ± 0.3	1.2 ± 0.4
A05ASL-304-13	0.75 ± 0.15	0.75 ± 0.15
A05ASL-304-14	1.0 ± 0.2	1.0 ± 0.4
A05ASL-305-02	1.2 ± 0.3	1.1 ± 0.3
A05ASL-305-03	1.0 ± 0.2	1.1 ± 0.3
A05ASL-306-03	1.2 ± 0.3	1.0 ± 0.4
A05ASL-308-01	1.5 ± 0.3	1.5 ± 0.4
A05BSL-001-01	1.1 ± 0.2	1.0 ± 0.3
A05BSL-001-13	0.82 ± 0.20	0.9 ± 0.3
A05BSL-004-01	1.0 ± 0.2	0.9 ± 0.3
A05BSL-004-03	1.0 ± 0.2	1.2 ± 0.3
A05BSL-005-01	1.1 ± 0.2	1.1 ± 0.3
A05BSL-005-03	1.0 ± 0.2	1.4 ± 0.3
A05BSL-007-01	1.2 ± 0.3	0.8 ± 0.3
A05BSL-007-03	1.0 ± 0.2	0.8 ± 0.3
A05BSL-009-01	1.13 ± 0.18	1.13 ± 0.18
A05BSL-011-01	1.0 ± 0.2	0.9 ± 0.3
A05BSL-011-03	1.1 ± 0.2	1.3 ± 0.3
A10SL-001-01	1.3 ± 0.3	1.2 ± 0.3
A10SL-003-01	1.1 ± 0.2	1.0 ± 0.3
A10SL-006-01	1.4 ± 0.3	0.6 ± 0.2

TABLE 3-14
OFFSITE LABORATORY GAS FLOW PROPORTIONAL COUNTER RESULTS
FOR RADIUM COPCS IN SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{226}Ra	^{228}Ra
A10SL-009-02	1.1 ± 0.2	1.0 ± 0.3
A10SL-010-02	0.9 ± 0.2	0.7 ± 0.3
A10SL-011-02	1.1 ± 0.2	0.9 ± 0.3
A10SL-013-01	1.1 ± 0.2	1.3 ± 0.3
A10SL-013-02	1.2 ± 0.3	1.7 ± 0.3
A10SL-301-01	0.9 ± 0.2	0.4 ± 0.2
A10SL-303-01	0.65 ± 0.19	0.5 ± 0.3
A10SL-303-02	0.92 ± 0.15	0.62 ± 0.19
A10SL-303-13	1.0 ± 0.2	0.6 ± 0.2
B02SL-005-01	1.31 ± 0.17	1.7 ± 0.2
B02SL-009-01	0.45 ± 0.15	0.4 ± 0.2
B02SL-009-02	1.6 ± 0.3	1.2 ± 0.3
B02SL-018-01	2.6 ± 0.4	2.0 ± 0.4
B02SL-018-02	3.1 ± 0.4	2.1 ± 0.4
B02SL-018-03	2.7 ± 0.4	1.7 ± 0.4
B02SL-022-03	1.5 ± 0.3	1.0 ± 0.3
B02SL-037-05	1.4 ± 0.2	1.1 ± 0.3
B02SL-045-01	2.3 ± 0.3	1.8 ± 0.4
B02SL-046-01	1.0 ± 0.2	1.3 ± 0.4
B02SL-049-01	2.4 ± 0.4	1.7 ± 0.4
B02SL-049-02	2.1 ± 0.3	1.7 ± 0.4
B02SL-052-03	2.7 ± 0.3	2.0 ± 0.3
B03SL-009-01	0.72 ± 0.14	0.7 ± 0.2
B03SL-014-01	0.29 ± 0.14	0.2 ± 0.3
B03SL-014-05	0.42 ± 0.15	0.9 ± 0.3
B03SL-016-01	1.5 ± 0.3	0.8 ± 0.3
B03SL-016-05	2.0 ± 0.4	1.4 ± 0.4
B03SL-018-02	1.27 ± 0.20	1.27 ± 0.20
B03SL-027-03	1.3 ± 0.3	0.9 ± 0.3
B03SL-037-01	0.9 ± 0.2	0.9 ± 0.3
B04&B09SL-009-02	1.3 ± 0.3	1.1 ± 0.4
B04&B09SL-015-01	0.59 ± 0.18	1.0 ± 0.3
B04&B09SL-018-01	1.9 ± 0.3	0.5 ± 0.3
B04&B09SL-018-02	1.2 ± 0.3	0.8 ± 0.3
B04&B09SL-020-01	1.7 ± 0.3	0.7 ± 0.4
B04&B09SL-025-02	1.9 ± 0.3	1.2 ± 0.4
B04&B09SL-026-01	0.36 ± 0.14	0.1 ± 0.3
B04&B09SL-032-01	1.0 ± 0.3	0.7 ± 0.4
B04&B09SL-033-02	1.4 ± 0.3	1.0 ± 0.3
B04&B09SL-036-02	1.8 ± 0.3	1.0 ± 0.4
B06SL-003-01	0.52 ± 0.18	0.9 ± 0.3
B06SL-005-01	0.7 ± 0.2	0.5 ± 0.3
B06SL-006-02	0.85 ± 0.20	1.5 ± 0.4
B06SL-011-05	1.0 ± 0.3	1.2 ± 0.3
B06SL-021-01	3.6 ± 0.5	16.3 ± 1.5
B06SL-021-05	3.4 ± 0.3	13.5 ± 0.9
B08SL-003-01	1.0 ± 0.2	2.8 ± 0.5
B08SL-003-05	1.3 ± 0.3	1.1 ± 0.3
B08SL-014-01	0.57 ± 0.20	1.6 ± 0.4
B08SL-015-09	0.59 ± 0.18	2.5 ± 0.4
B08SL-017-01	2.1 ± 0.4	11.0 ± 1.1
B08SL-017-05	1.5 ± 0.3	2.9 ± 0.5
B24SL-018-03	1.1 ± 0.3	1.1 ± 0.4
B24SL-019-02	1.6 ± 0.3	1.4 ± 0.4
B24SL-021-01	0.63 ± 0.18	0.7 ± 0.4
B24SL-021-02	1.4 ± 0.3	1.0 ± 0.4
B24SL-025-02	1.1 ± 0.3	0.9 ± 0.4
B24SL-026-01	1.1 ± 0.3	1.0 ± 0.4
B24SL-028-01	1.04 ± 0.17	1.04 ± 0.17
B24SL-033-01	1.1 ± 0.2	0.3 ± 0.3
B35SL-001-01	0.7 ± 0.2	2.0 ± 0.5
B35SL-003-07	2.5 ± 0.4	1.7 ± 0.5
BKGSL-001-01	1.03 ± 0.19	1.0 ± 0.3
BKGSL-001-02	0.9 ± 0.3	0.7 ± 0.4
BKGSL-002-01	1.4 ± 0.3	0.8 ± 0.3
BKGSL-002-04	1.0 ± 0.2	0.8 ± 0.3
BKGSL-003-01	1.2 ± 0.3	0.5 ± 0.3
BKGSL-003-09	0.56 ± 0.20	0.8 ± 0.3
BKGSL-004-01	1.1 ± 0.3	0.7 ± 0.4
BKGSL-004-02	1.2 ± 0.3	0.6 ± 0.3
BKGSL-005-01	1.1 ± 0.3	0.5 ± 0.3
BKGSL-005-02	0.7 ± 0.2	0.9 ± 0.4
BKGSL-006-01	1.1 ± 0.3	0.4 ± 0.3
BKGSL-006-03	1.2 ± 0.3	0.6 ± 0.3
BKGSL-007-01	0.9 ± 0.3	0.7 ± 0.3
BKGSL-007-04	1.0 ± 0.3	0.4 ± 0.2
BKGSL-008-01	1.1 ± 0.3	0.9 ± 0.5
BKGSL-008-03	1.0 ± 0.2	1.1 ± 0.5
BKGSL-009-01	1.0 ± 0.2	1.3 ± 0.5
BKGSL-009-03	1.2 ± 0.3	1.2 ± 0.5
BKGSL-010-01	1.0 ± 0.2	1.1 ± 0.4
BKGSL-010-03	1.1 ± 0.3	1.0 ± 0.5
BKGSL-011-01	1.36 ± 0.20	0.8 ± 0.3
BKGSL-011-08	0.9 ± 0.2	0.7 ± 0.3
BKGSL-012-01	1.0 ± 0.2	0.7 ± 0.4
BKGSL-012-04	1.0 ± 0.2	1.1 ± 0.4

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

TABLE 3-15
OFFSITE LABORATORY GAS FLOW PROPORTIONAL COUNTER RESULTS
FOR RADIUM COPCS IN SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{226}Ra	^{228}Ra
A03-SD-001	1.0 ± 0.3	0.7 ± 0.4
A03-SD-003	1.1 ± 0.3	0.7 ± 0.4
A03-SD-005	1.2 ± 0.3	0.9 ± 0.4
A08-A01-SD-001R	0.31 ± 0.11	0.4 ± 0.2
A08-A01-SD-002	0.76 ± 0.14	0.6 ± 0.3
A08-A01-SD-003	0.32 ± 0.16	0.3 ± 0.4
A08-A01-SD-004	0.8 ± 0.2	1.0 ± 0.6
A08-A01-SD-005	0.31 ± 0.14	0.6 ± 0.5
A08-A01-SD-006	0.56 ± 0.13	0.5 ± 0.3
A08-A01-SD-007	0.62 ± 0.19	0.3 ± 0.4
A08-A01-SD-008	0.9 ± 0.2	1.1 ± 0.5
A08-A01-SD-009	0.54 ± 0.17	0.5 ± 0.5
A08-A01-SD-010	0.45 ± 0.16	0.7 ± 0.4
A08-A01-SD-011	0.5 ± 0.18	0.5 ± 0.4
A08-A01-SD-012	0.55 ± 0.18	0.2 ± 0.3
A08-A01-SD-013	0.9 ± 0.2	0.6 ± 0.4
A08-B04&B09-SD-001	0.43 ± 0.16	0.5 ± 0.4
A08-B04&B09-SD-002	0.56 ± 0.17	0.4 ± 0.3
A08-B04&B09-SD-003	0.47 ± 0.16	0.6 ± 0.4
A08-B04&B09-SD-004	0.26 ± 0.13	0.2 ± 0.4
A08-B04&B09-SD-005	0.46 ± 0.17	0.2 ± 0.4
A08-B1-SD-001	0.42 ± 0.18	0.6 ± 0.4
A08-B1-SD-002	0.3 ± 0.13	0.5 ± 0.5
A08-B1-SD-003	0.27 ± 0.12	0.8 ± 0.5
A08-B1-SD-004	1.8 ± 0.3	1.4 ± 0.5
A08-B1-SD-005	0.31 ± 0.14	0.3 ± 0.2
A08-B1-SD-006	0.53 ± 0.12	0.34 ± 0.20
A08-B1-SL-001	0.22 ± 0.09	–0.08 ± 0.19
A08-B24-SD-001	0.46 ± 0.13	0.7 ± 0.3
A08-B24-SD-002	0.4 ± 0.2	0.7 ± 0.5
A08-B24-SD-003	0.48 ± 0.16	1.0 ± 0.5
A08-B24-SD-004	0.5 ± 0.16	0.5 ± 0.5
A08-B24-SD-005	0.14 ± 0.11	0.3 ± 0.4
A08-B24-SD-006	1.4 ± 0.3	1.9 ± 0.5
A08-B24-SD-007	0.51 ± 0.17	0.7 ± 0.5
A08-B2-SD-001	0.7 ± 0.2	1.1 ± 0.4
A08-B2-SD-002	0.66 ± 0.19	0.3 ± 0.4
A08-B2-SD-003	1.0 ± 0.2	0.6 ± 0.4
A08-B3-SD-002	0.13 ± 0.11	0.2 ± 0.4
A08-B3-SD-003	0.6 ± 0.2	0.0 ± 0.4
A08-B3-SD-004	0.5 ± 0.19	0.4 ± 0.4
A08-B3-SD-005	0.25 ± 0.14	0.2 ± 0.3
A08-B3-SD-006	0.21 ± 0.09	0.13 ± 0.15
A08-B3-SD-007	0.25 ± 0.13	0.1 ± 0.2
A08-B3-SD-008	0.25 ± 0.09	0.39 ± 0.18
A08-B3-SD-009	0.52 ± 0.13	0.3 ± 0.3
A08-B3-SD-010	1.9 ± 0.4	0.7 ± 0.4
A08-B3-SD-011	0.56 ± 0.13	0.7 ± 0.3
A08-B3-SD-012	0.2 ± 0.09	0.4 ± 0.3
A08-B3-SD-013	2.8 ± 0.5	2.0 ± 0.5
A08-B3-SD-014	2.6 ± 0.5	-1.3 ± 1.2
A08-B3-SD-015	2.6 ± 0.5	1.7 ± 0.6
A08-B6-SD-001	0.68 ± 0.14	1.3 ± 0.3
A08-B6-SD-002	0.55 ± 0.1	0.42 ± 0.16
A08-B8-SD-001	0.71 ± 0.14	1.1 ± 0.3
A08-B8-SD-002	0.57 ± 0.18	1.1 ± 0.3
A09-SD-001	1.1 ± 0.3	0.6 ± 0.4
A09-SD-003	0.9 ± 0.2	0.8 ± 0.4
A09-SD-005	1.0 ± 0.2	0.7 ± 0.4
A09-SD-007	1.0 ± 0.3	0.7 ± 0.5
A09-SD-008	0.98 ± 0.17	0.9 ± 0.3
A09-SD-011	1 ± 0.18	0.6 ± 0.4

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

TABLE 3-16
OFFSITE LABORATORY GAS FLOW PROPORTIONAL COUNTER RESULTS
FOR RADIUM COPCS IN BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	^{226}Ra	^{228}Ra
B01-BM-001	0.32 ± 0.15	0.4 ± 0.4
B01-BM-002	0.07 ± 0.09	-0.6 ± 0.4
B01-BM-003	0.56 ± 0.18	-0.1 ± 0.4
B02-BM-001	4.2 ± 0.6	1.0 ± 0.4
B02-BM-002	0.66 ± 0.20	0.0 ± 0.4
B02-BM-003	0.9 ± 0.2	-0.1 ± 0.4
B02-BM-004	0.26 ± 0.16	-0.5 ± 0.4
B02-BM-005	0.3 ± 0.16	-0.2 ± 0.5
B02-BM-006	0.54 ± 0.20	0.2 ± 0.4
B02-BM-007	0.3 ± 0.15	0.2 ± 0.4
B02-BM-008	1.4 ± 0.3	0.7 ± 0.3
B02-BM-009	1.0 ± 0.3	0.7 ± 0.4
B02-BM-010	0.15 ± 0.12	0.0 ± 0.3
B03-BM-001	0.33 ± 0.16	0.0 ± 0.3
B03-BM-002	0.7 ± 0.2	0.1 ± 0.3
B03-BM-003	0.12 ± 0.08	0.1 ± 0.4
B03-BM-004	1.4 ± 0.3	0.6 ± 0.3
B03-BM-005	0.38 ± 0.16	-1.2 ± 0.4
B03-BM-006	0.17 ± 0.13	-0.1 ± 0.3
B03-BM-007	1.4 ± 0.3	0.6 ± 0.4
B04&B09-BM-001	1.4 ± 0.2	1.1 ± 0.4
B04&B09-BM-002	0.51 ± 0.18	0.3 ± 0.4
B04&B09-BM-003	0.33 ± 0.18	-0.2 ± 0.5
B04&B09-BM-004	1.0 ± 0.2	0.4 ± 0.4
B05-BM-001	0.4 ± 0.16	-0.1 ± 0.4
B05-BM-002	1.2 ± 0.3	0.8 ± 0.4
B06-BM-001	1.18 ± 0.19	0.9 ± 0.3
B06-BM-002	1.34 ± 0.20	1.1 ± 0.3
B06-BM-003	-0.03 ± 0.11	-0.3 ± 0.4
B06-BM-004	-0.02 ± 0.09	-0.1 ± 0.3
B06-BM-005	2.2 ± 0.4	1.3 ± 0.5
B06-BM-006	-0.2 ± 0.2	-0.7 ± 0.8
B08-BM-001	0.49 ± 0.19	0.1 ± 0.3
B08-BM-002	1.0 ± 0.3	1.1 ± 0.5
B24-BM-001	0.28 ± 0.17	-0.3 ± 0.3
B24-BM-002	0.51 ± 0.20	0.0 ± 0.3
B24-BM-003	0.5 ± 0.2	0.6 ± 0.3
B24-BM-004	0.27 ± 0.15	-1.0 ± 0.3
B24SL-603-01 [b]	1.6 ± 0.4	3.8 ± 0.8
B35-BM-001	0.19 ± 0.17	0.2 ± 0.4
B35-BM-002	0.7 ± 0.2	0.1 ± 0.4

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Sample B24SL-603-01 inadvertently labeled “SL”; sample collected from dust on roof truss.

TABLE 3-17
GAS FLOW PROPORTIONAL COUNTER RESULTS FOR RADIUM ISOTOPES
IN SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)	
	^{226}Ra	^{228}Ra
A08-A01-SW-001	0.01 ± 0.07	0.5 ± 0.5
A08-A01-SW-004	0.14 ± 0.11	0.4 ± 0.5
A08-A01-SW-005	0.06 ± 0.09	0.3 ± 0.4
A08-A01-SW-006	0.14 ± 0.09	0.4 ± 0.3
A08-A01-SW-007	0.25 ± 0.15	-0.4 ± 0.6
A08-A01-SW-011	0.09 ± 0.11	0.5 ± 0.5
A08-A01-SW-012	0.09 ± 0.12	0.4 ± 0.5
A08-B04&B09-SW-001	0.17 ± 0.13	0.3 ± 0.6
A08-B04&B09-SW-002	0.12 ± 0.12	0.6 ± 0.5
A08-B04&B09-SW-003	0.09 ± 0.11	0.2 ± 0.4
A08-B04&B09-SW-004	0.04 ± 0.14	-0.3 ± 0.9
A08-B04&B09-SW-005	-0.04 ± 0.09	0.6 ± 0.5
A08-B1-SW-001	0.09 ± 0.13	0.0 ± 0.3
A08-B1-SW-002	0.06 ± 0.11	0.3 ± 0.3
A08-B1-SW-003	0.12 ± 0.14	0.6 ± 0.4
A08-B1-SW-004	0.08 ± 0.10	0.0 ± 0.2
A08-B1-SW-005	0.07 ± 0.10	0.3 ± 0.4
A08-B1-SW-006	0 ± 0.09	0.3 ± 0.3
A08-B2-SW-001	0.01 ± 0.08	0.4 ± 0.5
A08-B2-SW-003	0.44 ± 0.19	0.5 ± 0.7
A08-B3-SW-003	0.03 ± 0.13	0.2 ± 0.3
A08-B3-SW-004	0.17 ± 0.15	0.0 ± 0.3
A08-B3-SW-005	0.02 ± 0.11	0.3 ± 0.4
A08-B3-SW-006	0.17 ± 0.12	0.6 ± 0.3
A08-B3-SW-007	0.03 ± 0.17	0.0 ± 0.3
A08-B3-SW-008	0.14 ± 0.15	0.4 ± 0.4
A08-B3-SW-009	0.07 ± 0.09	0.07 ± 0.19
A08-B3-SW-011	0.09 ± 0.15	0.2 ± 0.5
A08-B3-SW-012	0.09 ± 0.11	-0.9 ± 0.6
A08-B3-SW-013	0.27 ± 0.13	0.8 ± 0.5
A08-B3-SW-014	0.06 ± 0.12	0.4 ± 0.3
A08-B3-SW-015	0.22 ± 0.17	0.5 ± 0.3
A08-B8-SW-001	0.09 ± 0.12	0.7 ± 0.4
A08-B8-SW-002	0.1 ± 0.12	0.3 ± 0.3
A09-SW-001	0.13 ± 0.11	0.4 ± 0.5
A09-SW-002	0.07 ± 0.13	-0.2 ± 0.5
A09-SW-003	0.15 ± 0.13	1.1 ± 0.6
A09-SW-004	0.17 ± 0.14	0.7 ± 0.6
A09-SW-005	0.07 ± 0.12	0.8 ± 0.6
A09-SW-006	0.09 ± 0.15	0.3 ± 0.5
A09-SW-007	0.1 ± 0.13	0.5 ± 0.6
A09-SW-008	0.12 ± 0.09	0.5 ± 0.3
A09-SW-009	0.07 ± 0.11	0.4 ± 0.5
A09-SW-010	0.07 ± 0.14	0.3 ± 0.4
A09-SW-011	0.14 ± 0.16	0.4 ± 0.5
A09-SW-012	0.2 ± 0.17	0.3 ± 0.5

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

Table 3-18
GAS FLOW PROPORTIONAL COUNTER RESULTS FOR RADIUM ISOTOPES IN GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)					
	^{226}Ra			^{228}Ra		
	Aug-07	Nov-07	Weighted Average[a]	Aug-07	Nov-07	Weighted Average[a]
A02MW06-F	0.044	0.15	0.07 ± 0.08	0.53	0.01	0.3 ± 0.3
A02MW06-U	0.12	0.04	0.09 ± 0.08	0.44	0.002	0.2 ± 0.3
A02MW08-F	0.22	0.26	0.24 ± 0.11	0.04	0.06	0.1 ± 0.2
A02MW08-U	0.24	0.21	0.23 ± 0.11	0.24	-0.02	0.1 ± 0.3
A02MW09-F	0.12	0.06	0.09 ± 0.09	-0.17	0.15	0.0 ± 0.3
A02MW09-U	0.12	0.05	0.09 ± 0.08	-0.82	-0.05	-0.4 ± 0.3
A02MW11-F	0.27	0.52	0.36 ± 0.13	0.12	0.28	0.2 ± 0.2
A02MW11-U	0.22	0.26	0.24 ± 0.11	0.19	0.38	0.3 ± 0.2
A02MW1-F	0.2	0.34	0.21 ± 0.08	0.75	-0.01	0.6 ± 0.2
A02MW1-U	0.23	0.21	0.25 ± 0.09	1.41	0.23	1.0 ± 0.2
A02MW2-F	0.18	0.11	0.15 ± 0.09	-0.23	0.16	0.0 ± 0.4
A02MW2-U	0.18	0.16	0.17 ± 0.09	0.25	0.25	0.3 ± 0.3
A02MW3-F	0.14	0.35	0.2 ± 0.12	-0.02	0.07	0.0 ± 0.3
A02MW3-U	0.16	0.24	0.20 ± 0.11	-0.01	0.1	0.07 ± 0.19
A02MW4-F	0.15	0.22	0.15 ± 0.08	0.15	0.1	0.09 ± 0.20
A02MW4-U	0.62	0.41	0.38 ± 0.10	0.54	0.21	0.27 ± 0.17
A02MW5-F	0.22	0.16	0.19 ± 0.11	0.11	-0.05	0.1 ± 0.2
A02MW5-U	0.14	0.1	0.12 ± 0.10	0.19	0.27	0.2 ± 0.3
A03MW13D-F	0.24	0.26	0.25 ± 0.10	0.11	-0.01	0.1 ± 0.3
A03MW13D-U	0.23	0.18	0.21 ± 0.10	0.09	-0.09	0.0 ± 0.3
A03MW14-F	0.33	0.25	0.29 ± 0.12	0.57	-0.1	0.2 ± 0.3
A03MW14-U	0.24	0.33	0.27 ± 0.10	0.33	-0.4	0.0 ± 0.2
A03MW15-F	0.08	0.18	0.13 ± 0.10	0.006	-1.6	-0.4 ± 0.2
A03MW15-U	0.06	0.03	0.05 ± 0.09	0.03	-0.03	0.0 ± 0.2
A03MW16-F	0.1	0.34	0.16 ± 0.09	0.48	-0.06	0.2 ± 0.3
A03MW16-U	0.15	0.23	0.20 ± 0.11	0.51	-0.11	0.1 ± 0.2
A03MW17-F	0.33	0.32	0.33 ± 0.10	0.21	-0.09	0.0 ± 0.3
A03MW17-U	0.38	0.42	0.39 ± 0.11	0.65	-0.25	0.1 ± 0.3
A03MW606D-RF	--	0.17	0.17 ± 0.15	--	0.22	0.2 ± 0.4
A03MW606D-RU	--	0.23	0.23 ± 0.15	--	0.18	0.2 ± 0.4
A03MW607D-F	0.24	0.18	0.21 ± 0.12	0.14	-0.24	-0.1 ± 0.2
A03MW607D-U	0.29	0.14	0.20 ± 0.10	0.25	0.14	0.2 ± 0.3
A04AMW020-F	0.025	0.13	0.05 ± 0.06	0.46	0.29	0.3 ± 0.2
A04AMW020-U	0.12	0.02	0.08 ± 0.06	0.28	0.22	0.1 ± 0.2
A04AMW21-F	0.35	0.21	0.25 ± 0.07	0.08	0.25	0.08 ± 0.17
A04AMW21-U	0.23	0.23	0.27 ± 0.07	0.11	0.01	0.1 ± 0.17
A04AMW22-F	0.23	0.35	0.28 ± 0.12	0.19	0.24	0.2 ± 0.2
A04AMW22-U	0.1	0.32	0.17 ± 0.10	0.1	-0.1	0.0 ± 0.2

Table 3-18
GAS FLOW PROPORTIONAL COUNTER RESULTS FOR RADIUM ISOTOPES IN GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)					
	^{226}Ra			^{228}Ra		
	Aug-07	Nov-07	Weighted Average[a]	Aug-07	Nov-07	Weighted Average[a]
A04AMW23-F	0.22	0.14	0.18 ± 0.10	0.35	0.38	0.4 ± 0.3
A04AMW23-U	0.18	0.11	0.15 ± 0.10	0.39	0.09	0.2 ± 0.3
A04AMW601D-F	0.11	0.2	0.15 ± 0.10	0.33	0.36	0.3 ± 0.3
A04AMW601D-U	0.22	0.14	0.18 ± 0.10	0.3	0.11	0.2 ± 0.3
A04AMW602D-F	0.37	0.15	0.23 ± 0.11	0.63	0.4	0.5 ± 0.3
A04AMW602D-U	0.3	0.15	0.22 ± 0.10	0.67	-0.1	0.3 ± 0.3
A04AMW603D-F	0.28	0.16	0.22 ± 0.11	0.36	0.12	0.2 ± 0.3
A04AMW603D-U	0.25	0.04	0.13 ± 0.11	0.07	0.06	0.1 ± 0.3
A04BMW18-F	0.31	0.1	0.18 ± 0.10	0.39	-0.3	0.1 ± 0.3
A04BMW18-U	0.28	0.17	0.23 ± 0.11	0.75	-0.06	0.3 ± 0.3
A04BMW19-F	0.13	0.17	0.14 ± 0.10	0.22	0.17	0.2 ± 0.3
A04BMW19-U	0.05	0.07	0.06 ± 0.09	0.53	-0.06	0.2 ± 0.3
A04BMW26-F	0.37	0.12	0.2 ± 0.11	0.41	0.41	0.4 ± 0.3
A04BMW26-U	0.2	0.14	0.17 ± 0.11	0.51	0.16	0.4 ± 0.2
A04BMW605D-F	0.36	0.21	0.28 ± 0.10	0.36	0.13	0.2 ± 0.3
A04BMW605D-U	0.34	0.21	0.27 ± 0.10	0.4	0.4	0.4 ± 0.3
A04DMW24-F	0.04	0.19	0.09 ± 0.10	0.35	0.37	0.4 ± 0.3
A04DMW24-U	0.07	0.09	0.08 ± 0.08	0.47	0.3	0.4 ± 0.2
A04DMW604D-F	0.13	0.17	0.14 ± 0.09	0.44	0.21	0.4 ± 0.2
A04DMW604D-U	0.28	0.13	0.21 ± 0.09	0.41	0.32	0.4 ± 0.3
A05BMW600D-F	1.26	1.49	1.4 ± 0.2	2.6	2.17	2.4 ± 0.4
A05BMW600D-U	1.35	1.18	1.26 ± 0.20	2.22	1.74	2.0 ± 0.4

Notes:
Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
F = filtered sample
U = unfiltered sample
pCi/L = picocuries per liter
Aug-07 = July/August 2007 sampling event
Nov-07 = November 2007 sampling event
-- = No sample collected.

TABLE 3-19
ICP-MS RESULTS FOR URANIUM ISOTOPES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b c]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
						Natural uranium [d]	—	0.0054%	0.7204%	—	99.2742%
						Low enrichment [d]	—	0.0290%	3.4989%	—	96.4722%
						Depleted uranium [d]	—	0.0010%	0.1991%	0.0003%	99.7996%
						Recycled uranium [d]	—	0.0082%	0.9700%	0.0680%	98.9500%
A02SL-028-01	[0.01]	0.011	2.1	0.017	822	824	ND	0.0013%	0.25%	0.0021%	99.7%
A03SL-217-13	[0.01]	0.023	2.7	[0.01]	486	489	ND	0.0047%	0.55%	ND	99.4%
A04ASL-051-01	[0.01]	0.024	2.9	[0.01]	447	450	ND	0.0053%	0.64%	ND	99.4%
A04ASL-214-05	[0.01]	0.037	4.1	[0.01]	669	673	ND	0.0055%	0.61%	ND	99.4%
A04ASL-278-10	[0.005]	0.047	5.4	[0.005]	1040	1045	ND	0.0045%	0.52%	ND	99.5%
A05ASL-301-01	[0.005]	0.74	92	0.021	15500	15592	ND	0.0047%	0.59%	0.0001%	99.4%
B03SL-014-05	[0.01]	0.063	7.1	[0.01]	1120	1127	ND	0.0056%	0.63%	ND	99.4%
B03SL-016-05	[0.01]	0.009	0.94	[0.01]	97	98	ND	0.0092%	0.96%	ND	99.0%
B03SL-037-01	[0.01]	[0.01]	0.033	[0.01]	5.1	5.1	ND	ND	0.64%	ND	99.4%
B08SL-003-01	[0.01]	0.55	59	[0.01]	8700	8759	ND	0.0063%	0.67%	ND	99.3%
B08SL-015-09	[0.01]	0.27	32	0.015	5190	5223	ND	0.0052%	0.62%	0.0003%	99.4%
B08SL-017-01	[0.01]	3	336	0.006[e]	50000	50339	ND	0.0060%	0.67%	0.00001%	99.3%
BKGSL-001-01	[0.013]	[0.013]	0.0059[e]	[0.013]	0.88	0.88			0.67%		99.3%
BKGSL-001-02	[0.013]	[0.013]	[0.013]	[0.013]	0.63	0.63					
BKGSL-002-01	[0.013]	[0.013]	0.0063[e]	[0.013]	0.95	0.95			0.66%		99.3%
BKGSL-002-04	[0.013]	[0.013]	[0.013]	[0.013]	0.46	0.46					
BKGSL-003-01	[0.013]	[0.013]	0.0065[e]	[0.013]	0.98	0.98			0.66%		99.3%
BKGSL-003-09	[0.013]	[0.013]	[0.013]	[0.013]	0.38	0.38					
BKGSL-004-01	[0.013]	[0.013]	0.0072[e]	[0.013]	1.1	1.1			0.65%		99.3%
BKGSL-004-02	[0.013]	[0.013]	0.0059[e]	[0.013]	0.90	0.90			0.65%		99.3%
BKGSL-005-01	[0.013]	[0.013]	0.006[e]	[0.013]	0.92	0.92			0.65%		99.4%
BKGSL-005-02	[0.013]	[0.013]	[0.013]	[0.013]	0.68	0.68					
BKGSL-006-01	[0.013]	[0.013]	0.0054[e]	[0.013]	0.81	0.81			0.66%		99.3%
BKGSL-006-03	[0.013]	[0.013]	[0.013]	[0.013]	0.71	0.71					
BKGSL-007-01	[0.013]	[0.013]	0.0053[e]	[0.013]	0.78	0.78			0.67%		99.3%
BKGSL-007-04	[0.013]	[0.013]	[0.013]	[0.013]	0.41	0.41					
BKGSL-008-01	[0.013]	[0.013]	0.0054[e]	[0.013]	0.82	0.82			0.67%		99.3%
BKGSL-008-03	[0.013]	[0.013]	[0.013]	[0.013]	0.52	0.52					

TABLE 3-19
ICP-MS RESULTS FOR URANIUM ISOTOPES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b c]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
BKGSL-009-01	[0.013]	[0.013]	0.0064[e]	[0.013]	0.93	0.93			0.68%		99.3%
BKGSL-009-03	[0.013]	[0.013]	[0.013]	[0.013]	0.57	0.57					
BKGSL-010-01	[0.013]	[0.013]	0.0064[e]	[0.013]	0.97	0.97			0.66%		99.3%
BKGSL-010-03	[0.013]	[0.013]	[0.013]	[0.013]	0.51	0.51					
BKGSL-011-01	[0.013]	[0.013]	0.0054[e]	[0.013]	0.97	0.97			0.55%		99.4%
BKGSL-011-08	[0.013]	[0.013]	[0.013]	[0.013]	0.37	0.37					
BKGSL-012-01	[0.013]	[0.013]	0.006[e]	[0.013]	0.91	0.91			0.66%		99.3%
BKGSL-012-04	[0.013]	[0.013]	[0.013]	[0.013]	0.64	0.64					

Notes:
[a] Bracketed numbers are the laboratory reporting limits.
[b] Relative mass abundances were calculated using uranium isotopic data in Table 3-30. "ND" represents samples for which the isotope was not detected above the laboratory reporting limit; these values are assigned a zero value in the calculations.
[c] The ICP-MS results did not provide sufficient information to accurately determine the relative abundances of the three naturally occurring isotopes of uranium for the background reference area samples. This is because the U-234 and U-235 mass concentrations were all below laboratory reporting limits. Therefore, U-234 and U-235 mass concentrations are not available to be related to the U-238 mass concentrations in order to calculate relative abundances. The values provided for U-235 and U-238 are estimated using the estimated U-235 ICP-MS data, and disregarding U-234 mass concentration.
[d] Traub, RJ. 2006. *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium*. Battelle-TBD-6001 rev. F0, Battelle, Richland, Washington.
[e] This laboratory-reported value is considered "estimated" as it is greater than the laboratory detection limit but less than the laboratory reporting limit.
ICP-MS – Inductively Coupled Plasma – Mass Spectroscopy
µg U/g – microgram uranium per gram soil

TABLE 3-20
GROSS ALPHA AND GROSS BETA RESULTS FOR SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)	
	Gross Alpha	Gross Beta
A02SL-028-01	158 ± 12	331 ± 18
A03SL-217-13	42 ± 6	80 ± 8
A04ASL-051-01	110 ± 14	157 ± 13
A04ASL-214-05	184 ± 19	309 ± 24
A04ASL-278-10	148 ± 17	304 ± 24
A05ASL-301-01	4810 ± 450	6190 ± 480
B03SL-014-05	275 ± 27	512 ± 39
B03SL-016-05	47 ± 7	62 ± 6
B03SL-037-01	8 ± 3	5.5 ± 1.2
B08SL-003-01	1430 ± 130	2110 ± 160
B08SL-015-09	499 ± 46	952 ± 73
B08SL-017-01	6270 ± 600	11500 ± 890
BKGSL-001-01	9 ± 2	17 ± 2
BKGSL-001-02	9 ± 3	18 ± 3
BKGSL-002-01	7 ± 3	16 ± 3
BKGSL-002-04	12 ± 4	17 ± 3
BKGSL-003-01	8 ± 3	17 ± 3
BKGSL-003-09	6 ± 3	15 ± 3
BKGSL-004-01	7 ± 3	19 ± 3
BKGSL-004-02	9 ± 3	20 ± 3
BKGSL-005-01	9 ± 3	16 ± 3
BKGSL-005-02	8 ± 3	16 ± 3
BKGSL-006-01	11 ± 4	17 ± 3
BKGSL-006-03	15 ± 4	21 ± 3
BKGSL-007-01	12 ± 3	20 ± 3
BKGSL-007-04	6 ± 3	19 ± 3
BKGSL-008-01	11 ± 3	21 ± 4
BKGSL-008-03	13 ± 4	21 ± 4
BKGSL-009-03	12 ± 4	24 ± 4
BKGSL-010-01	9 ± 3	22 ± 4
BKGSL-010-03	12 ± 4	24 ± 4
BKGSL-011-01	12 ± 3	21 ± 3
BKGSL-011-08	8 ± 3	18 ± 3
BKGSL-012-01	11 ± 3	23 ± 4
BKGSL-012-04	11 ± 3	20 ± 3

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

TABLE 3-21
GROSS ALPHA AND GROSS BETA RESULTS FOR GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Concentration (pCi/L)[b]					
	Gross Alpha			Gross Beta		
Sample ID [a]	Jul-07	Nov-07	Weighted Average	Jul-07	Nov-07	Weighted Average
A02MW06-F	5	9.6	7 ± 3	0.5	5.9	2 ± 2
A02MW06-U	3.9	5.6	5 ± 2	4.2	3.7	3.9 ± 2.0
A02MW08-F	3	2.4	3 ± 3	6.6	6.8	7 ± 3
A02MW08-U	2.1	3.5	2.1 ± 2.0	5.6	5.7	4 ± 2
A02MW09-F	9.8	9.2	9 ± 2	7.3	4	5.6 ± 1.7
A02MW09-U	14.9	10.2	13 ± 3	5.6	3.5	4.4 ± 1.5
A02MW11-F	2.5	13	5 ± 3	0.4	4.8	2 ± 2
A02MW11-U	4.9	17	9 ± 4	3.4	5	4 ± 2
A02MW1-F	1.2	4.1	4 ± 3	3.3	4.3	2 ± 3
A02MW1-U	1	6.9	4 ± 3	-0.03	2.1	1 ± 3
A02MW2-F	16	12	14 ± 3	7.2	4.7	5.8 ± 1.6
A02MW2-U	12.8	12.2	13 ± 3	6.9	6.9	6.9 ± 1.6
A02MW3-F	4.5	4.7	5 ± 2	1.9	4.4	3.2 ± 1.9
A02MW3-U	3.4	3.1	3 ± 2	3.4	2.7	2.9 ± 1.7
A02MW4-F	41.1	38.7	42 ± 4	10.5	8.6	8.1 ± 1.4
A02MW4-U	39.2	34.4	35 ± 4	9	8.2	7.1 ± 1.3
A02MW5-F	7.6	3.3	4 ± 2	3.3	5	4.1 ± 1.7
A02MW5-U	3.8	7.3	5 ± 2	2.3	7	4.0 ± 1.7
A03MW13D-F	50	33.1	39 ± 6	18.5	17.6	18 ± 3
A03MW13D-U	49	35.3	41 ± 6	13.3	13.7	14 ± 3
A03MW14-F	2.9	4.8	4 ± 3	10.2	14.4	12 ± 3
A03MW14-U	3.9	6	5 ± 3	14.2	11.9	13 ± 3
A03MW15-F	0.5	11.4	1.7 ± 1.5	8.5	13.9	9.5 ± 1.7
A03MW15-U	1	14.5	2.0 ± 1.4	9.3	12.4	9.9 ± 1.7
A03MW16-F	10	14.2	13 ± 4	3.1	8.8	5 ± 2
A03MW16-U	14.5	24.1	19 ± 5	3.5	7.3	5 ± 2
A03MW17-F	5	3.6	4 ± 3	3.9	0.4	3 ± 3
A03MW17-U	7.5	2.6	4 ± 4	-0.2	4.1	1 ± 3
A03MW606D-RF	--	10.6	11 ± 7	--	9.6	10 ± 4
A03MW606D-RU	--	5.2	5 ± 6	--	9.9	10 ± 4
A03MW607D-F	1.7	3.1	2 ± 2	6.9	10	9 ± 4
A03MW607D-U	2	1.8	2 ± 3	8	10.3	9 ± 3
A04AMW020-F	5.8	9.9	8 ± 2	6.2	4.2	5.3 ± 1.9
A04AMW020-U	5.9	9.6	9 ± 3	1	2.2	1.7 ± 1.2
A04AMW21-F	8.6	10.1	6 ± 3	-2	8.2	2.3 ± 2.0
A04AMW21-U	5.5	4.2	5 ± 3	0.5	5.6	2.1 ± 1.9
A04AMW22-F	49.7	6.6	12 ± 3	15.1	6.5	10 ± 2
A04AMW22-U	49.6	3.6	8 ± 3	14.4	2.8	6.2 ± 1.7
A04AMW23-F	6.9	10.3	9 ± 2	2.2	3	2.5 ± 1.4
A04AMW23-U	6.3	12.5	9 ± 3	3.1	2.9	3.0 ± 1.2
A04AMW601D-F	15	13.3	14 ± 4	3	8.7	4 ± 3
A04AMW601D-U	16	20.2	17 ± 6	1.6	6.2	3 ± 2
A04AMW602D-F	76	54	61 ± 9	22.1	14.6	17 ± 4
A04AMW602D-U	75	32	41 ± 8	18.1	19	19 ± 4
A04AMW603D-F	11.4	12	12 ± 4	6	1.4	3 ± 3
A04AMW603D-U	8.5	10.8	10 ± 4	7.7	5.4	6 ± 3
A04BMW18-F	86	66	73 ± 10	15.6	18.4	17 ± 3
A04BMW18-U	85	73	78 ± 10	20.4	19.3	20 ± 3
A04BMW19-F	2.6	8	4 ± 2	3.5	4	4 ± 2
A04BMW19-U	3.7	11.6	6 ± 3	2.5	3	3 ± 2
A04BMW26-F	126	170	150 ± 19	34	29.7	31 ± 6
A04BMW26-U	123	133	129 ± 17	34	32.2	33 ± 6
A04BMW605D-F	122	128	125 ± 13	42.1	37.6	40 ± 5
A04BMW605D-U	131	129	130 ± 13	32.4	32.8	33 ± 4
A04DMW24-F	1.1	6.7	2.3 ± 1.5	1.7	9.3	3.1 ± 1.2
A04DMW24-U	-0.3	5.7	0.7 ± 1.1	1.2	5.2	2.2 ± 1.1

TABLE 3-21
GROSS ALPHA AND GROSS BETA RESULTS FOR GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Concentration (pCi/L)[b]					
	Gross Alpha			Gross Beta		
Sample ID [a]	Jul-07	Nov-07	Weighted Average	Jul-07	Nov-07	Weighted Average
A04DMW604D-F	41	63	56 ± 7	8.6	25.6	16 ± 3
A04DMW604D-U	50	72	58 ± 9	11.2	22.6	15 ± 3
A05BMW600D-F	28	47	35 ± 23	7	38	18 ± 25
A05BMW600D-U	3	44	12 ± 22	-1	10	5 ± 19

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] The EPA drinking water MCL for gross alpha particle concentration (including ^{226}Ra but excluding radon and uranium) is 15 pCi/L (40 CFR 141.66). The EPA drinking water screening level for gross beta particle concentration (minus the naturally occurring potassium-40 beta particle concentration) is 50 pCi/L (40 CFR 141.66).

F = filtered sample
U = unfiltered sample
pCi/L = picocuries per liter
-- = No sample collected.
Aug-07 = July/August 2007 sampling event
Nov-07 = November 2007 sampling event

TABLE 3-22
SUMMARY OF TOTAL SUSPENDED SOLIDS RESULTS FOR GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION
FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Well	TSS Round 1 Groundwater Sampling		TSS Round 2 Groundwater Sampling	
	July-August 2007		November 2007	
MW-1	20	mg/L	22	mg/L
MW-2	6	mg/L	4	mg/L
MW-3	18	mg/L	14	mg/L
MW-4	10	mg/L	1	mg/L
MW-5	20	mg/L	10	mg/L
MW-06	10	mg/L	16	mg/L
MW-08	2	mg/L	20	mg/L
MW-09	18	mg/L	14	mg/L
MW-11	4	mg/L	14	mg/L
MW-13D	18	mg/L	16	mg/L
MW-14	2	mg/L	10	mg/L
MW-15	26	mg/L	42	mg/L
MW-16	20	mg/L	18	mg/L
MW-17	8	mg/L	12	mg/L
MW-18	1	mg/L	6	mg/L
MW-19	1	mg/L	8	mg/L
MW-20	14	mg/L	20	mg/L
MW-21	1	mg/L	28	mg/L
MW-22	6	mg/L	10	mg/L
MW-23	1	mg/L	4	mg/L
MW-24	8	mg/L	6	mg/L
MW-26	40	mg/L	16	mg/L
MW-601D	1	mg/L	20	mg/L
MW-602D	6	mg/L	16	mg/L
MW-603D	8	mg/L	18	mg/L
MW-604D	1	mg/L	12	mg/L
MW-605D	1	mg/L	8	mg/L
MW-606DR	NM[a]	mg/L	20	mg/L
MW-607D	1	mg/L	16	mg/L
MW-600S	NM[b]	mg/L	NM[b]	mg/L
MW-600D	62	mg/L	188	mg/L

Notes:
[a] Well installed 10/8/2007
[b] Dry well; no sample collected
TSS - Total Suspended Solids
All TSS taken from unfiltered groundwater sample
NM = not measured

TABLE 3-23
SUMMARY OF SURFACE AND SUBSURFACE SOIL SAMPLE IDENTIFICATION, and ON-SITE and OFF-SITE ANALYSIS COMPLETED FOR BACKGROUND SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Soil Boring Location	Soil Sample ID	Date Sampled	Interval Depth (ft BGS)	On-site Analysis[a]	Off-site Analysis[b]
BKGSL-001	BKGSL-001-01	8/1/2007	0-0.5	X	X
BKGSL-001	BKGSL-001-02	8/1/2007	0.5-1	X	X
BKGSL-001	BKGSL-001-03	8/1/2007	1-1.5	X	
BKGSL-001	BKGSL-001-04	8/1/2007	1.5-2	X	
BKGSL-001	BKGSL-001-05	8/1/2007	2-2.5	X	
BKGSL-001	BKGSL-001-06	8/1/2007	2.5-3	X	
BKGSL-001	BKGSL-001-07	8/1/2007	3-3.5	X	
BKGSL-001	BKGSL-001-08	8/1/2007	3.5-4	X	
BKGSL-001	BKGSL-001-09	8/1/2007	4-4.5	X	
BKGSL-001	BKGSL-001-10	8/1/2007	4.5-5	X	
BKGSL-002	BKGSL-002-01	8/1/2007	0-0.5	X	X
BKGSL-002	BKGSL-002-02	8/1/2007	0.5-1	X	
BKGSL-002	BKGSL-002-03	8/1/2007	1-1.5	X	
BKGSL-002	BKGSL-002-04	8/1/2007	1.5-2	X	X
BKGSL-002	BKGSL-002-05	8/1/2007	2-2.5	X	
BKGSL-002	BKGSL-002-06	8/1/2007	2.5-3	X	
BKGSL-002	BKGSL-002-07	8/1/2007	3-3.5	X	
BKGSL-003	BKGSL-003-01	8/1/2007	0-0.5	X	X
BKGSL-003	BKGSL-003-02	8/1/2007	0.5-1	X	
BKGSL-003	BKGSL-003-03	8/1/2007	1-1.5	X	
BKGSL-003	BKGSL-003-04	8/1/2007	1.5-2	X	
BKGSL-003	BKGSL-003-05	8/1/2007	2-2.5	X	
BKGSL-003	BKGSL-003-06	8/1/2007	2.5-3	X	
BKGSL-003	BKGSL-003-07	8/1/2007	3-3.5	X	
BKGSL-003	BKGSL-003-08	8/1/2007	3.5-4	X	
BKGSL-003	BKGSL-003-09	8/1/2007	4-4.5	X	X
BKGSL-003	BKGSL-003-10	8/1/2007	4.5-5	X	
BKGSL-003	BKGSL-003-11	8/1/2007	5-5.5	X	
BKGSL-003	BKGSL-003-12	8/1/2007	5.5-6	X	
BKGSL-004	BKGSL-004-01	8/2/2007	0-0.5	X	X
BKGSL-004	BKGSL-004-02	8/2/2007	0.5-1	X	X
BKGSL-004	BKGSL-004-03	8/2/2007	1-1.5	X	
BKGSL-004	BKGSL-004-04	8/2/2007	1.5-2	X	
BKGSL-004	BKGSL-004-05	8/2/2007	2-2.5	X	
BKGSL-004	BKGSL-004-06	8/2/2007	2.5-3	X	
BKGSL-005	BKGSL-005-01	8/2/2007	0-0.5	X	X
BKGSL-005	BKGSL-005-02	8/2/2007	0.5-1	X	X
BKGSL-005	BKGSL-005-03	8/2/2007	1-1.5	X	
BKGSL-005	BKGSL-005-04	8/2/2007	1.5-2	X	
BKGSL-005	BKGSL-005-05	8/2/2007	2-2.5	X	
BKGSL-005	BKGSL-005-06	8/2/2007	2.5-3	X	
BKGSL-005	BKGSL-005-07	8/2/2007	3-3.5	X	
BKGSL-005	BKGSL-005-08	8/2/2007	3.5-4	X	
BKGSL-005	BKGSL-005-09	8/2/2007	4-4.5	X	
BKGSL-005	BKGSL-005-10	8/2/2007	4.5-5	X	
BKGSL-006	BKGSL-006-01	8/2/2007	0-0.5	X	X
BKGSL-006	BKGSL-006-02	8/2/2007	0.5-1	X	
BKGSL-006	BKGSL-006-03	8/2/2007	1-1.5	X	X
BKGSL-006	BKGSL-006-04	8/2/2007	1.5-2	X	
BKGSL-006	BKGSL-006-05	8/2/2007	2-2.5	X	
BKGSL-006	BKGSL-006-06	8/2/2007	2.5-3	X	
BKGSL-006	BKGSL-006-07	8/2/2007	3-3.5	X	
BKGSL-006	BKGSL-006-08	8/2/2007	3.5-4	X	
BKGSL-006	BKGSL-006-09	8/2/2007	4-4.5	X	
BKGSL-007	BKGSL-007-01	8/2/2007	0-0.5	X	X
BKGSL-007	BKGSL-007-02	8/2/2007	0.5-1	X	
BKGSL-007	BKGSL-007-03	8/2/2007	1-1.5	X	
BKGSL-007	BKGSL-007-04	8/2/2007	1.5-2	X	X
BKGSL-007	BKGSL-007-05	8/2/2007	2-2.5	X	
BKGSL-007	BKGSL-007-06	8/2/2007	2.5-3	X	
BKGSL-008	BKGSL-008-01	8/2/2007	0-0.5	X	X
BKGSL-008	BKGSL-008-02	8/2/2007	0.5-1	X	
BKGSL-008	BKGSL-008-03	8/2/2007	1-1.5	X	X
BKGSL-008	BKGSL-008-04	8/2/2007	1.5-2	X	
BKGSL-008	BKGSL-008-05	8/2/2007	2-2.5	X	
BKGSL-008	BKGSL-008-06	8/2/2007	2.5-3	X	

TABLE 3-23
SUMMARY OF SURFACE AND SUBSURFACE SOIL SAMPLE IDENTIFICATION, and ON-SITE and OFF-SITE ANALYSIS COMPLETED FOR BACKGROUND SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Soil Boring Location	Soil Sample ID	Date Sampled	Interval Depth (ft BGS)	On-site Analysis[a]	Off-site Analysis[b]
BKGSL-008	BKGSL-008-07	8/2/2007	3-3.5	X	
BKGSL-008	BKGSL-008-08	8/2/2007	3.5-4	X	
BKGSL-008	BKGSL-008-09	8/2/2007	4-4.5	X	
BKGSL-008	BKGSL-008-10	8/2/2007	4.5-5	X	
BKGSL-008	BKGSL-008-11	8/2/2007	5-5.5	X	
BKGSL-009	BKGSL-009-01	8/2/2007	0-0.5	X	X
BKGSL-009	BKGSL-009-02	8/2/2007	0.5-1	X	
BKGSL-009	BKGSL-009-03	8/2/2007	1-1.5	X	X
BKGSL-009	BKGSL-009-04	8/2/2007	1.5-2	X	
BKGSL-009	BKGSL-009-05	8/2/2007	2-2.5	X	
BKGSL-009	BKGSL-009-06	8/2/2007	2.5-3	X	
BKGSL-009	BKGSL-009-07	8/2/2007	3-3.5	X	
BKGSL-009	BKGSL-009-08	8/2/2007	3.5-4	X	
BKGSL-009	BKGSL-009-09	8/2/2007	4-4.5	X	
BKGSL-009	BKGSL-009-10	8/2/2007	4.5-5	X	
BKGSL-010	BKGSL-010-01	8/6/2007	0-0.5	X	X
BKGSL-010	BKGSL-010-02	8/6/2007	0.5-1	X	
BKGSL-010	BKGSL-010-03	8/6/2007	1-1.5	X	X
BKGSL-010	BKGSL-010-04	8/6/2007	1.5-2	X	
BKGSL-010	BKGSL-010-05	8/6/2007	2-2.5	X	
BKGSL-010	BKGSL-010-06	8/6/2007	2.5-3	X	
BKGSL-010	BKGSL-010-07	8/6/2007	3-3.5	X	
BKGSL-010	BKGSL-010-08	8/6/2007	3.5-4	X	
BKGSL-010	BKGSL-010-09	8/6/2007	4-4.5	X	
BKGSL-010	BKGSL-010-51[c]	8/6/2007	0-0.5		X
BKGSL-011	BKGSL-011-01	8/6/2007	0-0.5	X	X
BKGSL-011	BKGSL-011-02	8/6/2007	0.5-1	X	
BKGSL-011	BKGSL-011-03	8/6/2007	1-1.5	X	
BKGSL-011	BKGSL-011-04	8/6/2007	1.5-2	X	
BKGSL-011	BKGSL-011-05	8/6/2007	2-2.5	X	
BKGSL-011	BKGSL-011-06	8/6/2007	2.5-3	X	
BKGSL-011	BKGSL-011-07	8/6/2007	3-3.5	X	
BKGSL-011	BKGSL-011-08	8/6/2007	3.5-4	X	X
BKGSL-011	BKGSL-011-09	8/6/2007	4-4.5	X	
BKGSL-011	BKGSL-011-10	8/6/2007	4.5-5	X	
BKGSL-012	BKGSL-012-01	8/6/2007	0-0.5	X	X
BKGSL-012	BKGSL-012-02	8/6/2007	0.5-1	X	
BKGSL-012	BKGSL-012-03	8/6/2007	1-1.5	X	
BKGSL-012	BKGSL-012-04	8/6/2007	1.5-2	X	X
BKGSL-012	BKGSL-012-05	8/6/2007	2-2.5	X	

Notes:

[a] On-site Gamma Spectroscopy Analysis by ARS International: Bi-212, Bi-214, PB-210, PB-212, PB-214, Ra-226, Ra-228, Th-232, U-234, U-235, U-238

[b] Off-site Analysis by TestAmerica Laboratories (formerly STL Inc.).

[c] BKGSL-010-51 is a Blind Duplicate of sample BKGSL-010-01.

ft BGS = feet below ground surface

Gamma ^{226}Ra & Hits by DOE GA-01-R Mod.: ^{228}Ac, ^{214}Bi, ^{212}Pb, ^{214}Pb, ^{40}K, ^{226}Ra, ^{228}Ra, ^{208}Tl, ^{232}Th, ^{235}U, ^{238}U

Gross A/B by GFPC SW846 9310 MOD: Gross Alpha, Gross Beta

Inductively Coupled Plasma Mass Spectrometer (6020): ^{233}U, ^{234}U, ^{235}U, ^{236}U, ^{238}U

Iso Th (Long Count) DOE A-01-R MOD: ^{238}Th, ^{230}Th, ^{232}Th

Iso U (Long Count) DOE A-01-R MOD: ^{234}U, $^{235/236}$U, ^{238}U

Moisture Percent (160.3)

^{226}Ra by EPA 903.0 MOD: ^{226}Ra

^{228}Ra by GFPC EPA 904 MOD: ^{228}Ra

TABLE 3-24
SUMMARY OF SURFACE AND SUBSURFACE SAMPLE IDENTIFICATION and OFF-SITE ANALYSIS COMPLETED FOR BACKGROUND SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]									
	Gamma Spec	Alpha Spec				GFPC		ICP/MS		
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD	Moisture, Percent (160_3)
BKGSL-001-01	X		X		X	X	X	X	X	X
BKGSL-001-02	X		X		X	X	X	X	X	X
BKGSL-002-01	X		X		X	X	X	X	X	X
BKGSL-002-04	X		X		X	X	X	X	X	X
BKGSL-003-01	X		X		X	X	X	X	X	X
BKGSL-003-09	X		X		X	X	X	X	X	X
BKGSL-004-01	X		X		X	X	X	X	X	X
BKGSL-004-02	X		X		X	X	X	X	X	X
BKGSL-005-01	X		X		X	X	X	X	X	X
BKGSL-005-02	X		X		X	X	X	X	X	X
BKGSL-006-01	X		X		X	X	X	X	X	X
BKGSL-006-03	X		X		X	X	X	X	X	X
BKGSL-007-01	X		X		X	X	X	X	X	X
BKGSL-007-04	X		X		X	X	X	X	X	X
BKGSL-008-01	X		X		X	X	X	X	X	X
BKGSL-008-03	X		X		X	X	X	X	X	X
BKGSL-009-01	X		X		X	X	X	X	-[b]	X
BKGSL-009-03	X		X		X	X	X	X	X	X
BKGSL-010-01	X		X		X	X	X	X	X	X
BKGSL-010-03	X		X		X	X	X	X	X	X
BKGSL-011-01	X		X		X	X	X	X	X	X
BKGSL-011-08	X		X		X	X	X	X	X	X
BKGSL-012-01	X		X		X	X	X	X	X	X
BKGSL-012-04	X		X		X	X	X	X	X	X
Totals:	24	0	24	0	24	24	24	24	23	24
QA/QC Duplicate Samples BKGSL-010-51	X									
Totals:	1	0	0	0	0	0	0	0	0	0

Notes:
[a] Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri
[b] Gross A/B missing for BKGSL-009-01
Alpha Spec = Alpha Spectroscopy
CT = Count
DOE = Department of Energy
EPA = Environmental Protection Agency
Gamma Spec = Gamma Spectroscopy
GFPC = Gas Flow Proportional Counting
Gross A/B = Gross Alpha/Beta
ICP/MS = Inductively Coupled Plasma Mass Spectrometry
QA/QC = Quality Assurance/Quality Control

TABLE 3-25
ONSITE LABORATORY GAMMA SPECTROSCOPY BACKGROUND RESULTS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g) [d]	
	^{232}Th	^{238}U
BKGSL-001-01	0.79 ± 0.20	1.5 ± 0.9
BKGSL-001-02	0.7 ± 0.2	1.4 ± 0.8
BKGSL-001-03	1.0 ± 0.3	1.3 ± 0.8
BKGSL-001-04	0.74 ± 0.19	0.7 ± 0.7
BKGSL-001-05	0.50 ± 0.17	0.8 ± 0.6
BKGSL-001-06	0.67 ± 0.19	1.3 ± 0.5
BKGSL-001-07	0.40 ± 0.18	1.0 ± 0.7
BKGSL-001-08	0.73 ± 0.19	0.9 ± 0.6
BKGSL-001-09	0.6 ± 0.2	1.0 ± 0.7
BKGSL-001-10	0.57 ± 0.20	0.9 ± 0.7
BKGSL-002-01	0.85 ± 0.17	1.4 ± 0.6
BKGSL-002-02	0.7 ± 0.2	1.5 ± 0.8
BKGSL-002-03	0.84 ± 0.20	0.9 ± 0.7
BKGSL-002-04	0.68 ± 0.19	1.3 ± 0.8
BKGSL-002-05	0.45 ± 0.19	0.5 ± 0.6
BKGSL-002-06	0.50 ± 0.17	0.7 ± 0.6
BKGSL-002-07	0.68 ± 0.17	0.9 ± 0.5
BKGSL-003-01	0.9 ± 0.2	**1.9 ± 0.8**
BKGSL-003-02	0.94 ± 0.18	1.3 ± 0.6
BKGSL-003-03	1.0 ± 0.2	1.2 ± 0.7
BKGSL-003-04	0.8 ± 0.2	0.5 ± 0.5
BKGSL-003-05	0.57 ± 0.18	0.6 ± 0.5
BKGSL-003-06	0.47 ± 0.16	0.7 ± 0.5
BKGSL-003-07	0.59 ± 0.17	0.8 ± 0.5
BKGSL-003-08	0.62 ± 0.19	0.8 ± 0.5
BKGSL-003-09	0.94 ± 0.20	1.3 ± 0.7
BKGSL-003-10	0.6 ± 0.2	1.0 ± 0.6
BKGSL-003-11	0.6 ± 0.2	1.0 ± 0.6
BKGSL-003-12	0.41 ± 0.16	0.8 ± 0.6
BKGSL-004-01	1.2 ± 0.2	0.9 ± 0.8
BKGSL-004-02	0.71 ± 0.17	1.6 ± 1.0
BKGSL-004-03	0.7 ± 0.2	0.9 ± 0.6
BKGSL-004-04	0.65 ± 0.17	1.0 ± 0.6
BKGSL-004-05	0.6 ± 0.2	0.6 ± 0.7
BKGSL-004-06	0.46 ± 0.17	0.7 ± 0.6
BKGSL-005-01	0.66 ± 0.18	1.4 ± 0.6
BKGSL-005-02	0.86 ± 0.18	1.5 ± 0.6
BKGSL-005-03	0.57 ± 0.20	0.8 ± 0.6
BKGSL-005-04	0.54 ± 0.15	0.4 ± 0.6
BKGSL-005-05	0.48 ± 0.17	0.9 ± 0.7
BKGSL-005-06	0.44 ± 0.15	0.7 ± 0.6
BKGSL-005-07	0.52 ± 0.16	1.0 ± 0.6
BKGSL-005-08	0.61 ± 0.16	0.7 ± 0.6
BKGSL-005-09	0.36 ± 0.18	0.9 ± 0.5
BKGSL-005-10	0.49 ± 0.17	0.6 ± 0.4
BKGSL-006-01	1.05 ± 0.19	0.9 ± 0.8
BKGSL-006-02	1.0 ± 0.2	**1.9 ± 0.8**
BKGSL-006-03	1.1 ± 0.2	1.5 ± 0.7
BKGSL-006-04	0.71 ± 0.16	0.7 ± 0.6
BKGSL-006-05	0.54 ± 0.14	0.6 ± 0.4
BKGSL-006-06	0.39 ± 0.18	1.0 ± 0.7
BKGSL-006-07	0.57 ± 0.17	0.6 ± 0.6
BKGSL-006-08	0.47 ± 0.17	0.4 ± 0.3
BKGSL-006-09	0.42 ± 0.15	0.7 ± 0.5
BKGSL-007-01	1.0 ± 0.2	1.0 ± 0.5
BKGSL-007-02	1.3 ± 0.2	1.3 ± 0.6
BKGSL-007-03	0.9 ± 0.2	0.8 ± 0.8
BKGSL-007-04	0.85 ± 0.17	1.6 ± 0.3
BKGSL-007-05	0.7 ± 0.2	1.0 ± 0.8
BKGSL-007-06	0.55 ± 0.16	0.9 ± 0.5
BKGSL-008-01	1.06 ± 0.18	0.9 ± 0.6
BKGSL-008-02	0.50 ± 0.16	0.6 ± 0.5
BKGSL-008-03	0.83 ± 0.20	1.8 ± 0.8
BKGSL-008-04	0.6 ± 0.2	0.9 ± 0.7
BKGSL-008-05	0.44 ± 0.18	0.7 ± 0.5
BKGSL-008-06	0.46 ± 0.15	0.7 ± 0.5
BKGSL-008-07	1.1 ± 0.2	1.4 ± 0.6
BKGSL-008-08	0.54 ± 0.18	0.7 ± 0.4
BKGSL-008-09	0.39 ± 0.18	1.0 ± 0.7
BKGSL-008-10	0.61 ± 0.18	0.7 ± 0.5
BKGSL-008-11	0.69 ± 0.20	0.6 ± 0.6
BKGSL-009-01	0.9 ± 0.4	1.5 ± 0.9
BKGSL-009-02	0.9 ± 0.3	1.2 ± 0.7
BKGSL-009-03	0.8 ± 0.2	1.7 ± 0.8
BKGSL-009-04	0.46 ± 0.19	0.9 ± 0.7
BKGSL-009-05	0.36 ± 0.17	0.7 ± 0.6
BKGSL-009-06	0.42 ± 0.14	0.3 ± 0.4
BKGSL-009-07	0.46 ± 0.14	0.7 ± 0.6
BKGSL-009-08	0.48 ± 0.17	0.9 ± 0.7
BKGSL-009-09	0.61 ± 0.18	**0.18 ± 0.16**
BKGSL-009-10	0.66 ± 0.20	1.0 ± 0.7
BKGSL-010-01	0.8 ± 0.2	0.8 ± 0.7
BKGSL-010-02	0.99 ± 0.18	1.1 ± 0.7
BKGSL-010-03	1.4 ± 0.3	1.2 ± 0.6
BKGSL-010-04	0.86 ± 0.16	0.8 ± 0.4
BKGSL-010-05	0.57 ± 0.16	0.5 ± 0.6
BKGSL-010-06	0.73 ± 0.16	0.7 ± 0.5
BKGSL-010-07	0.56 ± 0.19	0.7 ± 0.5
BKGSL-010-08	0.53 ± 0.13	0.6 ± 0.5
BKGSL-010-09	0.54 ± 0.15	0.9 ± 0.5
BKGSL-011-01	0.6 ± 0.2	1.6 ± 0.7
BKGSL-011-02	1.1 ± 0.2	0.9 ± 0.6
BKGSL-011-03	0.8 ± 0.2	1.2 ± 0.6
BKGSL-011-04	0.6 ± 0.2	1.7 ± 0.7
BKGSL-011-05	0.69 ± 0.20	1.0 ± 0.6
BKGSL-011-06	0.50 ± 0.16	0.7 ± 0.9
BKGSL-011-07	**0.33 ± 0.16**	0.7 ± 0.5
BKGSL-011-08	1.0 ± 0.2	1.7 ± 1.0
BKGSL-011-09	0.46 ± 0.20	1.2 ± 0.6
BKGSL-011-10	0.44 ± 0.16	0.7 ± 0.5
BKGSL-012-01	0.74 ± 0.17	1.2 ± 0.7
BKGSL-012-02	0.8 ± 0.2	1.4 ± 0.7
BKGSL-012-03	**1.4 ± 0.2**	1.1 ± 0.6
BKGSL-012-04	0.7 ± 0.2	1.4 ± 0.8
BKGSL-012-05	0.54 ± 0.15	0.8 ± 0.5
Surface weighted average [b]	0.87 ± 0.06	1.21 ± 0.20
Subsurface weighted avg. [c]	0.621 ± 0.019	0.79 ± 0.06
All weighted average [d]	0.644 ± 0.018	0.82 ± 0.05

Notes:
[a] Weighted averaging (see Section 4.1.1) not applied to individual sample points; no laboratory duplicate results or field duplicate results associated with this data set.
[b] Surface samples have suffix "-01."
[c] Subsurface samples have suffix other than "-01."
[d] Minimum and maximum values shown in bold font.
pCi/g – picocurie per gram

TABLE 3-26
OFFSITE LABORATORY GAMMA SPECTROSCOPY BACKGROUND RESULTS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g) [e]				
	^{226}Ra	^{228}Ra	^{232}Th	^{235}U	^{238}U [b]
BKGSL-001-01	0.76 ± 0.14	0.66 ± 0.15	0.66 ± 0.15	0.1 ± 0.2	*2.2 ± 0.6*
BKGSL-001-02	0.66 ± 0.18	0.9 ± 0.2	0.9 ± 0.2	0.2 ± 0.3	*2.7 ± 1.0*
BKGSL-002-01	0.9 ± 0.2	0.8 ± 0.3	0.8 ± 0.3	0.1 ± 0.4	*0.7 ± 1.3*
BKGSL-002-04	1.1 ± 0.2	0.7 ± 0.2	0.7 ± 0.2	0.1 ± 0.3	*0.1 ± 1.2*
BKGSL-003-01	1.1 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	0.1 ± 0.4	*0.9 ± 0.7*
BKGSL-003-09	0.67 ± 0.18	0.7 ± 0.2	0.7 ± 0.2	**0.0 ± 0.3**	*0.9 ± 0.5*
BKGSL-004-01	0.9 ± 0.2	0.7 ± 0.3	0.7 ± 0.3	0.1 ± 0.4	*1 ± 2*
BKGSL-004-02	0.9 ± 0.2	1.0 ± 0.3	1.0 ± 0.3	0.2 ± 0.3	*0.9 ± 1.2*
BKGSL-005-01	0.9 ± 0.2	0.7 ± 0.3	0.7 ± 0.3	0.0 ± 1.6	*1.6 ± 0.9*
BKGSL-005-02	0.7 ± 0.2	0.8 ± 0.3	0.8 ± 0.3	**0.0 ± 0.3**	*1.2 ± 1.1*
BKGSL-006-01	1.10 ± 0.20	0.8 ± 0.3	0.8 ± 0.3	-0.1 ± 1.1	*0.7 ± 1.1*
BKGSL-006-03	1.2 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	0.2 ± 0.4	*1.1 ± 1.4*
BKGSL-007-01	0.67 ± 0.20	0.8 ± 0.3	0.8 ± 0.3	0.0 ± 1.3	*0 ± 3*
BKGSL-007-04	**0.51 ± 0.14**	**0.6 ± 0.2**	**0.6 ± 0.2**	0.1 ± 0.3	*0.3 ± 0.9*
BKGSL-008-01	0.8 ± 0.2	1.0 ± 0.4	1.0 ± 0.4	0 ± 12	*3.0 ± 1.4*
BKGSL-008-03	0.8 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	0.1 ± 0.4	*2.4 ± 1.0*
BKGSL-009-01	1.2 ± 0.3	0.7 ± 0.3	0.7 ± 0.3	0.1 ± 0.3	*1.4 ± 1.0*
BKGSL-009-03	0.8 ± 0.2	**1.1 ± 0.3**	**1.1 ± 0.3**	0.2 ± 0.4	*2.4 ± 1.3*
BKGSL-010-01	0.84 ± 0.15	0.9 ± 0.2	0.9 ± 0.2	**0.2 ± 0.2**	*1.7 ± 0.7*
BKGSL-010-03	0.7 ± 0.2	0.8 ± 0.3	0.8 ± 0.3	-0.1 ± 0.6	*2.6 ± 1.0*
BKGSL-011-01	**1.37 ± 0.19**	1.0 ± 0.2	1.0 ± 0.2	0.1 ± 0.4	*2.4 ± 1.0*
BKGSL-011-08	0.56 ± 0.19	0.7 ± 0.3	0.7 ± 0.3	0.1 ± 0.3	*1 ± 2*
BKGSL-012-01	0.54 ± 0.19	0.7 ± 0.2	0.7 ± 0.2	0.0 ± 1.0	*0.3 ± 1.3*
BKGSL-012-04	1.1 ± 0.3	0.8 ± 0.3	0.8 ± 0.3	-0.2 ± 0.6	*0.4 ± 1.3*
Surface weighted average [c]	0.89 ± 0.06	0.78 ± 0.07	0.78 ± 0.07	0.12 ± 0.11	*1.6 ± 0.3*
Subsurface weighted average [d]	0.75 ± 0.06	0.79 ± 0.07	0.79 ± 0..07	0.09 ± 0.10	*1.3 ± 0.3*
All weighted average	0.82 ± 0.04	0.79 ± 0.05	0.79 ± 0.05	0.11 ± 0.07	*1.44 ± 0.20*

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging (see Section 4.1.1).
[b] Gamma spectroscopy concentrations for ^{238}U from the offsite laboratory are not used in this report because of concerns about their accuracy. They are shown in italics for information purposes only.
[c] Surface samples have suffix "-01."
[d] Subsurface samples have suffix other than "-01."
[e] Minimum and maximum value for each COPC shown in bold.
pCi/g – picocurie per gram

TABLE 3-27
OFFSITE LABORATORY ALPHA SPECTROSCOPY BACKGROUND RESULTS
FOR U AND TH COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration, long counts (pCi/g) [d]					
	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
BKGSL-001-01	0.7 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	0.68 ± 0.09	0.024 ± 0.016	0.71 ± 0.10
BKGSL-001-02	0.9 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	0.66 ± 0.14	0.02 ± 0.02	0.61 ± 0.13
BKGSL-002-01	**1.1 ± 0.2**	**1.2 ± 0.2**	0.88 ± 0.20	0.89 ± 0.17	0.03 ± 0.02	0.75 ± 0.15
BKGSL-002-04	0.99 ± 0.20	0.91 ± 0.19	0.83 ± 0.17	0.58 ± 0.12	**0.009 ± 0.015**	0.71 ± 0.14
BKGSL-003-01	0.84 ± 0.14	1.05 ± 0.16	0.87 ± 0.14	0.80 ± 0.15	0.06 ± 0.04	0.91 ± 0.17
BKGSL-003-09	0.8 ± 0.2	0.8 ± 0.2	0.61 ± 0.19	0.52 ± 0.11	0.03 ± 0.03	0.56 ± 0.12
BKGSL-004-01	0.89 ± 0.19	0.84 ± 0.18	0.89 ± 0.19	0.77 ± 0.15	0.04 ± 0.03	0.84 ± 0.16
BKGSL-004-02	0.9 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	0.73 ± 0.15	0.05 ± 0.04	0.77 ± 0.15
BKGSL-005-01	0.69 ± 0.15	0.68 ± 0.15	**0.59 ± 0.13**	0.70 ± 0.14	0.06 ± 0.04	0.67 ± 0.13
BKGSL-005-02	0.91 ± 0.18	0.85 ± 0.17	0.76 ± 0.16	0.65 ± 0.13	0.013 ± 0.017	0.63 ± 0.13
BKGSL-006-01	0.81 ± 0.19	0.9 ± 0.2	0.71 ± 0.18	0.74 ± 0.15	0.02 ± 0.02	0.79 ± 0.15
BKGSL-006-03	**1.1 ± 0.2**	1.1 ± 0.2	1.0 ± 0.2	0.82 ± 0.16	0.04 ± 0.03	0.81 ± 0.16
BKGSL-007-01	0.65 ± 0.16	0.82 ± 0.19	0.79 ± 0.18	0.66 ± 0.13	0.03 ± 0.03	0.77 ± 0.15
BKGSL-007-04	0.70 ± 0.14	0.75 ± 0.15	0.76 ± 0.15	0.49 ± 0.11	0.022 ± 0.021	0.53 ± 0.11
BKGSL-008-01	0.9 ± 0.2	0.81 ± 0.20	0.9 ± 0.2	0.78 ± 0.15	0.013 ± 0.017	0.69 ± 0.14
BKGSL-008-03	0.82 ± 0.20	1.1 ± 0.2	0.9 ± 0.2	0.67 ± 0.15	0.02 ± 0.02	0.56 ± 0.13
BKGSL-009-01	1.0 ± 0.2	1.1 ± 0.2	0.87 ± 0.20	0.79 ± 0.16	**0.07 ± 0.04**	**1.06 ± 0.20**
BKGSL-009-03	1.0 ± 0.2	0.8 ± 0.2	0.9 ± 0.2	0.77 ± 0.16	0.06 ± 0.04	0.77 ± 0.16
BKGSL-010-01	1.0 ± 0.2	1.0 ± 0.2	0.95 ± 0.20	**0.93 ± 0.18**	0.03 ± 0.03	0.86 ± 0.16
BKGSL-010-03	**1.1 ± 0.2**	1.1 ± 0.2	0.88 ± 0.19	0.64 ± 0.13	0.04 ± 0.03	0.73 ± 0.14
BKGSL-011-01	1.07 ± 0.18	0.97 ± 0.17	1.02 ± 0.17	0.82 ± 0.11	0.05 ± 0.02	0.84 ± 0.11
BKGSL-011-08	**0.56 ± 0.15**	**0.67 ± 0.16**	0.59 ± 0.15	**0.44 ± 0.10**	0.016 ± 0.019	**0.46 ± 0.10**
BKGSL-012-01	0.81 ± 0.17	0.72 ± 0.16	0.65 ± 0.15	0.75 ± 0.15	0.02 ± 0.02	0.91 ± 0.17
BKGSL-012-04	1.1 ± 0.3	1.0 ± 0.2	**1.1 ± 0.2**	0.69 ± 0.13	0.04 ± 0.03	0.76 ± 0.14
Surface weighted average [b]	0.84 ± 0.05	0.88 ± 0.05	0.80 ± 0.05	0.76 ± 0.04	0.030 ± 0.007	0.79 ± 0.04
Subsurface weighted average [c]	0.85 ± 0.06	0.87 ± 0.06	0.81 ± 0.05	0.61 ± 0.04	0.022 ± 0.007	0.63 ± 0.04
All weighted average	0.85 ± 0.04	0.88 ± 0.04	0.80 ± 0.04	0.68 ± 0.03	0.026 ± 0.005	0.70 ± 0.03

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging (see Section 4.1.1).
[b] Surface samples have suffix "-01."
[c] Subsurface samples have suffix other than "-01."
[d] Minimum and maximum value for each COPC shown in bold.
pCi/g – picocurie per gram

TABLE 3-28
OFFSITE LABORATORY GAS FLOW PROPORTIONAL COUNTER (GFPC)
BACKGROUND RESULTS FOR RADIUM COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g) [d]	
	^{226}Ra	^{228}Ra
BKGSL-001-01	1.03 ± 0.19	1.0 ± 0.3
BKGSL-001-02	0.9 ± 0.3	0.7 ± 0.4
BKGSL-002-01	**1.4 ± 0.3**	0.8 ± 0.3
BKGSL-002-04	1.0 ± 0.2	0.8 ± 0.3
BKGSL-003-01	1.2 ± 0.3	0.5 ± 0.3
BKGSL-003-09	**0.56 ± 0.20**	0.8 ± 0.3
BKGSL-004-01	1.1 ± 0.3	0.7 ± 0.4
BKGSL-004-02	1.2 ± 0.3	0.6 ± 0.3
BKGSL-005-01	1.1 ± 0.3	0.5 ± 0.3
BKGSL-005-02	0.7 ± 0.2	0.9 ± 0.4
BKGSL-006-01	1.1 ± 0.3	0.4 ± 0.3
BKGSL-006-03	1.2 ± 0.3	0.6 ± 0.3
BKGSL-007-01	0.9 ± 0.3	0.7 ± 0.3
BKGSL-007-04	1.0 ± 0.3	**0.4 ± 0.2**
BKGSL-008-01	1.1 ± 0.3	0.9 ± 0.5
BKGSL-008-03	1.0 ± 0.2	1.1 ± 0.5
BKGSL-009-01	1.0 ± 0.2	**1.3 ± 0.5**
BKGSL-009-03	1.2 ± 0.3	1.2 ± 0.5
BKGSL-010-01	1.0 ± 0.2	1.1 ± 0.4
BKGSL-010-03	1.1 ± 0.3	1.0 ± 0.5
BKGSL-011-01	1.36 ± 0.20	0.8 ± 0.3
BKGSL-011-08	0.9 ± 0.2	0.7 ± 0.3
BKGSL-012-01	1.0 ± 0.2	0.7 ± 0.4
BKGSL-012-04	1.0 ± 0.2	1.1 ± 0.4
Surface weighted average [b]	1.10 ± 0.07	0.73 ± 0.10
Subsurface weighted average [c]	0.94 ± 0.07	0.71 ± 0.10
All weighted average	1.02 ± 0.05	0.72 ± 0.07

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging (see Section 4.1.1).
[b] Surface samples have suffix "-01."
[c] Subsurface samples have suffix other than "-01."
[d] Minimum and maximum value for each COPC shown in bold.
pCi/g – picocurie per gram

Table 3-29
BACKGROUND URANIUM ISOTOPE CONCENTRATIONS DERIVED FROM ICP-MS RESULTS FOR ^{238}U
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration in soil [d]					
	^{238}U [d]		^{234}U [a,d]		^{235}U [a,d]	
	(µg/g)	(pCi/g)	(µg/g)	(pCi/g)	(µg/g)	(pCi/g)
BKGSL-001-01	0.88	0.30	4.9×10^{-5}	0.30	6.4×10^{-3}	0.014
BKGSL-001-02	0.63	0.21	3.5×10^{-5}	0.22	4.6×10^{-3}	0.010
BKGSL-002-01	0.95	0.32	5.3×10^{-5}	0.33	6.9×10^{-3}	0.015
BKGSL-002-04	0.46	0.15	2.5×10^{-5}	0.16	3.3×10^{-3}	0.007
BKGSL-003-01	**0.98**	0.33	5.4×10^{-5}	0.34	7.1×10^{-3}	0.015
BKGSL-003-09	0.38	0.13	2.1×10^{-5}	0.13	2.8×10^{-3}	0.006
BKGSL-004-01	1.10	0.37	**6.1×10^{-5}**	0.38	**8.0×10^{-3}**	0.017
BKGSL-004-02	0.90	0.30	5.0×10^{-5}	0.31	6.5×10^{-3}	0.014
BKGSL-005-01	0.92	0.31	5.1×10^{-5}	0.32	6.7×10^{-3}	0.014
BKGSL-005-02	0.68	0.23	3.8×10^{-5}	0.23	4.9×10^{-3}	0.011
BKGSL-006-01	0.81	0.27	4.5×10^{-5}	0.28	5.9×10^{-3}	0.013
BKGSL-006-03	0.71	0.24	3.9×10^{-5}	0.24	5.1×10^{-3}	0.011
BKGSL-007-01	0.78	0.26	4.3×10^{-5}	0.27	5.7×10^{-3}	0.012
BKGSL-007-04	0.41	0.14	2.3×10^{-5}	0.14	3.0×10^{-3}	0.006
BKGSL-008-01	0.82	0.28	4.5×10^{-5}	0.28	5.9×10^{-3}	0.013
BKGSL-008-03	0.52	0.17	2.9×10^{-5}	0.18	3.8×10^{-3}	0.008
BKGSL-009-01	0.93	0.31	5.2×10^{-5}	0.32	6.7×10^{-3}	0.015
BKGSL-009-03	0.57	0.19	3.2×10^{-5}	0.20	4.1×10^{-3}	0.009
BKGSL-010-01	0.97	0.33	5.4×10^{-5}	0.33	7.0×10^{-3}	0.015
BKGSL-010-03	0.51	0.17	2.8×10^{-5}	0.18	3.7×10^{-3}	0.008
BKGSL-011-01	0.97	0.33	5.4×10^{-5}	0.33	7.0×10^{-3}	0.015
BKGSL-011-08	**0.37**	0.12	**2.0×10^{-5}**	0.13	**2.7×10^{-3}**	0.006
BKGSL-012-01	0.91	0.31	5.0×10^{-5}	0.31	6.6×10^{-3}	0.014
BKGSL-012-04	0.64	0.22	3.5×10^{-5}	0.22	4.6×10^{-3}	0.010
Surface average [b]	0.92 ± 0.18	0.31 ± 0.06	$(5.1 \pm 1.0) \times 10^{-5}$	0.32 ± 0.06	$(6.7 \pm 1.3) \times 10^{-3}$	0.014 ± 0.003
Subsurface average [c]	0.6 ± 0.3	0.19 ± 0.11	$(3.1 \pm 1.7) \times 10^{-5}$	0.19 ± 0.11	$(4 \pm 2) \times 10^{-3}$	0.009 ± 0.005
All average	0.7 ± 0.4	0.25 ± 0.15	$(4 \pm 2) \times 10^{-5}$	0.26 ± 0.15	$(5 \pm 3) \times 10^{-3}$	0.012 ± 0.007

Notes:
[a] Concentrations for ^{234}U and ^{235}U were derived from the mass concentration for ^{238}U assuming natural relative abundance for the isotopes. The ^{234}U activity concentration should be about the same as that of ^{238}U since they are assumed to be in secular equilibrium. The small discrepancies are due to minor inconsistencies in the values for the natural abundances, half-lives, and atomic masses found in the literature and used in the calculations.
[b] Surface samples have suffix "-01."
[c] Subsurface samples have suffix other than "-01."
[d] Minimum and maximum value for each COPC shown in bold.
ICP-MS – Inductively Coupled Plasma – Mass Spectroscopy
pCi/g – picocurie per gram
µg/g – microgram per gram

TABLE 3-30
URANIUM ISOTOPIC DATA
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Parameter [a b]	^{234}U	^{235}U	^{238}U
Mass natural abundance	0.0055%	0.720%	99.2745%
Activity natural abundance	48.9%	2.2%	48.9%
Half-life (y)	2.455×10^5	7.038×10^8	4.468×10^9
Atomic mass (AMU)	234.0409456	235.0439231	238.0507826
Specific activity (pCi/g)	6.22×10^9	2.16×10^6	3.36×10^5

Notes:
[a] Source: http://atom.kaeri.re.kr/
[b] y = year; AMU = atomic mass unit; pCi/g = picocurie per gram

TABLE 3-31
BACKGROUND GROSS ALPHA AND GROSS BETA RESULTS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g) [d]	
	Gross α	Gross β
BKGSL-001-01	9 ± 2	17 ± 2
BKGSL-001-02	9 ± 3	18 ± 3
BKGSL-002-01	7 ± 3	16 ± 3
BKGSL-002-04	12 ± 4	17 ± 3
BKGSL-003-01	8 ± 3	17 ± 3
BKGSL-003-09	**6 ± 3**	**15 ± 3**
BKGSL-004-01	7 ± 3	19 ± 3
BKGSL-004-02	9 ± 3	20 ± 3
BKGSL-005-01	9 ± 3	16 ± 3
BKGSL-005-02	8 ± 3	16 ± 3
BKGSL-006-01	11 ± 4	17 ± 3
BKGSL-006-03	**15 ± 4**	21 ± 3
BKGSL-007-01	12 ± 3	20 ± 3
BKGSL-007-04	**6 ± 3**	19 ± 3
BKGSL-008-01	11 ± 3	21 ± 4
BKGSL-008-03	13 ± 4	21 ± 4
BKGSL-009-03	12 ± 4	**24 ± 4**
BKGSL-010-01	9 ± 3	22 ± 4
BKGSL-010-03	12 ± 4	**24 ± 4**
BKGSL-011-01	12 ± 3	21 ± 3
BKGSL-011-08	8 ± 3	18 ± 3
BKGSL-012-01	11 ± 3	23 ± 4
BKGSL-012-04	11 ± 3	20 ± 3
Surface weighted average [b]	9.6 ± 0.9	18.3 ± 0.9
Subsurface weighted average [c]	9.6 ± 1.0	18.8 ± 0.9
All weighted average	9.6 ± 0.7	18.5 ± 0.6

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging (see Section 4.1.1).
[b] Surface samples have suffix "-01."
[c] Subsurface samples have suffix other than "-01."
[d] Minimum and maximum value shown in bold font.
α – Alpha
β – Beta
pCi/g – picocurie per gram

TABLE 3-32
SUMMARY OF AVERAGE SOIL BACKGROUND CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Method	Concentration (pCi/g) [a]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
Onsite laboratory gamma	—	0.33 ± 0.16[b] 0.644 ± 0.018[b] 1.4 ± 0.2[b]	0.33 ± 0.16[b] 0.644 ± 0.018[b] 1.4 ± 0.2[b]	—	0.33 ± 0.16 0.644 ± 0.018 1.4 ± 0.2	0.18 ± 0.16[c] 0.82 ± 0.05[c] 1.9 ± 0.08[c]	0.18 ± 0.16[d] 0.82 ± 0.05[d] 1.9 ± 0.08[d]	0.18 ± 0.16 0.82 ± 0.05 1.9 ± 0.8
Offsite laboratory gamma	0.51 ± 0.14 0.82 ± 0.04 1.37 ± 0.19	0.6 ± 0.2 0.79 ± 0.05 1.1 ± 0.3	0.6 ± 0.2[b] 0.79 ± 0.05[b] 1.1 ± 0.3[b]	—	0.6 ± 0.2 0.79 ± 0.05 1.1 ± 0.3	—	0.0 ± 0.3 0.11 ± 0.07 0.2 ± 0.2	0 ± 3[e] 1.44 ± 0.20[e] 3.0 ± 1.4[e]
Alpha	—	0.59 ± 0.13[b] 0.80 ± 0.04[b] 1.1 ± 0.2[b]	0.56 ± 0.15 0.85 ± 0.04 1.1 ± 0.2	0.67 ± 0.16 0.88 ± 0.04 1.2 ± 0.2	0.59 ± 0.13 0.80 ± 0.04 1.1 ± 0.2	0.44 ± 0.10 0.68 ± 0.03 0.93 ± 0.18	0.009 ± 0.015 0.026 ± 0.005 0.07 ± 0.04	0.46 ± 0.10 0.70 ± 0.03 1.06 ± 0.20
GFPC	0.56 ± 0.20 1.02 ± 0.05 1.4 ± 0.3	0.4 ± 0.2 0.72 ± 0.07 1.3 ± 0.5	—	—	—	—	—	—
ICP-MS [f]	—	—	—	—	—	— (4 ± 2) x 10^{-3} µg/g —	2.7 x 10^{-3} µg/g[g] (5 ± 3) x 10^{-3} µg/g —	0.37 µg/g (0.7 ± 0.4) µg/g 0.98 µg/g

Notes:

[a] The three values shown for each method and COPC are the minimum reported concentration, the weighted average concentration, and the maximum reported concentration.

[b] ^{228}Ra and ^{228}Th concentrations derived from ^{232}Th concentration assuming secular equilibrium.

[c] ^{234}U concentration derived from ^{238}U concentration assuming secular equilibrium.

[d] ^{235}U concentration derived from ^{238}U concentration assuming natural abundance.

[e] Gamma spectroscopy ^{238}U concentrations from the offsite laboratory are not used in this report because of concerns about their accuracy. They are shown for information purposes only.

[f] Bracketed numbers are the laboratory reporting limits. Specific activity of ^{238}U is 0.336 pCi/µg (converted from value in Table 3.4.1-8), so (0.7 ± 0.4) µg/g × 0.336 pCi/µg = (0.25 ± 0.15) pCi/g.

[g] This laboratory-reported value is greater than the laboratory detection limit but less than the laboratory reporting limit.

TABLE 3-33
COPC BACKGROUND CONCENTRATIONS IN SURFACE WATER
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L) [b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A09-SW-010	0.07 ± 0.14	0.3 ± 0.4	0.3 ± 0.2	0.18 ± 0.16	0.05 ± 0.08	0.24 ± 0.15	—	0.09 ± 0.10
A09-SW-011	0.14 ± 0.16	0.4 ± 0.5	0.07 ± 0.11	0.19 ± 0.14	-0.01 ± 0.06	0.09 ± 0.11	0.02 ± 0.07	0.10 ± 0.11
A09-SW-012	0.20 ± 0.17	0.3 ± 0.5	0.17 ± 0.17	0.16 ± 0.17	-0.01 ± 0.07	0.18 ± 0.14	0.06 ± 0.10	0.11 ± 0.11
Weighted average	0.13 ± 0.09	0.3 ± 0.3	0.13 ± 0.08	0.18 ± 0.09	0.00 ± 0.04	0.15 ± 0.07	0.03 ± 0.05	0.10 ± 0.06

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging (see Section 4.1.1).
[b] Radium isotopes by gas flow proportional counting; U and Th isotopes by alpha spectroscopy (short count).
pCi/L = picocurie per liter

TABLE 3-34
COPC BACKGROUND CONCENTRATIONS IN SEDIMENTS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]											
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th		^{234}U	^{235}U		^{238}U
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Alpha	Alpha	Gamma	Alpha
A09-SD-010	—	0.9 ± 0.3	—	0.5 ± 0.3	0.8 ± 0.2	0.7 ± 0.2	0.7 ± 0.2	0.5 ± 0.3	0.76 ± 0.20	0.03 ± 0.04	0.1 ± 0.3	0.73 ± 0.19
A09-SD-011	1.00 ± 0.18	0.78 ± 0.14	0.6 ± 0.4	0.67 ± 0.16	0.7 ± 0.2	0.9 ± 0.2	0.7 ± 0.2	0.67 ± 0.16	0.67 ± 0.19	0.07 ± 0.06	0.14 ± 0.19	0.54 ± 0.16
A09-SD-012	—	1.1 ± 0.2	—	0.7 ± 0.3	1.0 ± 0.2	0.8 ± 0.3	0.8 ± 0.3	0.7 ± 0.3	0.8 ± 0.3	0.05 ± 0.08	-0.1 ± 1.0	0.7 ± 0.3
Weighted average	1.00 ± 0.18	0.89 ± 0.11	0.6 ± 0.4	0.64 ± 0.12	0.78 ± 0.15	0.79 ± 0.14	0.72 ± 0.14	0.64 ± 0.12	0.74 ± 0.12	0.04 ± 0.03	0.11 ± 0.16	0.64 ± 0.11

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging (see Section 4.1.1).
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy
pCi/g = picocurie per gram

TABLE 3-35
COPC BACKGROUND CONCENTRATIONS IN GROUNDWATER
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Radionuclide	Concentration (pCi/L)		
	Well ID MW600D [a]		Weighted Average
	August 17, 2007	November 13, 2007	
^{226}Ra	1.4 ± 0.2	1.26 ± 0.20	1.31 ± 0.14[b]
^{228}Ra	2.4 ± 0.4	2.0 ± 0.4	2.1 ± 0.3[b]
^{228}Th	0.02 ± 0.05	0.12 ± 0.10	0.04 ± 0.04
^{230}Th	0.25 ± 0.12	0.14 ± 0.09	0.18 ± 0.07
^{232}Th	0.01 ± 0.04	0.00 ± 0.04	0.00 ± 0.03
^{234}U	1.2 ± 0.3	0.81 ± 0.20	0.96 ± 0.16[c]
^{235}U	0.07 ± 0.07	0.08 ± 0.12	0.07 ± 0.06[c]
^{238}U	1.2 ± 0.3	0.67 ± 0.18	0.85 ± 0.15[c]

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] The combined ^{226}Ra/^{228}Ra concentration is (3.4 ± 0.3) pCi/L, which meets the relevant EPA drinking water radium MCL of 5 pCi/L with a level of confidence greater than 95 percent.
[c] The combined uranium mass concentration is (2.6 ± 0.4) µg/L, which meets the EPA drinking water uranium MCL of 30 µg/L with a level of confidence greater than 95 percent.
MCL = maximum contaminant level
pCi/L = picocurie per liter
µg/L = microgram per liter

TABLE 3-36
RADIONUCLIDE CONCENTRATIONS IN BACKGROUND (CLASS 3 AREAS) BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]											
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th		^{234}U	^{235}U		^{238}U
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Alpha	Alpha	Gamma	Alpha
Brick												
B05-BM-002	1.2 ± 0.3	1.0 ± 0.2	0.8 ± 0.4	1.0 ± 0.3	1.1 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	1.0 ± 0.3	0.78 ± 0.20	0.04 ± 0.05	–0.1 ± 1.2	0.80 ± 0.20
B08-BM-002	1.0 ± 0.3	1.3 ± 0.3	1.1 ± 0.5	1.5 ± 0.3	1.3 ± 0.4	1.2 ± 0.3	1.3 ± 0.4	1.5 ± 0.3	3.1 ± 0.6	0.17 ± 0.11	0.2 ± 0.4	3.4 ± 0.6
B35-BM-002	0.7 ± 0.2	0.73 ± 0.13	0.1 ± 0.4	0.66 ± 0.15	0.8 ± 0.2	1.8 ± 0.4	0.66 ± 0.15	0.66 ± 0.15	0.67 ± 0.18	0.06 ± 0.06	0.1 ± 0.2	1.0 ± 0.2
Ceramic tile												
B03-BM-007	1.4 ± 0.3	1.6 ± 0.2	0.6 ± 0.4	2.2 ± 0.3	1.5 ± 0.4	1.4 ± 0.3	1.6 ± 0.4	2.2 ± 0.3	1.3 ± 0.3	0.07 ± 0.08	0± 0.7	1.4 ± 0.3
Cinder Block												
B04&B09-BM-004	1.0 ± 0.2	0.82 ± 0.19	0.4 ± 0.4	0.5 ± 0.2	0.67 ± 0.20	1.1 ± 0.3	0.57 ± 0.18	0.5 ± 0.2	1.0 ± 0.2	0.03 ± 0.04	0.0 ± 0.4	1.0 ± 0.2
B24-BM-004	0.27 ± 0.15	0.37 ± 0.11	-1.0 ± 0.3	0.08 ± 0.13	0.21 ± 0.12	0.38 ± 0.14	0.19 ± 0.10	0.08 ± 0.13	0.30 ± 0.12	0.03 ± 0.05	0.07 ± 0.16	0.29 ± 0.12
Particle Board												
B02-BM-010	0.15 ± 0.12	0.5 ± 0.5	0.0 ± 0.3	0.2 ± 0.9	0.25 ± 0.11	0.27 ± 0.12	0.26 ± 0.11	0.2 ± 0.9	2.2 ± 0.4	0.07 ± 0.06	0.2 ± 0.6	2.6 ± 0.4
Wallboard												
B01-BM-003	0.56 ± 0.18	0.0 ± 0.3	-0.1 ± 0.4	0.00 ± 0.16	0.14 ± 0.09	0.15 ± 0.09	0.06 ± 0.05	0.00 ± 0.16	0.65 ± 0.18	0.03 ± 0.04	0.1 ± 0.5	0.74 ± 0.19
Wood												
B06-BM-006	-0.2 ± 0.2	-0.1 ± 0.9	-0.7 ± 0.8	-1 ± 18	0.07 ± 0.07	0.12 ± 0.09	0.04 ± 0.06	-1 ± 18	4.0 ± 0.7	0.21 ± 0.13	0.2 ± 1.5	4.5 ± 0.8

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy

pCi/g = picocuries per gram

TABLE 3-37
SURFACE MATERIAL FOR BORING LOCATIONS WHERE SURFACE SOIL WAS PRESENT
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Surface Condition	
Sample ID	Fill	Native
IA01-Building 2		
B02-002	X	
B02-020	X	
B02-022	X	
B02-027	X	
B02-028	X	
B02-030	X	
B02-036	X	
B02-043	X	
B02-046	X	
B02-052	X	
B02-056	X	
B02-303	X	
IA01-Building 3		
B03-001	X	
B03-010	X	
B03-014	X	
B03-016	X	
B03-017	X	
B03-020	X	
B03-024	X	
B03-025	X	
B03-026	X	
B03-027	X	
B03-028	X	
B03-029	X	
B03-030	X	
B03-031	X	
B03-033	X	
B03-037	X	
B03-301	X	
B03-305	X	
B03-306	X	
B03-307	X	
IA01-Buildings 4 & 9		
B04&09-008	X	
B04&09-015	X	
B04&09-017	X	
B04&09-018	X	
B04&09-019	X	
B04&09-026	X	
IA01-Building 6		
B06-003	X	
B06-004	X	
B06-005	X	
B06-010	X	
B06-011	X	
B06-021	X	
B06-023	X	
B06-301	X	

	Surface Condition	
Sample ID	Fill	Native
IA01-Building 8		
B08-002	X	
B08-003	X	
B08-004	X	
B08-005	X	
B08-010	X	
B08-011	X	
B08-023	X	
B08-026	X	
B08-028	X	
IA02		
A02-001	X	
A02-002	X	
A02-003	X	
A02-004	X	
A02-005	X	
A02-006	X	
A02-007	X	
A02-008	X	
A02-009	X	
A02-010	X	
A02-011	X	
A02-012	X	
A02-013	X	
A02-014	X	
A02-015	X	
A02-016	X	
A02-017	X	
A02-018	X	
A02-019	X	
A02-020	X	
A02-021	X	
A02-022	X	
A02-023	X	
A02-024	X	
A02-025	X	
A02-026	X	
A02-029	X	
A02-030	X	
A02-031	X	
A02-032	X	
A02-033	X	
A02-034	X	
A02-035	X	
A02-036	X	
A02-037	X	
A02-038	X	
A02-039	X	
A02-040	X	
A02-041	X	
A02-042	X	
A02-043	X	

	Surface Condition	
Sample ID	Fill	Native
IA03		
A03-001	X	
A03-002	X	
A03-003	X	
A03-004	X	
A03-005	X	
A03-006	X	
A03-007	X	
A03-008	X	
A03-009	X	
A03-010	X	
A03-011	X	
A03-012	X	
A03-013	X	
A03-014	X	
A03-015	X	
A03-016	X	
A03-017	X	
A03-018	X	
A03-019	X	
A03-020	X	
A03-021	X	
A03-022	X	
A03-023	X	
A03-024	X	
A03-025	X	
A03-026	X	
A03-027	X	
A03-028	X	
A03-029	X	
A03-030	X	
A03-031	X	
A03-032	X	
A03-033	X	
A03-034	X	
A03-035	X	
A03-036	X	
A03-037	X	
A03-038	X	
A03-039	X	
A03-040	X	
A03-041	X	
A03-042	X	
IA04A		
A04A-001	X	
A04A-002	X	
A04A-003	X	
A04A-004	X	
A04A-005	X	
A04A-006	X	
A04A-007	X	
A04A-008	X	

	Surface Condition	
Sample ID	Fill	Native
IA04A (CONTINUED)		
A04A-009	X	
A04A-010	X	
A04A-011	X	
A04A-012	X	
A04A-013	X	
A04A-014	X	
A04A-015	X	
A04A-016	X	
A04A-017	X	
A04A-018	X	
A04A-019	X	
A04A-020	X	
A04A-021	X	
A04A-022	X	
A04A-023	X	
A04A-024	X	
A04A-025	X	
A04A-026	X	
A04A-027	X	
A04A-028	X	
A04A-029	X	
A04A-030	X	
A04A-031	X	
A04A-032	X	
A04A-033	X	
A04A-034	X	
A04A-035	X	
A04A-036	X	
A04A-037	X	
A04A-038	X	
A04A-039	X	
A04A-040	X	
A04A-041	X	
A04A-042	X	
A04A-043	X	
A04A-044	X	
A04A-045	X	
A04A-046	X	
A04A-047	X	
A04A-048	X	
A04A-050	X	
A04A-051	X	
A04A-052	X	
A04A-053	X	
A04A-054	X	
A04A-055	X	
A04A-056	X	
A04A-057	X	
A04A-058	X	
A04A-059	X	
A04A-060	X	

TABLE 3-37
SURFACE MATERIAL FOR BORING LOCATIONS WHERE SURFACE SOIL WAS PRESENT
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Surface Condition	
Sample ID	Fill	Native
IA04A (CONTINUED)		
A04A-061	X	
A04A-062	X	
A04A-063	X	
A04A-064	X	
A04A-065	X	
A04A-066	X	
A04A-067	X	
A04A-068	X	
A04A-069	X	
A04A-070	X	
A04A-071	X	
A04A-072	X	
A04A-073	X	
A04A-074	X	
A04A-075	X	
A04A-076	X	
A04A-077	X	
A04A-078	X	
A04A-301	X	
A04A-302	X	
A04A-303	X	
A04A-304		X
A04A-305	X	
A04A-307	X	
A04A-308	X	
A04A-309	X	
A04A-310	X	
A04A-312	X	
A04A-313	X	
A04A-314	X	
A04A-316	X	
A04A-317	X	
A04A-318	X	
A04A-319	X	
A04A-320	X	
A04A-321	X	
A04A-322	X	
A04A-323	X	
IA04B		
A04B-001	X	
A04B-002	X	
A04B-004	X	
A04B-005	X	
A04B-006	X	
A04B-007	X	
A04B-008	X	
A04B-009	X	
A04B-010	X	
A04B-011	X	
A04B-012	X	
A04B-013	X	
A04B-014	X	
A04B-015	X	
A04B-016	X	
A04B-017	X	
A04B-019	X	
A04B-021	X	

	Surface Condition	
Sample ID	Fill	Native
IA04B (CONTINUED)		
A04B-022	X	
A04B-024	X	
A04B-025	X	
A04B-027	X	
A04B-028	X	
A04B-029	X	
A04B-030	X	
A04B-031	X	
A04B-032	X	
A04B-033	X	
A04B-036	X	
A04B-038	X	
A04B-039	X	
A04B-040	X	
A04B-042	X	
A04B-043	X	
A04B-301	X	
A04B-304	X	
A04B-305	X	
A04B-306	X	
A04B-308	X	
A04B-309	X	
A04B-310	X	
A04B-311	X	
A04B-312	X	
IA04C		
A04C-001	X	
A04C-002	X	
A04C-003	X	
A04C-004	X	
A04C-005	X	
A04C-006	X	
A04C-007	X	
A04C-008	X	
A04C-009	X	
A04C-010	X	
A04C-011	X	
A04C-012	X	
A04C-013	X	
A04C-014	X	
A04C-015	X	
A04C-301	X	
A04C-302	X	
A04C-303	X	
A04C-305	X	
A04C-306	X	
A04C-307	X	
A04C-308	X	
A04C-309	X	
A04C-305	X	
A04C-306	X	
A04C-307	X	
A04C-308	X	
A04C-309	X	
A04C-310	X	
A04C-311	X	
A04C-312	X	

	Surface Condition	
Sample ID	Fill	Native
IA04D		
A04C-313	X	
A04D-001	X	
A04D-002	X	
A04D-003	X	
A04D-004	X	
A04D-005	X	
A04D-007	X	
A04D-009	X	
A04D-010	X	
A04D-012	X	
A04D-013	X	
A04D-015	X	
A04D-016	X	
A04D-017	X	
A04D-018	X	
A04D-019	X	
A04D-020	X	
A04D-021	X	
A04D-022	X	
A04D-023	X	
A04D-024	X	
A04D-025	X	
A04D-026	X	
A04D-028	X	
A04D-029	X	
A04D-030	X	
A04D-031	X	
A04D-032	X	
A04D-301	X	
A04D-302	X	
A04D-303	X	
A04D-305	X	
A04D-306	X	
A04D-307	X	
A04D-308	X	
A04D-309	X	
A04D-310	X	
A04D-311	X	
A04D-312	X	
A04D-313	X	
A04D-314	X	
A04D-315	X	
A04D-317	X	
A04D-318	X	
A04D-321	X	
A04D-326	X	
IA05A		
A05A-001	X	
A05A-002	X	
A05A-003	X	
A05A-004		X
A05A-005	X	
A05A-006	X	
A05A-007	X	
A05A-008	X	
A05A-010	X	
A05A-011	X	

	Surface Condition	
Sample ID	Fill	Native
IA05A (CONTINUED)		
A05A-012	X	
A05A-013	X	
A05A-014	X	
A05A-015	X	
A05A-016	X	
A05A-017	X	
A05A-018	X	
A05A-019	X	
A05A-020	X	
A05A-021	X	
A05A-022	X	
A05A-023	X	
A05A-024	X	
A05A-025	X	
A05A-026	X	
A05A-027	X	
A05A-028	X	
A05A-029	X	
A05A-030	X	
A05A-031	X	
A05A-209 [a]	X	
A05A-301	X	
A05A-302	X	
A05A-303	X	
A05A-304	X	
A05A-305	X	
A05A-306	X	
A05A-307	X	
A05A-308	X	
IA05B		
A05B-001		X
A05B-002		X
A05B-003		X
A05B-004		X
A05B-005		X
A05B-006		X
A05B-007		X
A05B-008		X
A05B-009		X
A05B-010		X
A05B-011		X
IA10		
A10-302	X	
A10-303	X	
Background		
BKG-001		X
BKG-002		X
BKG-003		X
BKG-004		X
BKG-005		X
BKG-006		X
BKG-007		X
BKG-008		X
BKG-009		X
BKG-010		X
BKG-011		X
BKG-012		X

Note:

[a] A05A-209-01 had surface soil present. A05A-009 did not have surface soil present. All other Secondary (200s) borings have the same surface material as their associated Primary (000s) borings and are not individually listed in this table.

TABLE 3-38
SURFACE MATERIAL FOR BORING LOCATIONS WHERE SURFACE SOIL WAS NOT PRESENT
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Secondary Boring ID	Surface Material				
		Brick	Concrete	Asphalt	Metal Plate	Railroad Ballast
A02-027				X		
A02-028				X		
A04A-049	A04A-249			X		
A04A-306				X		
A04A-311				X		
A04A-315				X		
A04B-003				X		
A04B-018				X		
A04B-020				X		
A04B-023				X		
A04B-026				X		
A04B-034				X		
A04B-035				X		
A04B-037				X		
A04B-041				X		
A04B-302				X		
A04B-303				X		
A04B-307				X		
A04C-304				X		
A04D-006				X		
A04D-008				X		
A04D-011				X		
A04D-014	A04D-214			X		
A04D-027				X		
A04D-304				X		
A04D-316				X		
A04D-319				X		
A04D-320				X		
A04D-322				X		
A04D-323				X		
A04D-324				X		
A04D-325				X		
A05A-009 [a]				X		
A10-001			X			
A10-002			X			
A10-003			X			
A10-004			X			
A10-005			X			
A10-006			X			
A10-007			X			
A10-008			X			
A10-009			X			
A10-010			X			
A10-011			X			
A10-012			X			
A10-013			X			
A10-301			X			
B02-001			X			
B02-003			X			
B02-004			X			
B02-005			X			
B02-006			X			
B02-007			X			
B02-008			X			
B02-009			X			
B02-010			X			
B02-011			X			
B02-012			X			
B02-013			X			
B02-014			X			
B02-015			X			
B02-016			X			
B02-017			X			
B02-018			X			
B02-019			X			
B02-021			X			
B02-023			X			
B02-024		X				

TABLE 3-38
SURFACE MATERIAL FOR BORING LOCATIONS WHERE SURFACE SOIL WAS NOT PRESENT
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Secondary Boring ID	Surface Material				
		Brick	Concrete	Asphalt	Metal Plate	Railroad Ballast
B02-025		X				
B02-026			X			
B02-029		X				
B02-031			X			
B02-032			X			
B02-033		X				
B02-034			X			
B02-035			X			
B02-037		X				
B02-038			X			
B02-039			X			
B02-040			X			
B02-041			X			
B02-042			X			
B02-044			X			
B02-045			X			
B02-047			X			
B02-048			X			
B02-049			X			
B02-050			X			
B02-051			X			
B02-053			X			
B02-054			X			
B02-055			X			
B02-057			X			
B02-058			X			
B02-059			X			
B02-301			X			
B02-302			X			
B03-002			X			
B03-003			X			
B03-004			X			
B03-005			X			
B03-006			X			
B03-007			X			
B03-008			X			
B03-009			X			
B03-011			X			
B03-012			X			
B03-013			X			
B03-015			X			
B03-018			X			
B03-019			X			
B03-021			X			
B03-022			X			
B03-023			X			
B03-032			X			
B03-034			X			
B03-035			X			
B03-036			X			
B03-302		X				
B03-303			X			
B03-304			X			
B04&09-001			X			
B04&09-002			X			
B04&09-003		X				
B04&09-004		X				
B04&09-005			X			
B04&09-006			X			
B04&09-007		X				
B04&09-009			X			
B04&09-010			X			
B04&09-011		X				
B04&09-012			X			
B04&09-013			X			
B04&09-014		X				
B04&09-016		X				
B04&09-020			X			

TABLE 3-38
SURFACE MATERIAL FOR BORING LOCATIONS WHERE SURFACE SOIL WAS NOT PRESENT
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Secondary Boring ID	Surface Material				
		Brick	Concrete	Asphalt	Metal Plate	Railroad Ballast
B04&09-021			X			
B04&09-022		X				
B04&09-023		X				
B04&09-024		X				
B04&09-025		X				
B04&09-027			X			
B04&09-028			X			
B04&09-029		X				
B04&09-030		X				
B04&09-031			X			
B04&09-032			X			
B04&09-033			X			
B04&09-034		X				
B04&09-035			X			
B04&09-036		X				
B04&09-037			X			
B04&09-038			X			
B04&09-039			X			
B04&09-040			X			
B04&09-041			X			
B04&09-301			X			
B04&09-302			X			
B04&09-303			X			
B04&09-304		X				
B04&09-305		X				
B06-001					X	
B06-002		X				
B06-006					X	
B06-007		X				
B06-008		X				
B06-009		X				
B06-012					X	
B06-013			X			
B06-014		X				
B06-015					X	
B06-016					X	
B06-017		X				
B06-018		X				
B06-019		X				
B06-020		X				
B06-022					X	
B06-024		X				
B06-302					X	
B08-001		X				
B08-006		X				
B08-007		X				
B08-008					X	
B08-009			X			
B08-012					X	
B08-013					X	
B08-014					X	
B08-015					X	
B08-016					X	
B08-017					X	
B08-018					X	
B08-019					X	
B08-020					X	
B08-021					X	
B08-022					X	
B08-024					X	
B08-025		X				
B08-027		X				
B08-301			X			
B08-302					X	
B08-303					X	
B08-304		X				
B08-305					X	
B24-001						X

TABLE 3-38
SURFACE MATERIAL FOR BORING LOCATIONS WHERE SURFACE SOIL WAS NOT PRESENT
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Secondary Boring ID	Surface Material				
		Brick	Concrete	Asphalt	Metal Plate	Railroad Ballast
B24-002			X			
B24-003			X			
B24-004			X			
B24-005			X			
B24-006			X			
B24-007			X			
B24-008			X			
B24-009			X			
B24-010			X			
B24-011			X			
B24-012			X			
B24-013			X			
B24-014			X			
B24-015			X			
B24-016			X			
B24-017			X			
B24-018			X			
B24-019			X			
B24-020			X			
B24-021			X			
B24-022			X			
B24-023			X			
B24-024			X			
B24-025			X			
B24-026			X			
B24-027			X			
B24-028			X			
B24-029			X			
B24-030			X			
B24-031			X			
B24-032			X			
B24-033			X			
B24-034			X			
B24-301			X			
B24-302			X			
B24-303			X			
B24-304			X			
B24-305			X			
B35-001			X			
B35-002			X			
B35-003			X			
B35-004			X			
B35-301			X			
B35-302			X			
B35-303			X			
B35-304			X			
B35-305			X			

Notes:

[a] A05A-009 did not have surface soil present. The secondary boring associated with this boring (A05A-209) did have surface soil present and is not listed on this table. All other secondary (200s) borings have the same surface material as their associated primary (000s) borings.

TABLE 3-39
SUMMARY OF PRIMARY, SECONDARY, AND DELINEATION BORING IDS AND DEPTH TO REFUSAL
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
A02-001							
B02-001	N	Concrete			1.00		
B02-002	Y	Fill			4.30		
B02-003	N	Concrete			2.70		
B02-004	N	Concrete			2.70		
B02-005	N	Concrete			1.90		
B02-006	N	Concrete			2.30		
B02-007	N	Concrete			2.80		
B02-008	N	Concrete		B02-302	2.30		2.80
B02-009	N	Concrete			3.90		
B02-010	N	Concrete			1.90		
B02-011	N	Concrete		B02-301	1.80		3.30
B02-012	N	Concrete			2.70		
B02-013	N	Concrete			1.90		
B02-014	N	Concrete			1.50		
B02-015	N	Concrete			0.40		
B02-016	N	Concrete			1.50		
B02-017	N	Concrete			3.20		
B02-018	N	Concrete			1.80		
B02-019	N	Concrete			1.00		
B02-020	Y	Fill			5.00		
B02-021	N	Concrete			0.50		
B02-022	Y	Fill			4.50		
B02-023	N	Concrete			2.00		
B02-024	N	Brick			4.00		
B02-025	N	Brick			3.70		
B02-026	N	Concrete			1.50		
B02-027	Y	Fill			3.00		
B02-028	Y	Fill			3.90		
B02-029	N	Brick			3.50		
B02-030	Y	Fill			3.00		
B02-031	N	Concrete			3.50		
B02-032	N	Concrete		B02-303	3.00		3.50
B02-033	N	Brick			3.20		
B02-034	N	Concrete			2.50		
B02-035	N	Concrete			3.20		
B02-036	Y	Fill			3.00		
B02-037	N	Brick			4.70		
B02-038	N	Concrete			0.70		
B02-039	N	Concrete			2.5' concrete		
B02-040	N	Concrete			2.00		
B02-041	N	Concrete			3.00		
B02-042	N	Concrete			2.90		
B02-043	Y	Fill			4.10		
B02-044	N	Concrete			0.40		
B02-045	N	Concrete			1.50		
B02-046	Y	Fill			3.50		
B02-047	N	Concrete			1.20		
B02-048	N	Concrete			1.00		
B02-049	N	Concrete			1.00		
B02-050	N	Concrete			1.60		
B02-051	N	Concrete			3.80		
B02-052	Y	Fill			3.20		

TABLE 3-39
SUMMARY OF PRIMARY, SECONDARY, AND DELINEATION BORING IDS AND DEPTH TO REFUSAL
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
B02-053	N	Concrete			2.50		
B02-054	N	Concrete			1.50		
B02-055	N	Concrete			2.50		
B02-056	Y	Fill			2.70		
B02-057	N	Concrete			2.50		
B02-058	N	Concrete			1.70		
B02-059	N	Concrete			2.60		
IA01-Building 3							
B03-001	Y	Fill			1.90		
B03-002	N	Concrete			3.80		
B03-003	N	Concrete			1.90		
B03-004	N	Concrete			1.70		
B03-005	N	Concrete			2.50		
B03-006	N	Concrete			1.90		
B03-007	N	Concrete			1.70		
B03-008	N	Concrete			2.50		
B03-009	N	Concrete		B03-301	2.20		3.50
B03-010	Y	Fill			1.50		
B03-011	N	Concrete			2.80		
B03-012	N	Concrete			1.80		
B03-013	N	Concrete			1.80		
B03-014	Y	Fill			3.00		
B03-015	N	Concrete			2.20		
B03-016	Y	Fill		B03-302	3.50		3.00
B03-017	Y	Fill			3.20		
B03-018	N	Concrete			1.90		
B03-019	N	Concrete			1.90		
B03-020	Y	Fill		B03-303, B03-304	1.90		5.00, 2.20
B03-021	N	Concrete			0.70		
B03-022	N	Concrete			1.50		
B03-023	N	Concrete			0.50		
B03-024	Y	Fill			2.50		
B03-025	Y	Fill			1.90		
B03-026	Y	Fill			4.20		
B03-027	Y	Fill			2.50		
B03-028	Y	Fill		B03-307	1.90		1.95
B03-029	Y	Fill			3.00		
B03-030	Y	Fill			7.50		
B03-031	Y	Fill			2.40		
B03-032	N	Concrete		B03-305	2.30		2.30
B03-033	Y	Fill			2.40		
B03-034	N	Concrete			0.30		
B03-035	N	Concrete			0.40		
B03-036	N	Concrete			1.50		
B03-037	Y	Fill		B03-306	N/A		5.50
IA01-Buildings 4 & 9							
B04&09-001	N	Concrete			1.90		
B04&09-002	N	Concrete			1.70		
B04&09-003	N	Brick			5.10		
B04&09-004	N	Brick			2.50		
B04&09-005	N	Concrete			2.20		
B04&09-006	N	Concrete			2.40		
B04&09-007	N	Brick			3.00		

TABLE 3-39
SUMMARY OF PRIMARY, SECONDARY, AND DELINEATION BORING IDS AND DEPTH TO REFUSAL
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
B04&09-008	Y	Fill			2.30		
B04&09-009	N	Concrete			2.60		
B04&09-010	N	Concrete			2.85		
B04&09-011	N	Brick			3.00		
B04&09-012	N	Concrete		B04&09-301	2.20		3.00
B04&09-013	N	Concrete			2.00		
B04&09-014	N	Brick			2.90		
B04&09-015	Y	Fill			3.20		
B04&09-016	N	Brick			1.90		
B04&09-017	Y	Fill			2.90		
B04&09-018	Y	Fill			3.00		
B04&09-019	Y	Fill			3.90		
B04&09-020	N	Concrete			2.40		
B04&09-021	N	Concrete			2.40		
B04&09-022	N	Brick			2.90		
B04&09-023	N	Brick			3.90		
B04&09-024	N	Brick			3.00		
B04&09-025	N	Brick			1.90		
B04&09-026	Y	Fill		B04&09-305	3.00		3.00
B04&09-027	N	Concrete			2.20		
B04&09-028	N	Concrete			2.40		
B04&09-029	N	Brick		B04&09-303	3.00		1.50
B04&09-030	N	Brick			3.00		
B04&09-031	N	Concrete			3.20		
B04&09-032	N	Concrete		B04&09-302	2.40		2.50
B04&09-033	N	Concrete			2.20		
B04&09-034	N	Brick			3.00		
B04&09-035	N	Concrete			1.90		
B04&09-036	N	Brick			2.90		
B04&09-037	N	Concrete			1.90		
B04&09-038	N	Concrete			2.30		
B04&09-039	N	Concrete			2.90		
B04&09-040	N	Concrete			2.30		
B04&09-041	N	Concrete		B04&09-304	2.10		3.90
IA01-Building 6							
B06-001	N	Metal Plate			1.80		
B06-002	N	Brick			3.00		
B06-003	Y	Fill			1.90		
B06-004	Y	Fill		B06-301	3.00		2.90
B06-005	Y	Fill			2.30		
B06-006	N	Metal Plate		B06-302	1.70		3.00
B06-007	N	Brick			1.90		
B06-008	N	Brick			7.00		
B06-009	N	Brick			3.80		
B06-010	Y	Fill			3.70		
B06-011	Y	Fill			3.00		
B06-012	N	Metal Plate			3.50		
B06-013	N	Concrete			2.50		
B06-014	N	Brick			3.50		
B06-015	N	Metal Plate			3.90		
B06-016	N	Metal Plate			2.90		
B06-017	N	Brick			3.10		
B06-018	N	Brick			2.40		

TABLE 3-39
SUMMARY OF PRIMARY, SECONDARY, AND DELINEATION BORING IDS AND DEPTH TO REFUSAL
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
B06-019	N	Brick			2.40		
B06-020	N	Brick			3.80		
B06-021	Y	Fill			3.40		
B06-022	N	Metal Plate			3.80		
B06-023	Y	Fill			2.50		
B06-024	N	Brick			2.40		
IA01-Building 8							
B08-001	N	Brick			2.50		
B08-002	Y	Fill			2.50		
B08-003	Y	Fill			2.80		
B08-004	Y	Fill			1.90		
B08-005	Y	Fill			3.90		
B08-006	N	Brick			2.50		
B08-007	N	Brick			3.00		
B08-008	N	Metal Plate			3.50		
B08-009	N	Concrete			3.00		
B08-010	Y	Fill		B08-301	3.50		3.50
B08-011	Y	Fill			2.20		
B08-012	N	Metal Plate		B08-304	3.20		3.90
B08-013	N	Metal Plate			3.00		
B08-014	N	Metal Plate		B08-303	3.60		3.00
B08-015	N	Metal Plate			5.00		
B08-016	N	Metal Plate			5.00		
B08-017	N	Metal Plate			2.80		
B08-018	N	Metal Plate		B08-305	3.00		3.00
B08-019	N	Metal Plate		B08-302	2.80		2.80
B08-020	N	Metal Plate			3.60		
B08-021	N	Metal Plate			3.70		
B08-022	N	Metal Plate			3.00		
B08-023	Y	Fill			3.90		
B08-024	N	Metal Plate			2.50		
B08-025	N	Brick			3.50		
B08-026	Y	Fill			1.70		
B08-027	N	Brick			1.50		
B08-028	Y	Fill			3.90		
IA01-Building 24							
B24-001	N	RR Ballast			1.70		
B24-002	N	Concrete			1.50		
B24-003	N	Concrete			1.90		
B24-004	N	Concrete			1.30		
B24-005	N	Concrete			1.50		
B24-006	N	Concrete			1.30		
B24-007	N	Concrete			1.40		
B24-008	N	Concrete			1.90		
B24-009	N	Concrete			1.90		
B24-010	N	Concrete			1.60		
B24-011	N	Concrete			1.90		
B24-012	N	Concrete			1.20		
B24-013	N	Concrete			1.50		
B24-014	N	Concrete			1.50		
B24-015	N	Concrete		B24-301	1.90		2.20
B24-016	N	Concrete			2.40		
B24-017	N	Concrete			1.90		

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Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
B24-018	N	Concrete			2.30		
B24-019	N	Concrete			1.90		
B24-020	N	Concrete			1.20		
B24-021	N	Concrete			3.90		
B24-022	N	Concrete			1.90		
B24-023	N	Concrete			2.90		
B24-024	N	Concrete		B24-302	1.20		2.50
B24-025	N	Concrete			1.90		
B24-026	N	Concrete			1.90		
B24-027	N	Concrete			2.50		
B24-028	N	Concrete			1.90		
B24-029	N	Concrete		B24-303, B24-304	1.70		3.00, 1.00
B24-030	N	Concrete			1.90		
B24-031	N	Concrete			2.00		
B24-032	N	Concrete			1.90		
B24-033	N	Concrete		B24-305	1.50		1.80
B24-034	N	Concrete			1.50		
IA01-Building 35							
B35-001	N	Concrete		B35-301, B35-302	3.70		3.00, 3.20
B35-002	N	Concrete		B35-303, B35-304	3.90		3.50, 3.50
B35-003	N	Concrete		B35-305	4.70		3.00
B35-004	N	Concrete			4.20		
IA02							
A02-001	Y	Fill			3.20		
A02-002	Y	Fill			1.20		
A02-003	Y	Fill			N/A		
A02-004	Y	Fill			4.20		
A02-005	Y	Fill			4.20		
A02-006	Y	Fill			3.30		
A02-007	Y	Fill			2.50		
A02-008	Y	Fill	A02-208		1.80	4.40	
A02-009	Y	Fill			3.90		
A02-010	Y	Fill			3.70		
A02-011	Y	Fill			2.20		
A02-012	Y	Fill			3.80		
A02-013	Y	Fill			2.70		
A02-014	Y	Fill			3.90		
A02-015	Y	Fill	A02-215		5.70	8.00	
A02-016	Y	Fill	A02-216		5.80	6.60	
A02-017	Y	Fill	A02-217		1.50	4.30	
A02-018	Y	Fill			3.10		
A02-019	Y	Fill			3.90		
A02-020	Y	Fill			3.70		
A02-021	Y	Fill			3.50		
A02-022	Y	Fill			2.50		
A02-023	Y	Fill	A02-223		2.30	3.70	
A02-024	Y	Fill			3.80		
A02-025	Y	Fill			3.70		
A02-026	Y	Fill			3.90		
A02-027	N	Asphalt			3.80		
A02-028	N	Asphalt			3.00		
A02-029	Y	Fill	A02-229		2.30	6.70	
A02-030	Y	Fill			3.00		

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Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
A02-031	Y	Fill			3.80		
A02-032	Y	Fill			3.00		
A02-033	Y	Fill			3.00		
A02-034	Y	Fill	A02-234		3.00	6.10	
A02-035	Y	Fill			3.00		
A02-036	Y	Fill			2.60		
A02-037	Y	Fill			3.50		
A02-038	Y	Fill			3.50		
A02-039	Y	Fill			3.70		
A02-040	Y	Fill			3.00		
A02-041	Y	Fill			3.00		
A02-042	Y	Fill			4.80		
A02-043	Y	Fill			3.80		
IA03							
A03-001	Y	Fill	A03-201		1.00	4.00	
A03-002	Y	Fill	A03-202		0.90	4.00	
A03-003	Y	Fill	A03-203		1.50	2.00	
A03-004	Y	Fill	A03-204		0.65	1.30	
A03-005	Y	Fill	A03-205		0.70	1.50	
A03-006	Y	Fill	A03-206		1.30	1.50	
A03-007	Y	Fill	A03-207		1.35	5.10	
A03-008	Y	Fill	A03-208		3.00	8.80	
A03-009	Y	Fill	A03-209		1.70	5.70	
A03-010	Y	Fill	A03-210		3.10	3.90	
A03-011	Y	Fill			3.20		
A03-012	Y	Fill			1.40		
A03-013	Y	Fill			1.70		
A03-014	Y	Fill	A03-214		1.00	4.00	
A03-015	Y	Fill	A03-215		1.00	6.80	
A03-016	Y	Fill	A03-216		1.90	7.80	
A03-017	Y	Fill	A03-217		0.90	7.80	
A03-018	Y	Fill	A03-218		2.40	5.10	
A03-019	Y	Fill			4.40		
A03-020	Y	Fill	A03-220		1.50	6.00	
A03-021	Y	Fill	A03-221		1.80	6.80	
A03-022	Y	Fill	A03-222		2.70	8.70	
A03-023	Y	Fill	A03-223		1.90	8.70	
A03-024	Y	Fill	A03-224		2.00	8.30	
A03-025	Y	Fill	A03-225		2.50	6.00	
A03-026	Y	Fill	A03-226		2.50	15.60	
A03-027	Y	Fill	A03-227		1.50	9.80	
A03-028	Y	Fill	A03-228		2.20	8.00	
A03-029	Y	Fill			5.70		
A03-030	Y	Fill	A03-230		1.50	5.00	
A03-031	Y	Fill	A03-231		1.70	7.80	
A03-032	Y	Fill	A03-232		1.40	13.50	
A03-033	Y	Fill	A03-233		1.70	8.90	
A03-034	Y	Fill	A03-234		0.90	7.70	
A03-035	Y	Fill			3.20		
A03-036	Y	Fill	A03-236		1.50	1.90	
A03-037	Y	Fill	A03-237		1.00	11.10	
A03-038	Y	Fill			5.90		
A03-039	Y	Fill	A03-239		1.50	7.90	

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Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
A03-040	Y	Fill	A03-240		1.00	5.10	
A03-041	Y	Fill	A03-241		1.50	3.70	
A03-042	Y	Fill			1.50		
IA04A							
A04A-001	Y	Fill			3.50		
A04A-002	Y	Fill			2.90		
A04A-003	Y	Fill	A04A-203		1.80	6.80	
A04A-004	Y	Fill			3.00		
A04A-005	Y	Fill			1.60		
A04A-006	Y	Fill			2.40		
A04A-007	Y	Fill			3.50		
A04A-008	Y	Fill	A04A-208		1.90	7.70	
A04A-009	Y	Fill	A04A-209		3.50	7.10	
A04A-010	Y	Fill	A04A-210		1.00	2.50	
A04A-011	Y	Fill	A04A-211		2.20	8.60	
A04A-012	Y	Fill			3.50		
A04A-013	Y	Fill	A04A-213		1.70	9.40	
A04A-014	Y	Fill	A04A-214(1st),		0.60	3.00, 8.00	
A04A-015	Y	Fill	A04A-215		1.00	4.80	
A04A-016	Y	Fill			2.50		
A04A-017	Y	Fill			3.00		
A04A-018	Y	Fill	A04A-218		1.90	10.30	
A04A-019	Y	Fill			2.90		
A04A-020	Y	Fill	A04A-220		0.65	7.60	
A04A-021	Y	Fill			3.80		
A04A-022	Y	Fill			3.00		
A04A-023	Y	Fill	A04A-223		1.40	7.60	
A04A-024	Y	Fill	A04A-224		1.00	9.20	
A04A-025	Y	Fill	A04A-225		1.00	5.40	
A04A-026	Y	Fill			2.50		
A04A-027	Y	Fill			3.00		
A04A-028	Y	Fill	A04A-228		1.50	6.80	
A04A-029	Y	Fill			2.50		
A04A-030	Y	Fill	A04A-230		1.70	7.90	
A04A-031	Y	Fill			5.50		
A04A-032	Y	Fill			2.50		
A04A-033	Y	Fill			3.10		
A04A-034	Y	Fill			1.00		
A04A-035	Y	Fill	A04A-235		1.10	0.90	
A04A-036	Y	Fill	A04A-236		1.60	5.30	
A04A-037	Y	Fill			1.20		
A04A-038	Y	Fill	A04A-238		1.70	7.10	
A04A-039	Y	Fill	A04A-239		1.30	2.50	
A04A-040	Y	Fill	A04A-240		1.00	3.10	
A04A-041	Y	Fill	A04A-241		0.30	3.50	
A04A-042	Y	Fill			2.50		
A04A-043	Y	Fill	A04A-243		1.20	3.50	
358N, 19W (Orise)	NA	NA		A04A-301, A04A-302, A04A-303, A04A-304, A04A-305	NA[c]		4.30, 4.30, 4.30, 5.80, 9.20
A04A-044	Y	Fill	A04A-244		0.90	2.30	
A04A-045	Y	Fill			2.10		
A04A-046	Y	Fill			3.50		3.30, 5.30, 4.60
A04A-047	Y	Fill	A04A-247	A04A-314, A04A-315, A04A-316, A04A-317	1.00	4.20	4.90, 5.90, 5.20, 5.10
168N, 26E (Orise)	NA	NA		A04A-321, A04A-322, A04A-323	NA[d]		

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Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
A04A-048	Y	Fill	A04A-248	A04A-310, A04A-311, A04A-312, A04A-313	1.40	3.50	6.40, 5.30, 4.60, 3.80
A04A-049	N	Asphalt	A04A-249	A04A-306, A04A-307, A04A-308, A04A-309	0.60	3.20	5.20, 4.40, 4.40, 3.90
A04A-050	Y	Fill	A04A-250		0.90	3.00	
A04A-051	Y	Fill	A04A-251	A04A-318, A04A-319, A04A-320	0.80	3.00	3.80, 3.80, 3.90
A04A-052	Y	Fill	A04A-252		1.50	4.20	
A04A-053	Y	Fill			1.50		
A04A-054	Y	Fill			1.20		
A04A-055	Y	Fill			1.20		
A04A-056	Y	Fill	A04A-256		2.70	3.90	
A04A-057	Y	Fill			2.70		
A04A-058	Y	Fill			1.50		
A04A-059	Y	Fill			1.70		
A04A-060	Y	Fill			1.20		
A04A-061	Y	Fill			1.70		
A04A-062	Y	Fill			1.20		
A04A-063	Y	Fill			3.50		
A04A-064	Y	Fill			1.40		
A04A-065	Y	Fill			1.25		
A04A-066	Y	Fill	A04A-266		2.20	5.70	
A04A-067	Y	Fill			1.40		
A04A-068	Y	Fill			1.90		
A04A-069	Y	Fill			1.65		
A04A-070	Y	Fill	A04A-270		1.00	3.60	
A04A-071	Y	Fill	A04A-271		1.00	3.20	
A04A-072	Y	Fill	A04A-272		1.00	2.70	
A04A-073	Y	Fill			1.50		
A04A-074	Y	Fill	A04A-274		1.50	5.20	
A04A-075	Y	Fill	A04A-275		1.00	3.00	
A04A-076	Y	Fill	A04A-276		3.10	3.90	
A04A-077	Y	Fill			4.20		
A04A-078	Y	Fill	A04A-278		1.20	9.60	
IA04B							
A04B-001	Y	Fill			2.40		
A04B-002	Y	Fill			2.50		
A04B-003	N	Asphalt			2.50		
A04B-004	Y	Fill			3.70		
A04B-005	Y	Fill			3.40		
A04B-006	Y	Fill			3.50		
A04B-007	Y	Fill			3.90		
A04B-008	Y	Fill			3.00		
A04B-009	Y	Fill			3.00		
A04B-010	Y	Fill			3.40		
A04B-011	Y	Fill			3.50		
A04B-012	Y	Fill			3.80		
A04B-013	Y	Fill		A04B-309, A04B-310, A04B-311, A04B-312	3.00		5.10, 5.90, 4.60, 3.10
A04B-014	Y	Fill			3.90		
A04B-015	Y	Fill			3.50		
A04B-016	Y	Fill			2.40		
A04B-017	Y	Fill			2.50		
A04B-018	N	Asphalt		A04B-301, A04B-302, A04B-303, A04B-304	3.80		5.20, 4.70, 4.60, 4.70
A04B-019	Y	Fill	A04B-219		1.50	3.90	
A04B-020	N	Asphalt			3.20		
A04B-021	Y	Fill	A04B-221		1.50	3.20	

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Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
A04B-022	Y	Fill			2.50		
A04B-023	N	Asphalt			1.90		
A04B-024	Y	Fill			3.50		
A04B-025	Y	Fill			3.80		
A04B-026	N	Asphalt			3.70		
A04B-027	Y	Fill			2.00		
A04B-028	Y	Fill			1.50		
A04B-029	Y	Fill			1.80		
A04B-030	Y	Fill			2.50		
A04B-031	Y	Fill			3.50		
A04B-032	Y	Fill			3.50		
A04B-033	Y	Fill			3.00		
A04B-034	N	Asphalt			2.50		
A04B-035	N	Asphalt			3.20		
A04B-036	Y	Fill			3.00		
A04B-037	N	Asphalt			3.40		
A04B-038	Y	Fill			3.00		
A04B-039	Y	Fill			2.10		
A04B-040	Y	Fill			2.60		
A04B-041	N	Asphalt		A04B-305, A04B-306, A04B-307, A04B-308	2.80		3.75, 3.10, 2.65, 3.90
A04B-042	Y	Fill			2.20		
A04B-043	Y	Fill			2.50		
IA04C							
A04C-001	Y	Fill			0.90		
A04C-002	Y	Fill			0.60		
A04C-003	Y	Fill		A04C-309	1.90		3.40
A04C-004	Y	Fill			1.00		
A04C-005	Y	Fill			0.60		
A04C-006	Y	Fill			1.50		
A04C-007	Y	Fill			0.60		
A04C-008	Y	Fill			0.80		
A04C-009	Y	Fill		A04C-305, A04C-306, A04C-307, A04C-308	0.90		3.80, 3.60, 3.60, 3.60
A04C-010	Y	Fill			0.80		
A04C-011	Y	Fill			3.00		
A04C-012	Y	Fill			0.60		
A04C-013	Y	Fill		A04C-301, A04C-302, A04C-303, A04C-304, A04C-310, A04C-311, A04C-312, A04C-313	1.80		3.10, 3.30, 3.70, 6.90, 3.10, 3.10, 3.20, 3.70
A04C-014	Y	Fill			0.60		
A04C-015	Y	Fill			2.60		
IA04D							
A04D-001	Y	Fill	A04D-201		0.60	3.30	
A04D-002	Y	Fill			4.00		
A04D-003	Y	Fill	A04D-203		1.40	3.10	
A04D-004	Y	Fill	A04D-204		0.60	2.60	
A04D-005	Y	Fill			2.30		
A04D-006	N	Asphalt			3.20		
A04D-007	Y	Fill			2.80		
A04D-008	N	Asphalt		A04D-322, A04D-323, A04D-324, A04D-325	3.42		3.10, 5.40, 3.60, 3.90
A04D-009	Y	Fill	A04D-209		0.60	3.70	
A04D-010	Y	Fill	A04D-210		1.50	3.70	
A04D-011	N	Asphalt			4.17		
A04D-012	Y	Fill	A04D-212	A04D-326	0.60	3.80	3.40
A04D (160S, 60E)[5]	NA	NA		A04D-326	NA[e]		3.40

TABLE 3-39
SUMMARY OF PRIMARY, SECONDARY, AND DELINEATION BORING IDS AND DEPTH TO REFUSAL
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
A04D-013	Y	Fill	A04D-213		1.50	2.70	
A04D-014	N	Asphalt	A04D-214		1.00	2.70	
A04D-015	Y	Fill			2.50		
A04D-016	Y	Fill			2.67		
A04D-017	Y	Fill			3.40		
A04D-018	Y	Fill			2.50		
A04D-019	Y	Fill			3.00		
A04D-020	Y	Fill	A04D-220		1.00	3.20	
A04D-021	Y	Fill		A04D-305, A04D-306, A04D-307	3.67		3.80, 1.90, 3.40
A04D-022	Y	Fill		A04D-301, A04D-302, A04D-303, A04D-304	3.50		4.20, 0.70, 3.90, 3.60
A04D-023	Y	Fill	A04D-223	A04D-319, A04D-320, A04D-321	1.90	3.20	3.50, 3.10, 3.60
A04D-024	Y	Fill			2.50		
A04D-025	Y	Fill	A04D-225		1.80	3.40	
A04D-026	Y	Fill	A04D-226	A04D-315, A04D-316, A04D-317, A04D-318	1.20	1.50	3.90, 3.10, 2.90, 3.10
A04D-027	N	Asphalt			1.50		
A04D-028	Y	Fill	A04D-228	A04D-311, A04D-312, A04D-313, A04D-314	1.20	1.90	3.10, 2.40, 3.70, 3.10
A04D-029	Y	Fill			1.50		
A04D-030	Y	Fill			3.50		
A04D-031	Y	Fill		A04D-308, A04D-309, A04D-310	2.10		3.90, 3.90, 1.90
A04D-032	Y	Fill			2.67		
IA05A							
A05A-001	Y	Fill	A05A-201		0.90	7.70	
A05A-002	Y	Fill	A05A-202		1.00	7.30	
A05A-003	Y	Fill			1.50		
A05A-004	Y	Native Soil			1.40		
A05A-005	Y	Fill			1.80		
A05A-006	Y	Fill			3.50		
A05A-007	Y	Fill			2.50		
A05A-008	Y	Fill			3.90		
A05A-009	N	Asphalt	A05A-209		7.50	13.60	
A05A-010	Y	Fill	A05A-210		5.00	10.70	
A05A-011	Y	Fill	A05A-211	A05A-306, A05A-307, A05A-308	5.50	7.90	2.00, 2.00, 2.00
A05A-012	Y	Fill			3.80		
A05A-013	Y	Fill	A05A-213		0.95	10.00	
A05A-014	Y	Fill	A05A-214		1.10	8.00	
A05A-015	Y	Fill	A05A-215		1.20	1.00	
A05A-016	Y	Fill	A05A-216		1.10	8.70	
A05A-017	Y	Fill			1.80		
A05A-018	Y	Fill			1.50		
A05A (500N, 220W)[e]	NA	NA		A05A-301	NA[e]		3.80
A05A-019	Y	Fill	A05A-219	A05A-302, A05A-303, A05A-304, A05A-305	0.70	9.90	8.80, 9.80, 10.60, 9.90
A05A-020	Y	Fill			1.50		
A05A-021	Y	Fill			3.50		
A05A-022	Y	Fill			1.90		
A05A-023	Y	Fill			1.80		
A05A-024	Y	Fill			1.60		
A05A-025	Y	Fill			1.70		
A05A-026	Y	Fill	A05A-226		1.50	7.70	
A05A-027	Y	Fill			2.70		
A05A-028	Y	Fill	A05A-228		0.70	11.70	
A05A-029	Y	Fill			2.50		
A05A-030	Y	Fill			1.80		
A05A-031	Y	Fill			1.70		

TABLE 3-39
SUMMARY OF PRIMARY, SECONDARY, AND DELINEATION BORING IDS AND DEPTH TO REFUSAL
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Primary Boring Location	Primary Location Surface Soil Present (Y/N)	Type of Surface Material at Primary Location	Secondary Boring Location	Delineation Borings[a]	Primary Depth to Refusal (ft)	Secondary Depth to Refusal (ft)	Delineation Depth to Refusal (ft)[b]
IA05B							
A05B-001	Y	Native Soil			7.70		
A05B-002	Y	Native Soil			7.00		
A05B-003	Y	Native Soil			5.00		
A05B-004	Y	Native Soil			3.00		
A05B-005	Y	Native Soil			4.60		
A05B-006	Y	Native Soil			6.40		
A05B-007	Y	Native Soil			5.40		
A05B-008	Y	Native Soil			5.00		
A05B-009	Y	Native Soil			2.70		
A05B-010	Y	Native Soil			3.00		
A05B-011	Y	Native Soil			3.20		
IA10							
A10-001	N	Concrete			1.00		
A10-002	N	Concrete			0.90		
A10-003	N	Concrete			1.80		
A10-004	N	Concrete			3.70		
A10-005	N	Concrete			1.00		
A10-006	N	Concrete			3.50		
A10-007	N	Concrete			3.50		
A10-008	N	Concrete			3.50		
A10-009	N	Concrete			1.90		
A10-010	N	Concrete			1.50		
A10-011	N	Concrete			1.50		
A10-012	N	Concrete			1.80		
A10-013	N	Concrete		A10-301, A10-302, A10-303	1.70		7.80, 11.70, 13.20
Background							
BKG-001	Y	Native Soil			5.00		
BKG-002	Y	Native Soil			3.80		
BKG-003	Y	Native Soil			5.90		
BKG-004	Y	Native Soil			3.00		
BKG-005	Y	Native Soil			5.00		
BKG-006	Y	Native Soil			4.50		
BKG-007	Y	Native Soil			3.70		
BKG-008	Y	Native Soil			5.20		
BKG-009	Y	Native Soil			4.90		
BKG-010	Y	Native Soil			4.30		
BKG-011	Y	Native Soil			5.10		
BKG-012	Y	Native Soil			2.70		

Notes:

[a] Delineation Borings associated with nearby primary boring location.

[b] Multiple delineation boring depths are comma delimited and respectively listed

[c] Orise boring. Bottom most interval was collected from 120 to 180 centimeters below ground surface.

[d] Orise boring. Bottom most interval was collected from 60 to 120 centimeters below ground surface.

[e] Delineation boring at this location based on field screening data.

TABLE 3-40
PLANNED NUMBER OF SOIL BORINGS COMPARED
TO ACTUAL NUMBER OF SOIL BORINGS COMPLETED
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL
CORPORATION FUSRAP SITE

Exterior Areas - Soil Samples	Planned Primary Locations per Area	Actual Primary Locations per Area	Actual Contingency Borings per Area
IA02	43	43	0
IA03	42	42	0
IA04A	78	78	23
IA04B	41	43	12
IA04C	15	15	13
IA04D	32	32	26
IA05A	31	31	8
IA05B	11	11	0
IA10	13	13	3
Subtotal	**306**	**308**	**85**
Interior Areas (IA01 Soil)			
Building 1	1	0	0
Building 2	58	59	3
Building 3	36	37	7
Building 4/9	41	41	5
Building 6	24	24	2
Building 8	28	28	5
Building 24	34	34	5
Building 35	4	4	5
IA01 (Bldg Interior) subtotal	**226**	**227**	**32**
Background/reference area	12	12	0
Bkgd Area Subtotal	**12**	**12**	**0**
Total (without contingency)	**544**	**547**	
Contingency Subtotal at 20%	**109**	**117**	**117**
TOTAL (including contingency)	**653**	**664**	

TABLE 3-41
DETRITUS SAMPLES AND ASSOCIATED BORING LOCATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Boring Number	Detritus Sample Date	On-site Analysis (Gamma Spec) [a]	Off-site Analysis (Alpha Spec) [b]
		Detritus Sample Label	Detritus Sample Label
B02SL-007	9/18/2007	B02SL-707-01	
B02SL-009	9/18/2007	B02SL-709-01	
B02SL-010	9/18/2007	B02SL-710-01	
B02SL-013	9/18/2007	B02SL-713-01	
B02SL-014	9/18/2007	B02SL-714-01	
B02SL-015	9/18/2007	B02SL-715-01	
B02SL-016	9/18/2007	B02SL-716-01	
B02SL-017	9/18/2007	B02SL-717-01	
B02SL-018	9/18/2007	B02SL-718-01	
B02SL-019	9/18/2007	B02SL-719-01	
B02SL-020	9/18/2007	B02SL-720-01	
B02SL-021	9/18/2007	B02SL-721-01	B02SL-721-01
B02SL-022	9/18/2007	B02SL-722-01	
B02SL-023	9/18/2007	B02SL-723-01	
B02SL-024	9/12/2007	B02SL-724-01	
B02SL-025	9/12/2007	B02SL-725-01	
B02SL-026	9/18/2007	B02SL-726-01	
B02SL-027	9/18/2007	B02SL-727-01	
B02SL-028	9/18/2007	B02SL-728-01	
B02SL-029	9/12/2007	B02SL-729-01	
B02SL-030	9/18/2007	B02SL-730-01	
B02SL-032	9/18/2007	B02SL-732-01	
B02SL-033	9/12/2007	B02SL-733-01	
B02SL-036	9/18/2007	B02SL-736-01	
B02SL-037	9/12/2007	B02SL-737-01	
B02SL-038	9/18/2007	B02SL-738-01	
B02SL-039	9/18/2007	B02SL-739-01	B02SL-739-01
B02SL-042	9/18/2007	B02SL-742-01	
B02SL-043	9/18/2007	B02SL-743-01	
B02SL-045	9/18/2007	B02SL-745-01	
B02SL-046	9/18/2007	B02SL-746-01	
B02SL-048	9/18/2007	B02SL-748-01	
B02SL-049	9/18/2007	B02SL-749-01	
B02SL-050	9/18/2007	B02SL-750-01	
B02SL-051	9/18/2007	B02SL-751-01	
B02SL-052	9/18/2007	B02SL-752-01	
B02SL-053	9/18/2007	B02SL-753-01	
B02SL-054	9/18/2007	B02SL-754-01	
B02SL-055	9/18/2007	B02SL-755-01	
B02SL-056	9/18/2007	B02SL-756-01	
B02SL-057	9/18/2007	B02SL-757-01	
B02SL-058	9/18/2007	B02SL-758-01	
B03SL-001	9/17/2007	B03SL-701-01	
B03SL-002	9/17/2007	B03SL-702-01	
B03SL-004	9/17/2007	B03SL-704-01	
B03SL-005	9/17/2007	B03SL-705-01	
B03SL-006	9/17/2007	B03SL-706-01	
B03SL-007	9/17/2007	B03SL-707-01	
B03SL-008	9/17/2007	B03SL-708-01	
B03SL-009	9/17/2007	B03SL-709-01	
B03SL-010	9/17/2007	B03SL-710-01	
B03SL-011	9/17/2007	B03SL-711-01	
B03SL-012	9/17/2007	B03SL-712-01	
B03SL-013	9/17/2007	B03SL-713-01	
B03SL-015	9/17/2007	B03SL-715-01	
B03SL-017	9/17/2007	B03SL-717-01	
B03SL-018	9/17/2007	B03SL-718-01	

TABLE 3-41
DETRITUS SAMPLES AND ASSOCIATED BORING LOCATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Boring Number	Detritus Sample Date	On-site Analysis (Gamma Spec) [a]	Off-site Analysis (Alpha Spec) [b]
		Detritus Sample Label	Detritus Sample Label
B03SL-019	9/17/2007	B03SL-719-01	
B03SL-020	9/17/2007	B03SL-720-01	
B03SL-021	9/17/2007	B03SL-721-01	
B03SL-022	9/17/2007	B03SL-722-01	
B03SL-023	9/17/2007	B03SL-723-01	
B03SL-024	9/17/2007	B03SL-724-01	
B03SL-025	9/17/2007	B03SL-725-01	
B03SL-026	9/17/2007	B03SL-726-01	
B03SL-027	9/17/2007	B03SL-727-01	
B03SL-028	9/17/2007	B03SL-728-01	
B03SL-029	9/17/2007	B03SL-729-01	
B03SL-030	9/17/2007	B03SL-730-01	
B03SL-031	9/17/2007	B03SL-731-01	
B03SL-032	9/12/2007	B03SL-732-01	
B03SL-033	9/17/2007	B03SL-733-01	
B03SL-034	9/17/2007	B03SL-734-01	
B03SL-035	9/17/2007	B03SL-735-01	
B03SL-036	9/17/2007	B03SL-736-01	
B03SL-037	9/19/2007	B03SL-737-01	
B03SL-038	11/14/2007	B03SL-738-01	
B03SL-039	11/14/2007	B03SL-739-01	
B04&B09SL-002	9/13/2007	B04&B09SL-702-01	
B04&B09SL-003	9/12/2007	B04&B09SL-703-01	
B04&B09SL-004	9/12/2007	B04&B09SL-704-01	
B04&B09SL-005	9/13/2007	B04&B09SL-705-01	
B04&B09SL-007	9/13/2007	B04&B09SL-707-01	
B04&B09SL-008	9/13/2007	B04&B09SL-708-01	
B04&B09SL-010	9/13/2007	B04&B09SL-710-01	
B04&B09SL-011	9/12/2007	B04&B09SL-711-01	
B04&B09SL-012	9/13/2007	B04&B09SL-712-01	
B04&B09SL-013	9/13/2007	B04&B09SL-713-01	
B04&B09SL-014	9/12/2007	B04&B09SL-714-01	
B04&B09SL-015	9/13/2007	B04&B09SL-715-01	
B04&B09SL-016	9/12/2007	B04&B09SL-716-01	
B04&B09SL-017	9/13/2007	B04&B09SL-717-01	
B04&B09SL-019	9/13/2007	B04&B09SL-719-01	
B04&B09SL-020	9/13/2007	B04&B09SL-720-01	
B04&B09SL-021	9/13/2007	B04&B09SL-721-01	
B04&B09SL-022	9/12/2007	B04&B09SL-722-01	
B04&B09SL-023	9/12/2007	B04&B09SL-723-01	
B04&B09SL-024	9/12/2007	B04&B09SL-724-01	
B04&B09SL-025	9/12/2007	B04&B09SL-725-01	
B04&B09SL-027	9/13/2007	B04&B09SL-727-01	
B04&B09SL-028	9/13/2007	B04&B09SL-728-01	
B04&B09SL-029	9/12/2007	B04&B09SL-729-01	
B04&B09SL-030	9/12/2007	B04&B09SL-730-01	
B04&B09SL-031	9/13/2007	B04&B09SL-731-01	
B04&B09SL-032	9/13/2007	B04&B09SL-732-01	
B04&B09SL-033	9/13/2007	B04&B09SL-733-01	
B04&B09SL-034	9/12/2007	B04&B09SL-734-01	
B04&B09SL-036	9/12/2007	B04&B09SL-736-01	
B04&B09SL-038	9/13/2007	B04&B09SL-738-01	
B04&B09SL-039	9/13/2007	B04&B09SL-739-01	
B04&B09SL-040	9/13/2007	B04&B09SL-740-01	
B04&B09SL-041	9/13/2007	B04&B09SL-741-01	
B06SL-002	10/12/2007	B06SL-702-01	
B06SL-007	10/12/2007	B06SL-707-01	

TABLE 3-41
DETRITUS SAMPLES AND ASSOCIATED BORING LOCATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Boring Number	Detritus Sample Date	On-site Analysis (Gamma Spec) [a]	Off-site Analysis (Alpha Spec) [b]
		Detritus Sample Label	Detritus Sample Label
B06SL-008	10/12/2007	B06SL-708-01	
B06SL-009	10/12/2007	B06SL-709-01	
B06SL-017	11/14/2007	B06SL-717-01	
B08SL-025	10/12/2007	B08SL-725-01	
B24SL-001	9/19/2007	B24SL-701-01	
B24SL-004	10/7/2007	B24SL-704-01	
B24SL-015	9/19/2007	B24SL-715-01	
B24SL-016	9/19/2007	B24SL-716-01	
B24SL-018	9/19/2007	B24SL-718-01	
B24SL-020	9/19/2007	B24SL-720-01	
B24SL-022	9/19/2007	B24SL-722-01	
B24SL-023	9/19/2007	B24SL-723-01	
B24SL-031	9/19/2007	B24SL-731-01	
B24SL-032	9/19/2007	B24SL-732-01	

Notes:

[a] On-site Analysis by ARS International: Gamma Spectroscopy

[b] Off-site Analysis by TestAmerica Laboratories (formerly STL Inc.): Alpha Spec short count (Iso Uranium and Iso Thorium) DOE A-01-R MOD

DOE = Department of Energy

TABLE 3-42
SURFACE SOIL SAMPLE IDS FOR ONSITE GAMMA SPECTROSCOPY ANALYSIS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

A02SL-001-01	A02SL-029-01	A03SL-003-01	A03SL-028-01	A03SL-214-01	A04ASL-003-01	A04ASL-028-01	A04ASL-057-01	A04ASL-214-01
A02SL-002-01	A02SL-030-01	A03SL-004-01	A03SL-029-01	A03SL-215-01	A04ASL-004-01	A04ASL-029-01	A04ASL-058-01	A04ASL-215-01
A02SL-004-01	A02SL-031-01	A03SL-005-01	A03SL-030-01	A03SL-216-01	A04ASL-005-01	A04ASL-030-01	A04ASL-059-01	A04ASL-220-01
A02SL-005-01	A02SL-032-01	A03SL-006-01	A03SL-031-01	A03SL-217-01	A04ASL-006-01	A04ASL-031-01	A04ASL-060-01	A04ASL-224-01
A02SL-006-01	A02SL-033-01	A03SL-007-01	A03SL-032-01	A03SL-218-01	A04ASL-007-01	A04ASL-032-01	A04ASL-061-01	A04ASL-225-01
A02SL-007-01	A02SL-034-01	A03SL-008-01	A03SL-033-01	A03SL-220-01	A04ASL-008-01	A04ASL-033-01	A04ASL-062-01	A04ASL-228-01
A02SL-008-01	A02SL-035-01	A03SL-009-01	A03SL-034-01	A03SL-221-01	A04ASL-009-01	A04ASL-034-01	A04ASL-063-01	A04ASL-230-01
A02SL-009-01	A02SL-036-01	A03SL-010-01	A03SL-035-01	A03SL-222-01	A04ASL-010-01	A04ASL-035-01	A04ASL-064-01	A04ASL-236-01
A02SL-010-01	A02SL-037-01	A03SL-011-01	A03SL-036-01	A03SL-223-01	A04ASL-011-01	A04ASL-036-01	A04ASL-065-01	A04ASL-238-01
A02SL-011-01	A02SL-038-01	A03SL-012-01	A03SL-037-01	A03SL-224-01	A04ASL-012-01	A04ASL-037-01	A04ASL-066-01	A04ASL-239-01
A02SL-012-01	A02SL-039-01	A03SL-013-01	A03SL-038-01	A03SL-225-01	A04ASL-013-01	A04ASL-038-01	A04ASL-067-01	A04ASL-241-01
A02SL-013-01	A02SL-040-01	A03SL-014-01	A03SL-039-01	A03SL-226-01	A04ASL-014-01	A04ASL-039-01	A04ASL-068-01	A04ASL-243-01
A02SL-014-01	A02SL-041-01	A03SL-015-01	A03SL-040-01	A03SL-228-01	A04ASL-015-01	A04ASL-040-01	A04ASL-069-01	A04ASL-244-01
A02SL-015-01	A02SL-042-01	A03SL-016-01	A03SL-041-01	A03SL-230-01	A04ASL-016-01	A04ASL-042-01	A04ASL-070-01	A04ASL-247-01
A02SL-016-01	A02SL-043-01	A03SL-017-01	A03SL-042-01	A03SL-231-01	A04ASL-017-01	A04ASL-044-01	A04ASL-071-01	A04ASL-250-01
A02SL-017-01	A02SL-208-01	A03SL-018-01	A03SL-201-01	A03SL-232-01	A04ASL-018-01	A04ASL-045-01	A04ASL-072-01	A04ASL-271-01
A02SL-018-01	A02SL-215-01	A03SL-019-01	A03SL-202-01	A03SL-233-01	A04ASL-019-01	A04ASL-046-01	A04ASL-073-01	A04ASL-274-01
A02SL-019-01	A02SL-216-01	A03SL-020-01	A03SL-203-01	A03SL-234-01	A04ASL-020-01	A04ASL-047-01	A04ASL-076-01	A04ASL-275-01
A02SL-020-01	A02SL-217-01	A03SL-021-01	A03SL-204-01	A03SL-236-01	A04ASL-021-01	A04ASL-048-01	A04ASL-077-01	A04ASL-276-01
A02SL-021-01	A02SL-223-01	A03SL-022-01	A03SL-205-01	A03SL-237-01	A04ASL-022-01	A04ASL-051-01	A04ASL-203-01	A04ASL-278-01
A02SL-022-01	A02SL-229-01	A03SL-023-01	A03SL-206-01	A03SL-239-01	A04ASL-023-01	A04ASL-052-01	A04ASL-208-01	A04ASL-301-01
A02SL-023-01	A02SL-234-01	A03SL-024-01	A03SL-207-01	A03SL-240-01	A04ASL-024-01	A04ASL-053-01	A04ASL-209-01	A04ASL-302-01
A02SL-024-01	A02SL-703-01 [a]	A03SL-025-01	A03SL-208-01	A03SL-241-01	A04ASL-025-01	A04ASL-054-01	A04ASL-210-01	A04ASL-303-01
A02SL-025-01	A03SL-001-01	A03SL-026-01	A03SL-209-01	A04ASL-001-01	A04ASL-026-01	A04ASL-055-01	A04ASL-211-01	A04ASL-304-01
A02SL-026-01	A03SL-002-01	A03SL-027-01	A03SL-210-01	A04ASL-002-01	A04ASL-027-01	A04ASL-056-01	A04ASL-213-01	A04ASL-305-01
A04ASL-307-01	A04BSL-013-01	A04BSL-301-01	A04CSL-303-01	A04DSL-020-01	A04DSL-302-01	A05ASL-010-01	A05ASL-210-01	A05BSL-009-01
A04ASL-308-01	A04BSL-014-01	A04BSL-304-01	A04CSL-305-01	A04DSL-021-01	A04DSL-303-01	A05ASL-011-01	A05ASL-211-01	A05BSL-010-01
A04ASL-309-01	A04BSL-015-01	A04BSL-305-01	A04CSL-306-01	A04DSL-022-01	A04DSL-305-01	A05ASL-012-01	A05ASL-213-01	A05BSL-011-01
A04ASL-310-01	A04BSL-016-01	A04BSL-306-01	A04CSL-307-01	A04DSL-023-01	A04DSL-306-01	A05ASL-013-01	A05ASL-214-01	A10SL-302-01
A04ASL-312-01	A04BSL-017-01	A04BSL-308-01	A04CSL-308-01	A04DSL-024-01	A04DSL-307-01	A05ASL-014-01	A05ASL-215-01	A10SL-303-01
A04ASL-313-01	A04BSL-019-01	A04BSL-309-01	A04CSL-309-01	A04DSL-025-01	A04DSL-308-01	A05ASL-015-01	A05ASL-216-01	B02SL-002-01
A04ASL-314-01	A04BSL-021-01	A04BSL-310-01	A04CSL-310-01	A04DSL-026-01	A04DSL-309-01	A05ASL-016-01	A05ASL-219-01	B02SL-020-01
A04ASL-316-01	A04BSL-022-01	A04BSL-311-01	A04CSL-311-01	A04DSL-028-01	A04DSL-310-01	A05ASL-017-01	A05ASL-226-01	B02SL-022-01
A04ASL-317-01	A04BSL-024-01	A04BSL-312-01	A04CSL-312-01	A04DSL-029-01	A04DSL-311-01	A05ASL-018-01	A05ASL-228-01	B02SL-027-01
A04ASL-318-01	A04BSL-025-01	A04CSL-001-01	A04CSL-313-01	A04DSL-030-01	A04DSL-312-01	A05ASL-019-01	A05ASL-301-01	B02SL-028-01
A04ASL-319-01	A04BSL-027-01	A04CSL-002-01	A04DSL-001-01	A04DSL-031-01	A04DSL-313-01	A05ASL-020-01	A05ASL-302-01	B02SL-030-01
A04ASL-320-01	A04BSL-028-01	A04CSL-003-01	A04DSL-002-01	A04DSL-032-01	A04DSL-314-01	A05ASL-021-01	A05ASL-303-01	B02SL-036-01
A04ASL-321-01	A04BSL-029-01	A04CSL-005-01	A04DSL-003-01	A04DSL-201-01	A04DSL-315-01	A05ASL-022-01	A05ASL-304-01	B02SL-043-01
A04ASL-322-01	A04BSL-030-01	A04CSL-006-01	A04DSL-004-01	A04DSL-203-01	A04DSL-317-01	A05ASL-023-01	A05ASL-305-01	B02SL-046-01
A04ASL-323-01	A04BSL-031-01	A04CSL-007-01	A04DSL-005-01	A04DSL-204-01	A04DSL-318-01	A05ASL-024-01	A05ASL-306-01	B02SL-052-01
A04BSL-001-01	A04BSL-032-01	A04CSL-008-01	A04DSL-007-01	A04DSL-209-01	A04DSL-321-01	A05ASL-025-01	A05ASL-307-01	B02SL-056-01
A04BSL-002-01	A04BSL-033-01	A04CSL-009-01	A04DSL-009-01	A04DSL-210-01	A04DSL-326-01	A05ASL-026-01	A05ASL-308-01	B02SL-303-01
A04BSL-004-01	A04BSL-036-01	A04CSL-010-01	A04DSL-010-01	A04DSL-212-01	A05ASL-001-01	A05ASL-027-01	A05BSL-001-01	B02SL-707-01
A04BSL-005-01	A04BSL-038-01	A04CSL-011-01	A04DSL-012-01	A04DSL-213-01	A05ASL-002-01	A05ASL-028-01	A05BSL-002-01	B02SL-709-01
A04BSL-006-01	A04BSL-039-01	A04CSL-012-01	A04DSL-013-01	A04DSL-220-01	A05ASL-003-01	A05ASL-029-01	A05BSL-003-01	B02SL-710-01
A04BSL-008-01	A04BSL-040-01	A04CSL-013-01	A04DSL-015-01	A04DSL-223-01	A05ASL-004-01	A05ASL-030-01	A05BSL-004-01	B02SL-713-01
A04BSL-009-01	A04BSL-042-01	A04CSL-014-01	A04DSL-016-01	A04DSL-225-01	A05ASL-005-01	A05ASL-031-01	A05BSL-005-01	B02SL-714-01
A04BSL-010-01	A04BSL-043-01	A04CSL-015-01	A04DSL-017-01	A04DSL-226-01	A05ASL-006-01	A05ASL-201-01	A05BSL-006-01	B02SL-715-01
A04BSL-011-01	A04BSL-219-01	A04CSL-301-01	A04DSL-018-01	A04DSL-228-01	A05ASL-007-01	A05ASL-202-01	A05BSL-007-01	B02SL-716-01
A04BSL-012-01	A04BSL-221-01	A04CSL-302-01	A04DSL-019-01	A04DSL-301-01	A05ASL-008-01	A05ASL-209-01	A05BSL-008-01	B02SL-717-01

TABLE 3-42
SURFACE SOIL SAMPLE IDS FOR ONSITE GAMMA SPECTROSCOPY ANALYSIS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

B02SL-718-01	B02SL-750-01	B03SL-301-01	B03SL-725-01	B04&B09SL-707-01	B04&B09SL-736-01	B08SL-026-01
B02SL-719-01	B02SL-751-01	B03SL-305-01	B03SL-726-01	B04&B09SL-708-01	B04&B09SL-738-01	B08SL-028-01
B02SL-720-01	B02SL-752-01	B03SL-306-01	B03SL-727-01	B04&B09SL-710-01	B04&B09SL-739-01	B08SL-725-01
B02SL-721-01	B02SL-753-01	B03SL-307-01	B03SL-728-01	B04&B09SL-711-01	B04&B09SL-740-01	B24SL-701-01
B02SL-722-01	B02SL-754-01	B03SL-701-01	B03SL-729-01	B04&B09SL-712-01	B04&B09SL-741-01	B24SL-704-01
B02SL-723-01	B02SL-755-01	B03SL-702-01	B03SL-730-01	B04&B09SL-713-01	B06SL-003-01	B24SL-715-01
B02SL-724-01	B02SL-756-01	B03SL-704-01	B03SL-731-01	B04&B09SL-714-01	B06SL-004-01	B24SL-716-01
B02SL-725-01	B02SL-757-01	B03SL-705-01	B03SL-732-01	B04&B09SL-715-01	B06SL-005-01	B24SL-718-01
B02SL-726-01	B02SL-758-01	B03SL-706-01	B03SL-733-01	B04&B09SL-716-01	B06SL-010-01	B24SL-720-01
B02SL-727-01	B03SL-001-01	B03SL-707-01	B03SL-734-01	B04&B09SL-717-01	B06SL-011-01	B24SL-722-01
B02SL-728-01	B03SL-010-01	B03SL-708-01	B03SL-735-01	B04&B09SL-719-01	B06SL-021-01	B24SL-723-01
B02SL-729-01	B03SL-014-01	B03SL-709-01	B03SL-736-01	B04&B09SL-720-01	B06SL-023-01	B24SL-731-01
B02SL-730-01	B03SL-016-01	B03SL-710-01	B03SL-737-01	B04&B09SL-721-01	B06SL-301-01	B24SL-732-01
B02SL-732-01	B03SL-017-01	B03SL-711-01	B03SL-738-01	B04&B09SL-722-01	B06SL-702-01	BKGSL-001-01
B02SL-733-01	B03SL-020-01	B03SL-712-01	B03SL-739-01	B04&B09SL-723-01	B06SL-707-01	BKGSL-002-01
B02SL-736-01	B03SL-024-01	B03SL-713-01	B04&B09SL-008-01	B04&B09SL-724-01	B06SL-708-01	BKGSL-003-01
B02SL-737-01	B03SL-025-01	B03SL-715-01	B04&B09SL-015-01	B04&B09SL-725-01	B06SL-709-01	BKGSL-004-01
B02SL-738-01	B03SL-026-01	B03SL-717-01	B04&B09SL-017-01	B04&B09SL-727-01	B06SL-717-01	BKGSL-005-01
B02SL-739-01	B03SL-027-01	B03SL-718-01	B04&B09SL-018-01	B04&B09SL-728-01	B08SL-002-01	BKGSL-006-01
B02SL-742-01	B03SL-028-01	B03SL-719-01	B04&B09SL-019-01	B04&B09SL-729-01	B08SL-003-01	BKGSL-007-01
B02SL-743-01	B03SL-029-01	B03SL-720-01	B04&B09SL-026-01	B04&B09SL-730-01	B08SL-004-01	BKGSL-008-01
B02SL-745-01	B03SL-030-01	B03SL-721-01	B04&B09SL-702-01	B04&B09SL-731-01	B08SL-005-01	BKGSL-009-01
B02SL-746-01	B03SL-031-01	B03SL-722-01	B04&B09SL-703-01	B04&B09SL-732-01	B08SL-010-01	BKGSL-010-01
B02SL-748-01	B03SL-033-01	B03SL-723-01	B04&B09SL-704-01	B04&B09SL-733-01	B08SL-011-01	BKGSL-011-01
B02SL-749-01	B03SL-037-01	B03SL-724-01	B04&B09SL-705-01	B04&B09SL-734-01	B08SL-023-01	BKGSL-012-01

Notes:
[a] Sample is not a detritus sample; sample labeled incorrectly during field activities. Preferred ID is A02SL-003-01.

TABLE 3-43
OFFSITE SURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	ANALYTICAL METHODS								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A02SL-001-01		X		X					
A02SL-002-01		X		X		X	X		
A02SL-703-01 [a]		X		X					
A02SL-005-01		X		X		X	X		
A02SL-007-01		X		X					
A02SL-011-01		X		X		X	X		
A02SL-012-01						X	X		
A02SL-013-01	X								
A02SL-014-01		X		X					
A02SL-015-01		X		X		X	X		
A02SL-016-01		X		X		X	X		
A02SL-020-01		X		X					
A02SL-022-01		X		X		X	X		
A02SL-023-01		X		X					
A02SL-024-01		X		X					
A02SL-025-01		X		X		X	X		
A02SL-026-01		X		X		X	X		
A02SL-029-01		X		X					
A02SL-030-01		X		X					
A02SL-032-01		X		X					
A02SL-033-01		X		X					
A02SL-034-01		X		X					
A02SL-035-01		X		X					
A02SL-038-01		X		X		X	X		
A02SL-041-01		X		X		X	X		
A02SL-042-01		X		X					
A02SL-043-01		X		X		X	X		
A02SL-215-01		X		X		X	X		
A02SL-216-01		X		X		X	X		
A02SL-234-01		X		X					
A03SL-002-01		X		X					
A03SL-009-01	X	X		X		X	X		
A03SL-011-01		X		X					
A03SL-018-01	X	X		X		X	X		
A03SL-021-01		X		X					
A03SL-026-01		X		X					
A03SL-027-01		X		X					
A03SL-028-01		X		X					
A03SL-029-01		X		X					
A03SL-031-01		X		X					
A03SL-033-01		X		X					
A03SL-035-01		X		X					
A03SL-036-01		X		X		X	X		
A03SL-037-01		X		X					
A03SL-038-01		X		X		X	X		

TABLE 3-43
OFFSITE SURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	ANALYTICAL METHODS								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A03SL-040-01		X		X		X	X		
A03SL-042-01		X		X					
A03SL-203-01		X		X		X	X		
A03SL-209-01		X		X		X	X		
A03SL-217-01		X		X					
A03SL-221-01		X		X		X	X		
A03SL-224-01		X		X		X	X		
A03SL-226-01	X	X		X					
A03SL-228-01		X		X		X	X		
A03SL-231-01		X		X		X	X		
A03SL-232-01		X		X		X	X		
A03SL-233-01		X		X		X	X		
A03SL-234-01		X		X		X	X		
A03SL-237-01		X		X		X	X		
A03SL-239-01		X		X					
A04ASL-003-01	X	X		X		X	X		
A04ASL-009-01		X		X					
A04ASL-014-01		X		X		X	X		
A04ASL-020-01		X		X					
A04ASL-024-01		X		X		X	X		
A04ASL-031-01		X		X		X	X		
A04ASL-034-01		X		X					
A04ASL-038-01		X		X		X	X		
A04ASL-044-01		X		X					
A04ASL-051-01	X	X	X	X	X	X	X	X	X
A04ASL-054-01		X		X		X	X		
A04ASL-055-01		X		X		X	X		
A04ASL-056-01		X		X		X	X		
A04ASL-058-01		X		X					
A04ASL-059-01		X		X					
A04ASL-060-01		X		X					
A04ASL-061-01		X		X		X	X		
A04ASL-062-01		X		X		X	X		
A04ASL-203-01	X	X		X					
A04ASL-214-01		X		X					
A04ASL-220-01		X		X					
A04ASL-238-01		X		X		X	X		
A04ASL-241-01		X		X		X	X		
A04ASL-244-01	X	X		X		X	X		
A04ASL-276-01		X		X		X	X		
A04ASL-278-01		X		X					
A04ASL-309-01		X		X					
A04ASL-318-01	X	X		X		X	X		
A04ASL-319-01		X		X					
A04ASL-320-01		X		X					

TABLE 3-43
OFFSITE SURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	ANALYTICAL METHODS								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A04BSL-001-01		X		X					
A04BSL-002-01		X		X		X	X		
A04BSL-004-01		X		X					
A04BSL-005-01		X		X		X	X		
A04BSL-006-01		X		X		X	X		
A04BSL-008-01		X		X					
A04BSL-009-01		X		X					
A04BSL-010-01		X		X					
A04BSL-011-01		X		X		X	X		
A04BSL-013-01		X		X					
A04BSL-014-01		X		X					
A04BSL-016-01		X		X		X	X		
A04BSL-019-01		X		X					
A04BSL-021-01		X		X		X	X		
A04BSL-025-01		X		X		X	X		
A04BSL-027-01		X		X		X	X		
A04BSL-028-01		X		X		X	X		
A04BSL-033-01		X		X					
A04BSL-039-01		X		X		X	X		
A04BSL-042-01		X		X		X	X		
A04BSL-043-01		X		X		X	X		
A04BSL-221-01		X		X		X	X		
A04BSL-301-01	X								
A04BSL-308-01		X		X					
A04BSL-309-01		X		X					
A04BSL-310-01		X		X					
A04CSL-001-01		X		X		X	X		
A04CSL-002-01		X		X		X	X		
A04CSL-003-01		X		X		X	X		
A04CSL-005-01		X		X					
A04CSL-006-01		X		X					
A04CSL-007-01		X		X					
A04CSL-008-01		X		X					
A04CSL-009-01		X		X					
A04CSL-011-01		X		X					
A04CSL-012-01		X		X					
A04CSL-013-01		X		X		X	X		
A04CSL-014-01		X		X		X	X		
A04CSL-015-01		X		X		X	X		
A04CSL-301-01		X		X					
A04CSL-305-01		X		X					
A04CSL-307-01		X		X					
A04CSL-308-01		X		X					
A04CSL-309-01		X		X					
A04CSL-310-01		X		X					

TABLE 3-43
OFFSITE SURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	ANALYTICAL METHODS								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A04CSL-312-01		X		X					
A04CSL-313-01	X								
A04DSL-015-01		X		X					
A04DSL-020-01		X		X		X	X		
A04DSL-021-01	X	X		X					
A04DSL-023-01		X		X		X	X		
A04DSL-024-01		X		X		X	X		
A04DSL-026-01	X	X		X		X	X		
A04DSL-029-01	X	X		X					
A04DSL-204-01						X	X		
A04DSL-220-01		X		X					
A04DSL-307-01	X	X		X		X	X		
A04DSL-308-01	X	X		X					
A04DSL-317-01		X		X					
A04DSL-326-01	X	X		X					
A05ASL-003-01		X		X		X	X		
A05ASL-004-01		X		X		X	X		
A05ASL-005-01		X		X					
A05ASL-007-01		X		X					
A05ASL-008-01		X		X					
A05ASL-011-01		X		X		X	X		
A05ASL-012-01		X		X		X	X		
A05ASL-017-01		X		X					
A05ASL-018-01		X		X		X	X		
A05ASL-019-01	X	X		X		X	X		
A05ASL-020-01		X		X		X	X		
A05ASL-021-01		X		X					
A05ASL-022-01		X		X					
A05ASL-023-01		X		X					
A05ASL-024-01		X		X					
A05ASL-025-01		X		X		X	X		
A05ASL-026-01		X		X					
A05ASL-029-01		X		X					
A05ASL-210-01		X		X		X	X		
A05ASL-211-01	X	X		X		X	X		
A05ASL-219-01		X		X		X	X		
A05ASL-226-01		X		X					
A05ASL-301-01	X	X	X	X	X	X	X	X	X
A05ASL-302-01		X		X					
A05ASL-303-01		X		X		X	X		
A05ASL-304-01		X		X		X	X		
A05ASL-305-01		X		X					
A05ASL-307-01		X		X					
A05ASL-308-01	X	X		X		X	X		
A05BSL-001-01		X		X		X	X		

TABLE 3-43
OFFSITE SURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	ANALYTICAL METHODS								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A05BSL-003-01		X		X					
A05BSL-004-01		X		X		X	X		
A05BSL-005-01	X	X		X		X	X		
A05BSL-006-01		X		X					
A05BSL-007-01		X		X		X	X		
A05BSL-008-01		X		X					
A05BSL-009-01		X		X		X	X		
A05BSL-010-01		X		X					
A05BSL-011-01		X		X		X	X		
A10SL-302-01	X								
A10SL-303-01		X		X		X	X		
B02SL-020-01		X		X					
B02SL-046-01		X		X		X	X		
B03SL-014-01		X		X		X	X		
B03SL-016-01		X		X		X	X		
B03SL-020-01		X		X					
B03SL-030-01		X		X					
B03SL-033-01	X								
B03SL-037-01	X	X	X	X	X	X	X	X	X
B04&B09SL-015-01		X		X		X	X		
B04&B09SL-017-01		X		X					
B04&B09SL-018-01		X		X		X	X		
B04&B09SL-026-01		X		X		X	X		
B06SL-003-01		X		X		X	X		
B06SL-005-01		X		X		X	X		
B06SL-021-01	X	X		X		X	X		
B08SL-003-01	X	X	X	X	X	X	X	X	X
B08SL-023-01	X	X		X					
Totals:	28	201	4	201	4	103	103	4	4
QA/QC Duplicate Samples									
A02SL-703-51		X		X					
A03SL-018-51						X	X		
A03SL-036-51	X	X		X					
A04ASL-003-51	X								
A04ASL-038-51	X	X		X					
A04ASL-055-51						X	X		
A04BSL-016-51	X	X		X					
A04BSL-027-51						X	X		
A04DSL-021-51	X								
A05ASL-004-51	X	X		X					
A05ASL-018-51						X	X		
A05ASL-020-51		X		X					
A05BSL-009-51						X	X		

TABLE 3-43
OFFSITE SURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	ANALYTICAL METHODS								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A05BSL-011-51	X	X		X					
B02SL-046-51		X		X					
Totals:	7	8	0	8	0	5	5	0	0

Notes:
This surface soil sample table does not include background samples.
Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri.
[a] Sample labeled incorrectly during field activities. Correct ID should be A02SL-003-01. Sample was not collected using drilling techniques.
Alpha Spec = Alpha Spectroscopy
CT = Count
DOE = Department of Energy
EPA = Environmental Protection Agency
Gamma Spec = Gamma Spectroscopy
GFPC = Gas Flow Proportional Counting
Gross A/B = Gross Alpha/Beta
ICP/MS = Inductively Coupled Plasma Mass Spectrometry
QA/QC = Quality Assurance/Quality Control

TABLE 3-44
SUBSURFACE SOIL SAMPLE IDS FOR ONSITE GAMMA SPECTROSCOPY ANALYSIS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

A02SL-001-03	A02SL-028-02	A03SL-013-02	A03SL-217-13	A04ASL-011-04	A04ASL-047-02	A04ASL-218-04	A04ASL-278-19
A02SL-002-02	A02SL-030-06	A03SL-015-02	A03SL-217-14	A04ASL-012-03	A04ASL-048-02	A04ASL-218-15	A04ASL-301-06
A02SL-004-06	A02SL-031-06	A03SL-016-02	A03SL-218-10	A04ASL-012-04	A04ASL-051-02	A04ASL-218-17	A04ASL-301-07
A02SL-004-07	A02SL-031-07	A03SL-018-02	A03SL-220-02	A04ASL-013-02	A04ASL-052-02	A04ASL-220-14	A04ASL-302-06
A02SL-005-02	A02SL-032-03	A03SL-018-03	A03SL-222-10	A04ASL-016-03	A04ASL-053-02	A04ASL-220-15	A04ASL-302-07
A02SL-006-03	A02SL-033-03	A03SL-019-10	A03SL-222-13	A04ASL-016-04	A04ASL-055-02	A04ASL-223-06	A04ASL-303-03
A02SL-007-05	A02SL-034-03	A03SL-019-11	A03SL-223-05	A04ASL-017-03	A04ASL-056-04	A04ASL-224-10	A04ASL-304-03
A02SL-008-02	A02SL-035-02	A03SL-020-02	A03SL-224-02	A04ASL-018-03	A04ASL-056-05	A04ASL-224-11	A04ASL-305-14
A02SL-009-03	A02SL-036-03	A03SL-021-02	A03SL-224-05	A04ASL-019-06	A04ASL-057-05	A04ASL-224-14	A04ASL-305-17
A02SL-009-04	A02SL-036-05	A03SL-022-02	A03SL-225-10	A04ASL-021-03	A04ASL-057-06	A04ASL-224-15	A04ASL-306-01
A02SL-010-02	A02SL-037-05	A03SL-023-03	A03SL-226-25	A04ASL-021-04	A04ASL-058-02	A04ASL-225-06	A04ASL-306-03
A02SL-011-02	A02SL-037-06	A03SL-025-02	A03SL-227-04	A04ASL-022-03	A04ASL-059-02	A04ASL-228-02	A04ASL-307-06
A02SL-012-02	A02SL-038-03	A03SL-027-02	A03SL-227-18	A04ASL-026-03	A04ASL-061-02	A04ASL-230-05	A04ASL-307-07
A02SL-013-03	A02SL-038-04	A03SL-028-03	A03SL-228-06	A04ASL-027-03	A04ASL-062-02	A04ASL-230-06	A04ASL-308-06
A02SL-014-06	A02SL-039-03	A03SL-028-05	A03SL-230-06	A04ASL-027-04	A04ASL-063-03	A04ASL-236-09	A04ASL-308-07
A02SL-015-10	A02SL-039-06	A03SL-029-11	A03SL-231-02	A04ASL-028-02	A04ASL-064-02	A04ASL-236-10	A04ASL-309-06
A02SL-015-11	A02SL-040-04	A03SL-030-02	A03SL-231-05	A04ASL-029-03	A04ASL-065-02	A04ASL-238-05	A04ASL-310-02
A02SL-016-02	A02SL-041-02	A03SL-031-02	A03SL-232-06	A04ASL-030-02	A04ASL-066-03	A04ASL-239-03	A04ASL-310-09
A02SL-016-03	A02SL-042-06	A03SL-032-02	A03SL-233-07	A04ASL-031-02	A04ASL-067-02	A04ASL-239-04	A04ASL-311-01
A02SL-017-02	A02SL-043-06	A03SL-033-02	A03SL-233-09	A04ASL-031-03	A04ASL-068-02	A04ASL-240-02	A04ASL-311-06
A02SL-018-03	A02SL-208-06	A03SL-033-03	A03SL-234-13	A04ASL-031-04	A04ASL-069-02	A04ASL-241-06	A04ASL-311-07
A02SL-018-05	A02SL-208-07	A03SL-035-02	A03SL-237-10	A04ASL-031-05	A04ASL-073-02	A04ASL-241-07	A04ASL-312-03
A02SL-019-02	A02SL-215-10	A03SL-036-02	A03SL-239-10	A04ASL-031-06	A04ASL-076-02	A04ASL-243-03	A04ASL-312-04
A02SL-019-06	A02SL-215-11	A03SL-037-02	A03SL-239-11	A04ASL-031-07	A04ASL-076-03	A04ASL-244-02	A04ASL-313-06
A02SL-020-02	A02SL-216-10	A03SL-038-10	A03SL-239-13	A04ASL-031-08	A04ASL-077-06	A04ASL-244-03	A04ASL-314-03
A02SL-020-03	A02SL-216-13	A03SL-038-11	A03SL-240-06	A04ASL-031-09	A04ASL-077-07	A04ASL-247-03	A04ASL-314-07
A02SL-021-03	A02SL-217-02	A03SL-039-02	A03SL-240-07	A04ASL-031-10	A04ASL-203-06	A04ASL-247-04	A04ASL-315-01
A02SL-021-04	A02SL-229-02	A03SL-041-02	A04ASL-001-03	A04ASL-031-11	A04ASL-203-09	A04ASL-249-01	A04ASL-315-03
A02SL-022-03	A02SL-234-02	A03SL-042-02	A04ASL-001-05	A04ASL-031-12	A04ASL-208-15	A04ASL-249-03	A04ASL-315-05
A02SL-022-04	A03SL-001-02	A03SL-201-02	A04ASL-002-03	A04ASL-032-03	A04ASL-209-10	A04ASL-249-06	A04ASL-316-06
A02SL-023-02	A03SL-003-02	A03SL-202-05	A04ASL-002-04	A04ASL-032-04	A04ASL-210-03	A04ASL-250-04	A04ASL-317-02
A02SL-024-03	A03SL-006-02	A03SL-203-02	A04ASL-003-03	A04ASL-033-03	A04ASL-211-06	A04ASL-266-02	A04ASL-318-02
A02SL-024-06	A03SL-007-02	A03SL-207-06	A04ASL-004-03	A04ASL-033-04	A04ASL-213-14	A04ASL-270-03	A04ASL-319-02
A02SL-024-07	A03SL-008-03	A03SL-208-09	A04ASL-004-04	A04ASL-036-02	A04ASL-213-17	A04ASL-271-03	A04ASL-320-03
A02SL-025-06	A03SL-008-05	A03SL-209-06	A04ASL-005-03	A04ASL-037-02	A04ASL-214-03	A04ASL-274-02	A04ASL-321-03
A02SL-025-07	A03SL-009-02	A03SL-210-06	A04ASL-006-03	A04ASL-038-02	A04ASL-214-05	A04ASL-274-10	A04ASL-322-03
A02SL-026-07	A03SL-010-06	A03SL-214-06	A04ASL-007-06	A04ASL-039-02	A04ASL-214-06	A04ASL-274-11	A04ASL-322-09
A02SL-027-01	A03SL-011-02	A03SL-215-06	A04ASL-008-02	A04ASL-042-03	A04ASL-214-09	A04ASL-275-03	A04BSL-001-05
A02SL-027-06	A03SL-011-03	A03SL-216-10	A04ASL-009-06	A04ASL-045-03	A04ASL-215-03	A04ASL-276-05	A04BSL-002-05
A02SL-028-01	A03SL-012-02	A03SL-216-14	A04ASL-011-03	A04ASL-046-06	A04ASL-215-05	A04ASL-278-10	A04BSL-003-01

TABLE 3-44
SUBSURFACE SOIL SAMPLE IDS FOR ONSITE GAMMA SPECTROSCOPY ANALYSIS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

A04BSL-003-03	A04BSL-037-05	A04CSL-307-02	A04DSL-023-04	A04DSL-311-02	A05ASL-010-07	A05ASL-301-02
A04BSL-004-02	A04BSL-038-07	A04CSL-308-02	A04DSL-024-02	A04DSL-311-03	A05ASL-010-08	A05ASL-301-06
A04BSL-005-02	A04BSL-040-03	A04CSL-309-02	A04DSL-024-03	A04DSL-312-02	A05ASL-010-09	A05ASL-302-10
A04BSL-006-06	A04BSL-041-01	A04CSL-309-05	A04DSL-024-04	A04DSL-313-02	A05ASL-011-06	A05ASL-302-13
A04BSL-007-06	A04BSL-041-05	A04CSL-310-02	A04DSL-026-02	A04DSL-314-02	A05ASL-011-12	A05ASL-302-14
A04BSL-008-03	A04BSL-042-02	A04CSL-311-02	A04DSL-027-01	A04DSL-315-02	A05ASL-012-06	A05ASL-303-13
A04BSL-009-06	A04BSL-043-02	A04CSL-312-02	A04DSL-027-02	A04DSL-316-01	A05ASL-012-07	A05ASL-303-14
A04BSL-012-06	A04BSL-219-03	A04CSL-313-03	A04DSL-028-02	A04DSL-316-02	A05ASL-015-02	A05ASL-304-02
A04BSL-013-07	A04BSL-301-11	A04DSL-002-05	A04DSL-029-02	A04DSL-317-03	A05ASL-017-03	A05ASL-304-13
A04BSL-014-07	A04BSL-302-01	A04DSL-003-02	A04DSL-030-02	A04DSL-317-05	A05ASL-018-02	A05ASL-304-14
A04BSL-015-06	A04BSL-302-06	A04DSL-005-02	A04DSL-030-05	A04DSL-318-02	A05ASL-018-03	A05ASL-305-02
A04BSL-015-07	A04BSL-303-01	A04DSL-005-03	A04DSL-031-03	A04DSL-319-01	A05ASL-021-06	A05ASL-305-03
A04BSL-016-03	A04BSL-303-06	A04DSL-006-01	A04DSL-031-04	A04DSL-319-06	A05ASL-022-02	A05ASL-305-13
A04BSL-017-02	A04BSL-303-07	A04DSL-006-02	A04DSL-032-02	A04DSL-320-01	A05ASL-022-03	A05ASL-306-03
A04BSL-018-01	A04BSL-304-02	A04DSL-006-03	A04DSL-201-02	A04DSL-320-05	A05ASL-023-03	A05ASL-308-04
A04BSL-018-06	A04BSL-304-03	A04DSL-007-02	A04DSL-203-06	A04DSL-321-02	A05ASL-024-02	A05BSL-001-11
A04BSL-018-07	A04BSL-305-06	A04DSL-007-03	A04DSL-204-03	A04DSL-322-01	A05ASL-025-02	A05BSL-001-12
A04BSL-019-02	A04BSL-306-03	A04DSL-008-01	A04DSL-209-06	A04DSL-322-06	A05ASL-027-03	A05BSL-001-13
A04BSL-020-01	A04BSL-307-01	A04DSL-008-05	A04DSL-210-02	A04DSL-323-01	A05ASL-029-03	A05BSL-002-10
A04BSL-020-06	A04BSL-307-02	A04DSL-008-06	A04DSL-212-02	A04DSL-323-06	A05ASL-029-04	A05BSL-002-11
A04BSL-022-03	A04BSL-308-02	A04DSL-010-02	A04DSL-213-02	A04DSL-324-01	A05ASL-031-03	A05BSL-003-03
A04BSL-023-01	A04BSL-309-03	A04DSL-011-01	A04DSL-214-01	A04DSL-324-03	A05ASL-201-06	A05BSL-003-06
A04BSL-023-02	A04BSL-310-06	A04DSL-011-03	A04DSL-214-02	A04DSL-324-04	A05ASL-201-15	A05BSL-003-08
A04BSL-024-06	A04BSL-310-07	A04DSL-011-04	A04DSL-223-02	A04DSL-325-01	A05ASL-202-14	A05BSL-004-03
A04BSL-025-03	A04BSL-311-05	A04DSL-013-02	A04DSL-225-05	A04DSL-325-02	A05ASL-209-14	A05BSL-004-04
A04BSL-026-01	A04BSL-312-02	A04DSL-014-01	A04DSL-226-02	A04DSL-326-02	A05ASL-209-25	A05BSL-005-03
A04BSL-026-06	A04CSL-003-02	A04DSL-014-02	A04DSL-228-02	A04DSL-326-03	A05ASL-210-11	A05BSL-005-04
A04BSL-029-03	A04CSL-004-02	A04DSL-015-02	A04DSL-301-02	A05ASL-003-02	A05ASL-210-15	A05BSL-005-06
A04BSL-030-02	A04CSL-006-02	A04DSL-015-03	A04DSL-301-05	A05ASL-003-03	A05ASL-211-07	A05BSL-006-11
A04BSL-031-06	A04CSL-006-03	A04DSL-016-02	A04DSL-303-06	A05ASL-004-02	A05ASL-211-11	A05BSL-006-13
A04BSL-031-07	A04CSL-011-03	A04DSL-017-02	A04DSL-304-01	A05ASL-004-03	A05ASL-213-06	A05BSL-007-03
A04BSL-032-06	A04CSL-011-04	A04DSL-018-03	A04DSL-304-03	A05ASL-006-06	A05ASL-213-17	A05BSL-007-10
A04BSL-032-07	A04CSL-013-02	A04DSL-018-04	A04DSL-304-05	A05ASL-007-03	A05ASL-214-06	A05BSL-008-03
A04BSL-033-06	A04CSL-302-05	A04DSL-019-06	A04DSL-305-02	A05ASL-008-06	A05ASL-214-09	A05BSL-008-06
A04BSL-034-01	A04CSL-303-05	A04DSL-019-07	A04DSL-306-02	A05ASL-008-07	A05ASL-216-06	A05BSL-008-07
A04BSL-034-05	A04CSL-304-01	A04DSL-021-02	A04DSL-306-03	A05ASL-008-08	A05ASL-216-10	A05BSL-009-03
A04BSL-035-01	A04CSL-304-03	A04DSL-021-03	A04DSL-307-02	A05ASL-009-01	A05ASL-219-02	A05BSL-009-04
A04BSL-035-06	A04CSL-304-13	A04DSL-022-06	A04DSL-307-03	A05ASL-009-07	A05ASL-226-02	A05BSL-010-03
A04BSL-036-05	A04CSL-305-06	A04DSL-022-07	A04DSL-308-02	A05ASL-009-12	A05ASL-228-23	A05BSL-010-04
A04BSL-037-01	A04CSL-306-06	A04DSL-023-03	A04DSL-309-02	A05ASL-009-16	A05ASL-305-14	A05BSL-011-03

TABLE 3-44
SUBSURFACE SOIL SAMPLE IDS FOR ONSITE GAMMA SPECTROSCOPY ANALYSIS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

A05BSL-011-04	B02SL-006-01	B02SL-029-02	B02SL-055-01	B03SL-017-02	B04&B09SL-003-01	B04&B09SL-029-05
A10SL-001-01	B02SL-006-02	B02SL-031-01	B02SL-055-02	B03SL-017-03	B04&B09SL-004-01	B04&B09SL-030-01
A10SL-002-01	B02SL-007-01	B02SL-031-02	B02SL-055-03	B03SL-020-02	B04&B09SL-005-01	B04&B09SL-030-02
A10SL-003-01	B02SL-007-02	B02SL-032-01	B02SL-055-05	B03SL-021-01	B04&B09SL-006-01	B04&B09SL-031-01
A10SL-003-02	B02SL-008-01	B02SL-033-01	B02SL-057-05	B03SL-021-02	B04&B09SL-006-02	B04&B09SL-031-05
A10SL-004-01	B02SL-008-02	B02SL-033-02	B02SL-058-01	B03SL-022-01	B04&B09SL-007-01	B04&B09SL-032-01
A10SL-004-02	B02SL-008-03	B02SL-034-01	B02SL-059-01	B03SL-022-02	B04&B09SL-007-05	B04&B09SL-032-02
A10SL-005-01	B02SL-009-01	B02SL-035-01	B02SL-059-02	B03SL-023-01	B04&B09SL-008-03	B04&B09SL-033-01
A10SL-006-01	B02SL-009-02	B02SL-035-02	B02SL-301-01	B03SL-024-03	B04&B09SL-009-01	B04&B09SL-033-02
A10SL-006-06	B02SL-010-01	B02SL-036-02	B02SL-301-02	B03SL-024-04	B04&B09SL-009-02	B04&B09SL-034-01
A10SL-007-01	B02SL-010-02	B02SL-037-02	B02SL-302-01	B03SL-025-02	B04&B09SL-009-06	B04&B09SL-035-01
A10SL-007-06	B02SL-011-01	B02SL-037-05	B02SL-302-05	B03SL-025-03	B04&B09SL-010-01	B04&B09SL-035-02
A10SL-008-01	B02SL-012-01	B02SL-037-06	B02SL-303-06	B03SL-026-02	B04&B09SL-010-05	B04&B09SL-036-01
A10SL-009-01	B02SL-012-02	B02SL-038-01	B03SL-001-02	B03SL-027-02	B04&B09SL-011-01	B04&B09SL-036-02
A10SL-009-02	B02SL-013-01	B02SL-040-01	B03SL-002-01	B03SL-027-03	B04&B09SL-012-01	B04&B09SL-037-01
A10SL-010-01	B02SL-014-01	B02SL-040-03	B03SL-002-02	B03SL-028-02	B04&B09SL-012-02	B04&B09SL-037-02
A10SL-010-02	B02SL-014-02	B02SL-041-01	B03SL-003-01	B03SL-029-06	B04&B09SL-013-01	B04&B09SL-038-01
A10SL-011-01	B02SL-015-01	B02SL-041-02	B03SL-003-02	B03SL-030-02	B04&B09SL-014-01	B04&B09SL-038-02
A10SL-011-02	B02SL-016-01	B02SL-042-01	B03SL-004-01	B03SL-031-05	B04&B09SL-015-02	B04&B09SL-038-03
A10SL-012-01	B02SL-017-01	B02SL-043-02	B03SL-004-02	B03SL-032-01	B04&B09SL-016-01	B04&B09SL-039-01
A10SL-012-02	B02SL-017-05	B02SL-044-01	B03SL-005-01	B03SL-032-02	B04&B09SL-017-02	B04&B09SL-039-06
A10SL-013-01	B02SL-018-01	B02SL-045-01	B03SL-006-01	B03SL-033-03	B04&B09SL-018-02	B04&B09SL-040-01
A10SL-013-02	B02SL-018-02	B02SL-046-02	B03SL-006-03	B03SL-033-05	B04&B09SL-019-07	B04&B09SL-040-02
A10SL-301-01	B02SL-018-03	B02SL-047-01	B03SL-007-01	B03SL-034-01	B04&B09SL-020-01	B04&B09SL-041-01
A10SL-301-02	B02SL-019-01	B02SL-048-01	B03SL-008-01	B03SL-035-01	B04&B09SL-020-02	B04&B09SL-041-02
A10SL-301-13	B02SL-019-02	B02SL-048-02	B03SL-009-01	B03SL-036-01	B04&B09SL-021-01	B04&B09SL-041-03
A10SL-302-02	B02SL-020-03	B02SL-049-01	B03SL-010-02	B03SL-036-02	B04&B09SL-021-05	B04&B09SL-041-04
A10SL-302-13	B02SL-022-03	B02SL-049-02	B03SL-011-01	B03SL-301-06	B04&B09SL-022-01	B04&B09SL-301-01
A10SL-302-15	B02SL-022-04	B02SL-050-01	B03SL-011-02	B03SL-302-01	B04&B09SL-022-05	B04&B09SL-301-02
A10SL-303-02	B02SL-023-01	B02SL-050-02	B03SL-013-01	B03SL-303-01	B04&B09SL-023-01	B04&B09SL-302-01
A10SL-303-13	B02SL-023-02	B02SL-051-01	B03SL-013-02	B03SL-303-06	B04&B09SL-024-01	B04&B09SL-302-02
A10SL-303-18	B02SL-023-03	B02SL-051-02	B03SL-014-05	B03SL-304-01	B04&B09SL-025-01	B04&B09SL-302-05
A10SL-303-25	B02SL-024-01	B02SL-051-05	B03SL-014-08	B03SL-304-02	B04&B09SL-025-02	B04&B09SL-303-01
B02SL-001-01	B02SL-024-02	B02SL-052-03	B03SL-015-01	B03SL-305-02	B04&B09SL-026-02	B04&B09SL-303-02
B02SL-002-03	B02SL-025-01	B02SL-052-05	B03SL-015-02	B03SL-306-10	B04&B09SL-026-05	B04&B09SL-304-01
B02SL-003-01	B02SL-025-02	B02SL-052-06	B03SL-016-05	B03SL-306-11	B04&B09SL-026-06	B04&B09SL-304-02
B02SL-003-03	B02SL-026-01	B02SL-053-01	B03SL-018-01	B04&B09SL-001-01	B04&B09SL-027-01	B04&B09SL-304-06
B02SL-004-01	B02SL-026-02	B02SL-053-02	B03SL-018-02	B04&B09SL-001-02	B04&B09SL-027-02	B04&B09SL-305-01
B02SL-004-02	B02SL-027-03	B02SL-054-01	B03SL-019-01	B04&B09SL-002-01	B04&B09SL-028-01	B04&B09SL-305-02
B02SL-005-01	B02SL-029-01	B02SL-054-02	B03SL-016-07	B04&B09SL-002-02	B04&B09SL-029-01	B04&B09SL-305-03

TABLE 3-44
SUBSURFACE SOIL SAMPLE IDS FOR ONSITE GAMMA SPECTROSCOPY ANALYSIS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

B06SL-001-01	B06SL-024-01	B08SL-022-01	B24SL-014-01	B24SL-305-01	BKGSL-002-07	BKGSL-008-03
B06SL-001-02	B06SL-024-04	B08SL-022-02	B24SL-014-02	B24SL-305-03	BKGSL-003-02	BKGSL-008-04
B06SL-002-01	B06SL-301-02	B08SL-023-03	B24SL-015-01	B35SL-001-01	BKGSL-003-03	BKGSL-008-05
B06SL-002-02	B06SL-302-01	B08SL-023-07	B24SL-016-01	B35SL-001-05	BKGSL-003-04	BKGSL-008-06
B06SL-003-03	B08SL-001-01	B08SL-023-08	B24SL-017-01	B35SL-001-07	BKGSL-003-05	BKGSL-008-07
B06SL-004-05	B08SL-001-02	B08SL-024-01	B24SL-018-01	B35SL-002-01	BKGSL-003-06	BKGSL-008-08
B06SL-005-03	B08SL-002-02	B08SL-024-03	B24SL-018-02	B35SL-002-06	BKGSL-003-07	BKGSL-008-09
B06SL-006-01	B08SL-003-05	B08SL-025-01	B24SL-018-03	B35SL-002-07	BKGSL-003-08	BKGSL-008-10
B06SL-006-02	B08SL-004-02	B08SL-026-02	B24SL-019-01	B35SL-003-01	BKGSL-003-09	BKGSL-008-11
B06SL-007-01	B08SL-005-02	B08SL-027-01	B24SL-019-02	B35SL-003-07	BKGSL-003-10	BKGSL-009-02
B06SL-007-02	B08SL-006-01	B08SL-027-02	B24SL-021-01	B35SL-003-09	BKGSL-003-11	BKGSL-009-03
B06SL-008-01	B08SL-006-02	B08SL-028-05	B24SL-021-02	B35SL-004-01	BKGSL-003-12	BKGSL-009-04
B06SL-008-14	B08SL-007-01	B08SL-028-06	B24SL-022-01	B35SL-004-06	BKGSL-004-02	BKGSL-009-05
B06SL-009-01	B08SL-007-02	B08SL-301-01	B24SL-023-01	B35SL-004-07	BKGSL-004-03	BKGSL-009-06
B06SL-009-06	B08SL-008-01	B08SL-301-02	B24SL-023-02	B35SL-301-01	BKGSL-004-04	BKGSL-009-07
B06SL-010-02	B08SL-008-02	B08SL-302-01	B24SL-025-01	B35SL-301-07	BKGSL-004-05	BKGSL-009-08
B06SL-011-02	B08SL-009-01	B08SL-302-03	B24SL-025-02	B35SL-302-01	BKGSL-004-06	BKGSL-009-09
B06SL-011-05	B08SL-009-02	B08SL-304-01	B24SL-026-01	B35SL-302-06	BKGSL-005-02	BKGSL-009-10
B06SL-012-01	B08SL-010-02	B08SL-304-06	B24SL-026-02	B35SL-303-01	BKGSL-005-03	BKGSL-010-02
B06SL-012-06	B08SL-011-03	B08SL-305-01	B24SL-027-01	B35SL-303-03	BKGSL-005-04	BKGSL-010-03
B06SL-013-01	B08SL-012-01	B24SL-001-01	B24SL-027-02	B35SL-303-05	BKGSL-005-05	BKGSL-010-04
B06SL-013-02	B08SL-012-02	B24SL-001-03	B24SL-028-01	B35SL-304-01	BKGSL-005-06	BKGSL-010-05
B06SL-014-01	B08SL-013-01	B24SL-002-01	B24SL-028-02	B35SL-304-07	BKGSL-005-07	BKGSL-010-06
B06SL-014-05	B08SL-013-02	B24SL-003-01	B24SL-029-01	B35SL-305-01	BKGSL-005-08	BKGSL-010-07
B06SL-015-01	B08SL-014-01	B24SL-003-02	B24SL-029-02	B35SL-305-03	BKGSL-005-09	BKGSL-010-08
B06SL-015-06	B08SL-014-05	B24SL-004-01	B24SL-030-01	B35SL-305-05	BKGSL-005-10	BKGSL-010-09
B06SL-016-01	B08SL-015-01	B24SL-005-01	B24SL-030-02	BKGSL-001-02	BKGSL-006-02	BKGSL-011-02
B06SL-016-05	B08SL-015-09	B24SL-005-02	B24SL-031-01	BKGSL-001-03	BKGSL-006-03	BKGSL-011-03
B06SL-017-01	B08SL-015-10	B24SL-006-01	B24SL-031-02	BKGSL-001-04	BKGSL-006-04	BKGSL-011-04
B06SL-017-02	B08SL-016-01	B24SL-007-01	B24SL-032-01	BKGSL-001-05	BKGSL-006-05	BKGSL-011-05
B06SL-018-01	B08SL-016-06	B24SL-008-01	B24SL-033-01	BKGSL-001-06	BKGSL-006-06	BKGSL-011-06
B06SL-019-01	B08SL-017-01	B24SL-008-02	B24SL-034-01	BKGSL-001-07	BKGSL-006-07	BKGSL-011-07
B06SL-020-01	B08SL-017-05	B24SL-009-01	B24SL-034-02	BKGSL-001-08	BKGSL-006-08	BKGSL-011-08
B06SL-020-02	B08SL-018-01	B24SL-009-02	B24SL-301-01	BKGSL-001-09	BKGSL-006-09	BKGSL-011-09
B06SL-021-05	B08SL-018-02	B24SL-010-01	B24SL-301-02	BKGSL-001-10	BKGSL-007-02	BKGSL-011-10
B06SL-021-06	B08SL-019-01	B24SL-010-02	B24SL-302-01	BKGSL-002-02	BKGSL-007-03	BKGSL-012-02
B06SL-021-07	B08SL-019-03	B24SL-011-01	B24SL-302-05	BKGSL-002-03	BKGSL-007-04	BKGSL-012-03
B06SL-022-01	B08SL-020-01	B24SL-011-02	B24SL-303-01	BKGSL-002-04	BKGSL-007-05	BKGSL-012-04
B06SL-022-06	B08SL-021-01	B24SL-012-01	B24SL-303-02	BKGSL-002-05	BKGSL-007-06	BKGSL-012-05
B06SL-023-03	B08SL-021-06	B24SL-013-01	B24SL-304-01	BKGSL-002-06	BKGSL-008-02	

TABLE 3-45
OFFSITE SUBSURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample Id[b]	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A02SL-004-07		X		X		X	X		
A02SL-005-02		X		X					
A02SL-006-03		X		X		X	X		
A02SL-007-05		X		X					
A02SL-009-04	X	X		X		X	X		
A02SL-012-02	X	X		X					
A02SL-015-10		X		X		X	X		
A02SL-015-11		X		X					
A02SL-016-02		X		X		X	X		
A02SL-016-03		X		X					
A02SL-018-03	X	X		X		X	X		
A02SL-019-02		X		X					
A02SL-019-06		X		X		X	X		
A02SL-020-02	X	X		X		X	X		
A02SL-020-03	X	X		X		X	X		
A02SL-021-03		X		X		X	X		
A02SL-021-04		X		X					
A02SL-022-04		X		X		X	X		
A02SL-023-02		X		X		X	X		
A02SL-024-07		X		X		X	X		
A02SL-027-01		X		X					
A02SL-028-01	X	X	X	X	X	X	X	X	X
A02SL-028-02		X		X					
A02SL-030-06		X		X		X	X		
A02SL-031-06		X		X					
A02SL-035-02		X		X					
A02SL-037-05		X		X					
A02SL-037-06	X	X		X		X	X		
A02SL-039-03		X		X					
A02SL-216-13		X		X					
A02SL-229-02		X		X					
A02SL-234-02		X		X					
A03SL-009-02		X		X		X	X		
A03SL-011-02		X		X					
A03SL-015-02	X	X		X		X	X		
A03SL-018-03		X		X					
A03SL-022-02		X		X					
A03SL-028-03		X		X		X	X		
A03SL-028-05		X		X					
A03SL-030-02		X		X					
A03SL-031-02		X		X		X	X		
A03SL-035-02		X		X		X	X		
A03SL-038-10		X		X					
A03SL-039-02		X		X		X	X		
A03SL-042-02		X		X					
A03SL-214-06		X		X					
A03SL-216-10		X		X		X	X		
A03SL-217-13	X	X	X	X	X	X	X	X	X
A03SL-217-14		X		X		X	X		
A03SL-222-10		X		X					
A03SL-223-05		X		X					
A03SL-224-02		X		X					
A03SL-224-05		X		X					
A03SL-227-04		X		X		X	X		
A03SL-228-06		X		X		X	X		
A03SL-231-02		X		X		X	X		
A03SL-231-05		X		X					

TABLE 3-45
OFFSITE SUBSURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample Id[b]	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A03SL-232-06		X		X		X	X		
A03SL-233-07	X	X		X					
A03SL-239-11		X		X					
A03SL-240-06		X		X		X	X		
A03SL-240-07		X		X		X	X		
A04ASL-003-03		X		X		X	X		
A04ASL-051-02		X		X		X	X		
A04ASL-052-02		X		X					
A04ASL-055-02		X		X		X	X		
A04ASL-056-04		X		X		X	X		
A04ASL-056-05		X		X		X	X		
A04ASL-058-02		X		X		X	X		
A04ASL-062-02		X		X		X	X		
A04ASL-063-03		X		X		X	X		
A04ASL-067-02		X		X					
A04ASL-203-06		X		X					
A04ASL-209-10		X		X		X	X		
A04ASL-214-05	X	X	X	X	X	X	X	X	X
A04ASL-214-06		X		X					
A04ASL-214-09		X		X					
A04ASL-220-14		X		X					
A04ASL-224-10		X		X					
A04ASL-224-11		X		X		X	X		
A04ASL-224-14		X		X					
A04ASL-230-05		X		X					
A04ASL-236-09		X		X		X	X		
A04ASL-238-05		X		X		X	X		
A04ASL-239-03	X	X		X		X	X		
A04ASL-243-03	X								
A04ASL-244-02		X		X					
A04ASL-249-03	X								
A04ASL-250-04		X		X		X	X		
A04ASL-274-02	X								
A04ASL-274-11		X		X					
A04ASL-276-05		X		X					
A04ASL-278-10	X	X	X	X	X	X	X	X	X
A04ASL-303-03	X								
A04ASL-314-03		X		X					
A04ASL-318-02		X		X					
A04ASL-322-09	X								
A04BSL-003-01		X		X					
A04BSL-007-06	X	X		X		X	X		
A04BSL-008-03		X		X					
A04BSL-012-06		X		X					
A04BSL-013-07	X	X		X		X	X		
A04BSL-014-07		X		X					
A04BSL-015-06		X		X		X	X		
A04BSL-015-07		X		X					
A04BSL-016-03		X		X					
A04BSL-018-06	X	X		X		X	X		
A04BSL-018-07		X		X					
A04BSL-019-02		X		X		X	X		
A04BSL-020-06		X		X					
A04BSL-025-03		X		X		X	X		
A04BSL-026-01		X		X		X	X		
A04BSL-031-06		X		X					
A04BSL-031-07		X		X					

TABLE 3-45
OFFSITE SUBSURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample Id[b]	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A04BSL-032-06		X		X		X	X		
A04BSL-032-07		X		X		X	X		
A04BSL-036-05		X		X		X	X		
A04BSL-038-07		X		X					
A04BSL-040-03		X		X					
A04BSL-041-05		X		X		X	X		
A04BSL-042-02		X		X		X	X		
A04BSL-043-02		X		X					
A04BSL-219-03		X		X		X	X		
A04BSL-302-06		X		X					
A04BSL-303-01		X		X					
A04BSL-304-03		X		X		X	X		
A04BSL-305-06		X		X					
A04BSL-306-03		X		X		X	X		
A04BSL-307-01		X		X		X	X		
A04BSL-308-02		X		X					
A04BSL-310-06		X		X		X	X		
A04BSL-310-07		X		X					
A04CSL-003-02		X		X		X	X		
A04CSL-004-02		X		X		X	X		
A04CSL-006-02		X		X		X	X		
A04CSL-006-03		X		X		X	X		
A04CSL-011-03		X		X		X	X		
A04CSL-011-04		X		X					
A04CSL-013-02	X	X		X		X	X		
A04CSL-302-05		X		X					
A04CSL-307-02		X		X					
A04CSL-308-02		X		X					
A04CSL-309-05		X		X					
A04CSL-310-02		X		X					
A04CSL-312-02		X		X					
A04DSL-008-05		X		X					
A04DSL-014-01	X								
A04DSL-022-06		X		X					
A04DSL-023-03		X		X		X	X		
A04DSL-028-02	X								
A04DSL-031-03		X		X		X	X		
A04DSL-210-02	X	X		X		X	X		
A04DSL-214-02	X								
A04DSL-223-02	X								
A04DSL-304-03		X		X					
A04DSL-306-02		X		X					
A04DSL-307-02		X		X					
A04DSL-311-02		X		X		X	X		
A04DSL-314-02	X								
A04DSL-315-02	X								
A04DSL-318-02	X								
A04DSL-320-05		X		X		X	X		
A04DSL-324-03		X		X		X	X		
A04DSL-324-04		X		X					
A05ASL-004-02		X		X		X	X		
A05ASL-007-03		X		X		X	X		
A05ASL-008-07		X		X		X	X		
A05ASL-009-01		X		X					
A05ASL-009-07		X		X					
A05ASL-010-07		X		X					
A05ASL-010-08		X		X					

TABLE 3-45
OFFSITE SUBSURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample Id[b]	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A05ASL-011-06		X		X					
A05ASL-012-06		X		X					
A05ASL-012-07		X		X					
A05ASL-017-03		X		X					
A05ASL-018-02		X		X					
A05ASL-022-03		X		X					
A05ASL-023-03		X		X					
A05ASL-024-02		X		X					
A05ASL-027-03		X		X		X	X		
A05ASL-029-03		X		X					
A05ASL-031-03		X		X					
A05ASL-209-25		X		X					
A05ASL-219-02	X	X		X		X	X		
A05ASL-301-02	X	X		X		X	X		
A05ASL-301-06	X	X		X		X	X		
A05ASL-303-13		X		X		X	X		
A05ASL-303-14		X		X		X	X		
A05ASL-304-02		X		X		X	X		
A05ASL-304-13		X		X		X	X		
A05ASL-304-14		X		X		X	X		
A05ASL-305-02		X		X		X	X		
A05ASL-305-03	X	X		X		X	X		
A05ASL-305-13		X		X					
A05ASL-306-03		X		X		X	X		
A05BSL-001-12		X		X					
A05BSL-001-13		X		X		X	X		
A05BSL-002-11	X	X		X					
A05BSL-003-03		X		X					
A05BSL-004-03		X		X		X	X		
A05BSL-005-03		X		X		X	X		
A05BSL-006-11		X		X					
A05BSL-007-03		X		X		X	X		
A05BSL-007-10		X		X					
A05BSL-008-02		X		X					
A05BSL-010-03		X		X					
A05BSL-010-04		X		X					
A05BSL-011-03		X		X		X	X		
A10SL-001-01		X		X		X	X		
A10SL-003-01		X		X		X	X		
A10SL-004-01		X		X					
A10SL-004-02		X		X					
A10SL-005-01		X		X					
A10SL-006-01		X		X		X	X		
A10SL-007-01		X		X					
A10SL-008-01		X		X					
A10SL-009-01		X		X					
A10SL-009-02		X		X		X	X		
A10SL-010-01		X		X					
A10SL-010-02		X		X		X	X		
A10SL-011-02		X		X		X	X		
A10SL-012-01		X		X					
A10SL-013-01		X		X		X	X		
A10SL-013-02		X		X		X	X		
A10SL-301-01	X	X		X		X	X		
A10SL-301-02		X		X					
A10SL-302-02		X		X					
A10SL-302-13		X		X					

TABLE 3-45
OFFSITE SUBSURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample Id[b]	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A10SL-303-02		X		X		X	X		
A10SL-303-13		X		X		X	X		
A10SL-303-18		X		X					
B02SL-005-01		X		X		X	X		
B02SL-008-01		X		X					
B02SL-009-01		X		X		X	X		
B02SL-009-02		X		X		X	X		
B02SL-012-01		X		X					
B02SL-012-02	X	X		X					
B02SL-017-05		X		X					
B02SL-018-01		X		X		X	X		
B02SL-018-02		X		X		X	X		
B02SL-018-03		X		X		X	X		
B02SL-022-03		X		X		X	X		
B02SL-025-02		X		X					
B02SL-037-05		X		X		X	X		
B02SL-045-01		X		X		X	X		
B02SL-049-01		X		X		X	X		
B02SL-049-02		X		X		X	X		
B02SL-052-03		X		X		X	X		
B02SL-052-05		X		X					
B02SL-053-02	X								
B02SL-055-02	X								
B02SL-055-03		X		X					
B02SL-059-01		X		X					
B02SL-059-02	X								
B02SL-302-01		X		X					
B02SL-302-05		X		X					
B03SL-009-01		X		X		X	X		
B03SL-013-01		X		X					
B03SL-014-05	X	X	X	X	X	X	X	X	X
B03SL-016-05	X	X	X	X	X	X	X	X	X
B03SL-018-02		X		X		X	X		
B03SL-023-01		X		X					
B03SL-025-03		X		X					
B03SL-027-03		X		X		X	X		
B03SL-030-02		X		X					
B03SL-034-01	X								
B03SL-035-01		X		X					
B03SL-036-01	X								
B03SL-036-02	X	X		X					
B04&B09SL-009-02		X		X		X	X		
B04&B09SL-015-02		X		X					
B04&B09SL-017-02		X		X					
B04&B09SL-018-02		X		X		X	X		
B04&B09SL-020-01		X		X		X	X		
B04&B09SL-024-01	X								
B04&B09SL-025-02	X	X		X		X	X		
B04&B09SL-027-01		X		X					
B04&B09SL-030-01		X		X					
B04&B09SL-032-01	X	X		X		X	X		
B04&B09SL-032-02	X								
B04&B09SL-033-02		X		X		X	X		
B04&B09SL-034-01		X		X					
B04&B09SL-036-02	X	X		X		X	X		
B04&B09SL-037-01	X								
B04&B09SL-038-02		X		X					

TABLE 3-45
OFFSITE SUBSURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample Id[b]	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
B04&B09SL-038-03	X	X		X					
B04&B09SL-040-01	X								
B06SL-004-05		X		X					
B06SL-006-01		X		X					
B06SL-006-02		X		X		X	X		
B06SL-011-05		X		X		X	X		
B06SL-013-02	X								
B06SL-021-05	X	X		X		X	X		
B06SL-021-06		X		X					
B06SL-024-01		X		X					
B08SL-003-05	X	X		X		X	X		
B08SL-012-02	X								
B08SL-014-01	X	X		X		X	X		
B08SL-015-01	X	X		X					
B08SL-015-09	X	X	X	X	X	X	X	X	X
B08SL-017-01	X	X	X	X	X	X	X	X	X
B08SL-017-05	X	X		X		X	X		
B08SL-021-06	X	X		X					
B08SL-022-01	X	X		X					
B08SL-023-03	X	X		X					
B08SL-026-02	X	X		X					
B24SL-012-01	X								
B24SL-018-02		X		X					
B24SL-018-03		X		X		X	X		
B24SL-019-01	X	X		X					
B24SL-019-02		X		X		X	X		
B24SL-021-01		X		X		X	X		
B24SL-021-02		X		X		X	X		
B24SL-022-01		X		X					
B24SL-023-02	X	X		X					
B24SL-025-02	X	X		X		X	X		
B24SL-026-01	X	X		X		X	X		
B24SL-026-02		X		X					
B24SL-028-01	X	X		X		X	X		
B24SL-032-01	X								
B24SL-033-01		X		X		X	X		
B24SL-034-01		X		X					
B35SL-001-01	X	X		X		X	X		
B35SL-003-07	X	X		X		X	X		
Totals:	75	299	8	299	8	149	149	8	8
QA/QC Duplicate Samples									
A02SL-009-54						X	X		
A02SL-019-56	X	X		X					
A02SL-027-51		X		X					
A03SL-228-56						X	X		
A03SL-232-56	X	X		X					
A03SL-240-57		X		X					
A04ASL-224-60		X		X					
A04BSL-042-52	X	X		X					
A04BSL-304-53						X	X		
A04BSL-310-57		X		X					
A04CSL-011-53						X	X		
A04CSL-013-52	X	X		X					
A04DSL-023-53		X		X					
A05ASL-031-53		X		X					

TABLE 3-45
OFFSITE SUBSURFACE SOIL SAMPLE IDS AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]								
	Gamma Spec	Alpha Spec				GFPC		ICP/MS	
Sample Id[b]	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso URANIUM (LONG CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (LONG CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Inductively Coupled Plasma Mass Spectrometry(6020)	GROSS A/B BY GFPC SW846 9310 MOD
A05ASL-304-63						X	X		
A05ASL-305-53	X								
A05BSL-001-63	X	X		X					
A10SL-303-52		X		X		X	X		
B03SL-018-52						X	X		
B03SL-027-53	X	X		X					
B04&B09SL-033-52		X		X					
B04&B09SL-036-52	X								
B06SL-021-55		X		X		X	X		
B08SL-015-51	X								
B08SL-021-56		X		X					
B24SL-019-51	X								
B24SL-028-51						X	X		
B24SL-033-51	X	X		X					
Totals:	11	17	0	17	0	9	9	0	0

Notes:

[a] Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri.

[b] Any sample ending in -01 on this list is NOT considered a surface sample because it underlies another material such as brick, concrete, asphalt, metal plate etc.

[c] Background samples are not included.

Alpha Spec = Alpha Spectroscopy
CT = Count
DOE = Department of Energy
EPA = Environmental Protection Agency
Gamma Spec = Gamma Spectroscopy
GFPC = Gas Flow Proportional Counting
Gross A/B = Gross Alpha/Beta
ICP/MS = Inductively Coupled Plasma Mass Spectrometry
QA/QC = Quality Assurance/Quality Control

TABLE 3-46
REPRESENTATIVE MOISTURE CONTENT AND BULK DENSITY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Boring Location Sample ID	Depth Interval (ft BGS)	Soil Type	Bulk Density[a,b] (g/cm^3)	Average Density (g/cm^3)	Net Water Content (%)[b]	Average Net Water Content (%)
A03SL-018-03	1-1.5	Fill Material	1.51	1.44	12.79%	13%
A03SL-022-02	0.5-1	Fill Material	1.64		8.83%	
A03SL-030-02	0.5-1	Fill Material	0.68		19.26%	
A03SL-224-01	0-0.5	Fill Material	1.54		10.41%	
A03SL-231-05	2-2.5	Fill Material	1.84		11.67%	
A04ASL-020-01	0-0.5	Fill Material	1.65	1.36	3.51%	6%
A04ASL-052-02	0.5-1	Fill Material	0.83		5.52%	
A04ASL-056-05	2-2.5	Fill Material	1.72		6.72%	
A04ASL-067-02	0.5-1	Fill Material	1.31		3.66%	
A04ASL-278-10	4.5-5	Fill Material	1.27		11.06%	
BKGSL-001-02	0.5-1	Native Soil	1.45	1.78	9.17%	12%
BKGSL-003-09	4-4.5	Native Soil	1.94		13.08%	
BKGSL-005-01	0-0.5	Native Soil	1.13		7.58%	
BKGSL-007-04	1.5-2	Native Soil	1.50		8.45%	
BKGSL-010-03	1-1.5	Native Soil	1.19		10.61%	
A05A-215-01	0-0.5	Native Soil	1.68		12.68%	
A05A-209-01	0-0.5	Fill Material	0.75	1.22	27.72%	18%
A05A-213-01	0-0.5	Fill Material	1.69		13.01%	
A05A-216-01	0-0.5	Fill Material	1.22		12.28%	

Notes:

[a] Bulk Density = (Net_DryWt / Density_Volume) * (1+Percent_Liq)

[b] Analyses performed by American Radiation Services [ARS], Baton Rouge, LA

ft bgs = feet below ground surface

g/cm^3 = grams per cubic centimeter

TABLE 3-47
SUMMARY OF GEOTECHNICAL ANALYSIS OF SUBSURFACE SOILS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Boring Location Sample ID	Depth Interval (ft BGS)	Soil Type	Bulk Density[a,c] (g/cm^3)	Net Water Content (%)[c]	Atterberg Limits[d]			Percent Gravel[d]	Percent Sand[d]	Percent Silt & Clay[d]	Classification[b,d]
					Liquid Limit (%)	Plastic Limit (%)	Plasiticity Index (%)				
A02-208-09	4-4.5	Native Soil	-	-	32	17	15	10.6	64.4	25.0	CL
A02-229-10	4.5-5	Native Soil	-	-	26	17	9	42.3	19.2	38.5	ML
A03-223-09	4-4.5	Fill Material	-	-	20	19	1	33.0	45.6	21.4	ML
A03-226-31	15-15.5	Fill Material	-	-	23	19	4	31.8	24.5	43.7	CL-ML
A04A-211-07	3-3.5	Native Soil	-	-	18	16	2	6.6	24.6	38.8	ML
A04A-309-07	3-3.5	Native Soil	-	-	31	20	11	20.3	44.0	35.7	CL
A04B-219-05	2-2.5	Native Soil	-	-	34	19	15	32.9	27.9	39.2	CL
A04C-305-07	3-3.5	Native Soil	-	-	28	24	4	58.5	17.9	23.6	ML
A04C-306-07	3-3.5	Native Soil	-	-	19	18	1	15.2	28.4	56.4	ML
A04D-321-06	2.5-3.0	Mix of Fill and Native (Fill to 2.7ft)	-	-	44	28	16	14.7	44.0	41.3	ML
A05A-209-01	0-0.5	Fill Material	0.75	27.72%	-	non-plastic	non-plastic	6.5	72.6	20.9	non-plastic
A05A-213-01	0-0.5	Fill Material	1.69	13.01%	30	26	4	50.3	36.1	13.6	ML
A05A-215-01	0-0.5	Native Soil	1.68	12.68%	32	23	9	31.3	33.2	35.5	CL
A05A-216-01	0-0.5	Fill Material	1.22	12.28%	41	34	7	32.4	36.8	30.8	ML
A05B-001-02	0.5-1.0	Native Soil	-	-	37	22	15	2.4	56.6	41.0	CL

Notes:

[a] Bulk Density = (Net_DryWt / Density_Volume) * (1+Percent_Liq)

[b] Unified Soil Classification System:

[c] Analyses performed by American Radiation Services [ARS], Baton Rouge, LA

[d] Analyses performed by SJB Services, Inc. [SJB], Hamburg, NY

CL = Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays

ft BGS = feet below ground surface

g/mL = grams per milliliter

ML = Inorganic silts and very fine sands, silty or clayey fine sands with slight plasticity

- = sample not analyzed by ARS, therefore no value was obtained

TABLE 3-48
SUMMARY OF GEOTECHNICAL ANALYSIS OF SHELBY TUBES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Boring Location Sample ID	Depth Interval (ft BGS)	Soil Type	Coefficient of Permeability (cm/sec)	Specimen Height (cm)	Specimen Diameter (cm)	Dry Unit Weight (PCF)	Moisture Before Test (%)	Moisture After Test (%)	Cell Pressure (PSI)	Sat. Pressure (PSI)	Diff. Head (PSI)
MW-600S-3-5	3-5	Native Soil	1.46×10^{-6}	7.97	7.16	115.9	19.1	16.7	995.0	80.0	3.5
MW-600S-5-7	5-7	Native Soil	1.23×10^{-6}	7.87	7.12	120.3	15.6	14.2	95.0	80.0	3.0

Notes:
Analyses performed by SJB Services, Inc. [SJB], Hamburg, NY
cm = centimeters
cm/sec = centimeters per second
ft BGS = feet below ground surface
PCF = pounds per cubic foot
PSI = pounds per square inch

TABLE 3-49
SUMMARY OF TOTAL ORGANIC CARBON SAMPLING
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Date Collected	Soil Type	Investigative Area	Location	Sample Depth Interval (inches)	Depth of Auger Refusal (inches)	TOC Result (mg/kg)	Physical Description
A04DSL-TOC-001	4/10/2008	Native	A04D	10 ft North of MW-604D	0-6	12	66,000	0-6" brown topsoil (lawn area) (silt, little fine sand, trace clay, trace organics, moist); 6-8" is same as 0-6" interval.
A04DSL-TOC-002	4/10/2008	Native	A04D	10 ft North of MW-604D	8-12	12	35,400	8-12" is reddish brown SILT, little clay, trace fine sand, trace medium gravel, moist; 12" is refusal. Moved 1 ft Northeast and auger to 12" - refusal.
A04CSL-TOC-003	4/10/2008	Native	A04C	A04C-004; 60 ft east of Rt. 93	0-6	15	56,000	0-6" Brown topsoil (SILT, little-trace fine sand, trace clay, trace rootlets, moist); 6-8" is same as 0-6" interval.
A04CSL-TOC-004	4/10/2008	Native	A04C	A04C-004; 60 ft east of Rt. 93	8-15	15	8,890	8-12" is reddish tan SILT, little clay, trace fine sand, moist; 12-15" reddish tan to olive SILT, little clay, trace fine sand, moist; refusal at 15".
A05BSL-TOC-005	4/10/2008	Native	A05B	A05B-001	0-6	42	35,100	0-6" Dark brown topsoil (silt, little organics, trace fine sand, trace clay, moist); 6-12" same as above, becoming wetter.
A05BSL-TOC-006	4/10/2008	Native	A05B	A05B-001	12-18	42	6,440	12"-18" Reddish brown SILT, little fine-coarse sand, little-trace fine gravel, very moist 18-30" same as above (wet) becoming redder in color; 30-36" same as above, little gravel; 36-42" same as above; MW-600 well log indicates no change in lithology to top of rock.
A03SL-TOC-007	4/10/2008	Fill	A03	5 ft south of MW-17. Sample location at base of landfill	0-6	18	50,000	0-6" FILL, fine-coarse sand, little fine gravel, trace slag, trace metal, trace rootlets (dry); 6-13" FILL (moist).
A03SL-TOC-008	4/10/2008	Native	A03	5 ft south of MW-17. Sample location at base of landfill	13-18	18	5,840	13-18" Reddish brown SILT, little fine sand, trace fine gravel (dry); Auger refusal at 18" (Rocks).
A04ASL-TOC-009	4/10/2008	Fill	A04A	1 ft north of A04A-005	0-6	14	77,200	0-6" FILL, black-dark brown fine-coarse sand, some fine-coarse gravel, little-trace silt (moist); 6" refusal, use shovel to open borehole to 6" and reauger. 6-10" FILL Same as above.
A04ASL-TOC-010	4/10/2008	Fill	A04A	1 ft north of A04A-005	10-14	14	32,700	10-14" light brown to reddish tan "disturbed native" SILT, little fine sand, little trace fine-medium gravel (some gravel looks like fire brick, may have fallen into borehole), dry; refusal at 14"; attempt to widen borehole with shovel - large rocks in fill layer. Cannot be removed. Auger getting stuck between large rocks in fill layer.
A04ASL-TOC-011	4/10/2008	Fill	A04A	5 ft north of A04A-062	0-6	13	45,900	0-6" Black-dark brown FILL, fine-coarse sand, some fine-medium gravel, little-trace silt (moist); Refusal at 6" - move three times - refusal at 6" - fire brick. Use shovel to move bricks/rocks and continue augering. 6-7" FILL, same as above.
A04ASL-TOC-012	4/10/2008	Native	A04A	5 ft north of A04A-063	7-13	13.00	21,400	7-13" Reddish brown-tan SILT, little fine sand, trace fine gravel, trace clay (dry); Refusal at 13" - rocks(bricks) on side of borehole catching auger.
A02SL-TOC-013	4/10/2008	Fill	A02	5 ft east of A02-017	0-6	12	144,000	0-6" Black FILL - fine-coarse sand, little gravel (moist-loose); 6-12" same as above. Refusal at 12".

Notes:
" = inches
ft = feet
mg/kg = milligram per kilogram
Rt. = Route
TOC = Total Organic Carbon

TABLE 3-50
MONITORING WELL CONSTRUCTION SUMMARY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Well ID	Installation Date	Ground Surface Elevation (ft AMSL)	Top of Riser Elevation (ft AMSL)	Sandpack Interval (ft BGS)			Sandpack Interval (ft AMSL)			Well Screen Interval (ft BGS)			Well Screen Interval (ft AMSL)			Screened Unit
MW-1	5/15/1997	598.18	599.92	7.5	to	15.00	590.68	to	583.18	9.7	to	14.70	588.48	to	583.48	Goat Island Dolostone
MW-2	5/16/1997	596.86	598.78	7.5	to	14.50	589.36	to	582.36	9.2	to	14.20	587.66	to	582.66	Goat Island Dolostone
MW-3	5/14/1997	597.27	599.03	7.2	to	14.40	590.07	to	582.87	9.1	to	14.10	588.17	to	583.17	Goat Island Dolostone
MW-4	5/16/1997	597.70	599.52	6.9	to	14.40	590.80	to	583.30	9.1	to	14.10	588.60	to	583.60	Goat Island Dolostone
MW-5	5/15/1997	596.68	598.52	8.2	to	15.50	588.48	to	581.18	10.2	to	15.20	586.48	to	581.48	Goat Island Dolostone
MW-06	10/16/2006	597.59	600.68	5.0	to	15.70	592.59	to	581.89	6.0	to	15.70	591.59	to	581.89	Goat Island Dolostone
MW-07	10/16/2006	598.19	601.32	6.0	to	16.73	592.19	to	581.46	7.0	to	16.73	591.19	to	581.46	Goat Island Dolostone
MW-08	10/16/2006	598.31	601.37	6.0	to	16.90	592.31	to	581.41	7.0	to	16.90	591.31	to	581.41	Goat Island Dolostone
MW-09	10/17/2006	596.49	599.70	5.0	to	16.00	591.49	to	580.49	6.0	to	16.00	590.49	to	580.49	Goat Island Dolostone
MW-10	10/17/2006	599.06	601.92	6.0	to	16.93	593.06	to	582.13	7.0	to	16.93	592.06	to	582.13	Goat Island Dolostone
MW-11	10/17/2006	596.77	599.79	5.0	to	17.79	591.77	to	578.98	8.0	to	17.79	588.77	to	578.98	Goat Island Dolostone
MW-12	10/17/2006	596.88	600.01	6.0	to	16.99	590.88	to	579.89	7.0	to	16.99	589.88	to	579.89	Goat Island Dolostone
MW-13D	10/18/2006	600.15	603.47	5.0	to	16.03	595.15	to	584.12	6.0	to	16.03	594.15	to	584.12	Goat Island Dolostone
MW-13S	10/18/2006	600.31	603.62	2.3	to	4.14	598.01	to	596.17	2.5	to	4.14	597.81	to	596.17	Overburden
MW-14	10/18/2006	598.90	602.36	5.0	to	15.95	593.90	to	582.95	6.0	to	15.95	592.90	to	582.95	Goat Island Dolostone
MW-15	10/18/2006	604.42	608.09	9.0	to	20.00	595.42	to	584.42	10.0	to	20.00	594.42	to	584.42	Goat Island Dolostone
MW-16	10/18/2006	601.41	604.37	6.0	to	17.00	595.41	to	584.41	7.0	to	17.00	594.41	to	584.41	Goat Island Dolostone
MW-17	10/19/2006	603.79	606.97	6.0	to	16.76	597.79	to	587.03	7.0	to	16.76	596.79	to	587.03	Goat Island Dolostone
MW-18	10/19/2006	599.48	602.36	4.0	to	13.93	595.48	to	585.55	5.0	to	13.93	594.48	to	585.55	Goat Island Dolostone
MW-19	10/19/2006	598.29	601.36	9.0	to	20.02	589.29	to	578.27	10.0	to	20.02	588.29	to	578.27	Goat Island Dolostone
MW-20	10/19/2006	600.50	603.62	6.0	to	17.00	594.50	to	583.50	7.0	to	17.00	593.50	to	583.50	Goat Island Dolostone
MW-21	10/19/2006	605.41	608.46	10.0	to	21.00	595.41	to	584.41	11.0	to	21.00	594.41	to	584.41	Goat Island Dolostone
MW-22	10/20/2006	598.09	601.35	6.0	to	17.00	592.09	to	581.09	7.0	to	17.00	591.09	to	581.09	Goat Island Dolostone
MW-23	10/20/2006	597.58	600.50	6.0	to	16.00	591.58	to	581.58	6.0	to	16.00	591.58	to	581.58	Goat Island Dolostone
MW-24	10/20/2006	597.27	NM	6.0	to	16.43	591.27	to	580.84	6.5	to	16.43	590.77	to	580.84	Goat Island Dolostone
MW-25	10/23/2006	597.22	NM	6.0	to	17.00	591.22	to	580.22	7.0	to	17.00	590.22	to	580.22	Goat Island Dolostone
MW-26	10/24/2006	596.93	NM	6.0	to	17.00	590.93	to	579.93	7.0	to	17.00	589.93	to	579.93	Goat Island Dolostone
600S	7/13/2007	610.54	613.45	4.0	to	8.00	606.54	to	602.54	5.5	to	7.50	605.04	to	603.04	Native overburden
600D	7/12/2007	610.54	613.29	11.0	to	23.40	599.54	to	587.14	13.0	to	23.00	597.54	to	587.54	Goat Island Dolostone
601D	7/18/2007	602.42	604.85	7.5	to	20.00	594.92	to	582.42	9.5	to	19.50	592.92	to	582.92	Goat Island Dolostone
602D	7/19/2007	601.14	604.01	8.0	to	20.50	593.14	to	580.64	10.0	to	20.00	591.14	to	581.14	Goat Island Dolostone
603D	7/19/2007	597.69	600.43	7.5	to	20.00	590.19	to	577.69	9.5	to	19.50	588.19	to	578.19	Goat Island Dolostone
604D	7/12/2007	596.25	595.98	7.0	to	19.00	589.25	to	577.25	8.2	to	18.20	588.05	to	578.05	Goat Island Dolostone
605D	7/17/2007	598.50	598.11	6.0	to	18.50	592.50	to	580.00	8.0	to	18.00	590.50	to	580.50	Goat Island Dolostone
606D	7/17/2007	598.91	601.49	8.0	to	20.50	590.91	to	578.41	10.0	to	20.00	588.91	to	578.91	Goat Island Dolostone
606DR	10/8/2007	599.49	602.21	9.5	to	21.00	589.99	to	578.49	10.5	to	20.50	588.99	to	578.99	Goat Island Dolostone
607D	7/18/2007	597.93	600.38	5.4	to	17.90	592.53	to	580.03	7.4	to	17.40	590.53	to	580.53	Goat Island Dolostone

Notes:
ft AMSL = feet above mean sea level
ft BGS = feet below ground surface

TABLE 3-51
SUMMARY OF HYDRAULIC CONDUCTIVITY TESTING
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Monitoring Well Id[a]	Screen Length	Total Well Depth (BTOR)[2]	Data Set ID	Tested Horizon	Slug Type	Test Type	Estimated Horizontal Hydraulic Conductivity[c] (cm/sec)	Estimated Horizontal Hydraulic Conductivity (ft/day)	Average Horizontal Hydraulic Conductivity (cm/sec)	Average Horizontal Hydraulic Conductivity (ft/day)
MW-1	5 feet	10.5 feet	MW-01a	Water Table	Solid Slug	Falling Head	2.10E-03	5.95	2.40E-03	6.80
MW-1	5 feet	10.5 feet	MW-01b	Water Table	Solid Slug	Rising Head	2.60E-03	7.37		
MW-1	5 feet	10.5 feet	MW-01c	Water Table	Solid Slug	Falling Head	2.40E-03	6.80		
MW-1	5 feet	10.5 feet	MW-01d	Water Table	Solid Slug	Rising Head	2.50E-03	7.09		
MW-2	5 feet	9.7 feet	MW-02a	Water Table	Solid Slug	Falling Head	3.80E-03	10.77	3.65E-03	10.35
MW-2	5 feet	9.7 feet	MW-02b	Water Table	Solid Slug	Rising Head	3.50E-03	9.92		
MW-3	5 feet	9.6 feet	MW-03a	Water Table	Solid Slug	Falling Head	8.90E-02	252.28	7.70E-02	218.27
MW-3	5 feet	9.6 feet	MW-03b	Water Table	Solid Slug	Rising Head	6.50E-02	184.25		
MW-4	5 feet	10.6 feet	MW-04a	Water Table	Solid Slug	Falling Head	2.60E-03	7.37	2.55E-03	7.23
MW-4	5 feet	10.6 feet	MW-04b	Water Table	Solid Slug	Rising Head	2.50E-03	7.09		
MW-5	5 feet	11.45 feet	MW-05a	Water Table	Solid Slug	Falling Head	7.90E-03	22.39	7.55E-03	21.40
MW-5	5 feet	11.45 feet	MW-05b	Water Table	Solid Slug	Rising Head	7.20E-03	20.41		
MW-06	10 feet	11.7 feet	MW-06a	Water Table	Pneumatic	Rising Head	1.30E-02	36.85	1.20E-02	34.02
MW-06	10 feet	11.7 feet	MW-06b	Water Table	Pneumatic	Rising Head	1.30E-02	36.85		
MW-06	10 feet	11.7 feet	MW-06c	Water Table	Pneumatic	Rising Head	1.00E-02	28.35		
MW-08	10 feet	11.9 feet	MW-08a	Water Table	Solid Slug	Falling Head	1.00E-03	2.83	2.63E-03	7.44
MW-08	10 feet	11.9 feet	MW-08b	Water Table	Solid Slug	Rising Head	3.50E-03	9.92		
MW-08	10 feet	11.9 feet	MW-8c	Water Table	Solid Slug	Falling Head	2.90E-03	8.22		
MW-08	10 feet	11.9 feet	MW-08d	Water Table	Solid Slug	Rising Head	3.10E-03	8.79		
MW-09	10 feet	12.5 feet	MW-09a	Water Table	Solid Slug	Falling Head	4.10E-02	116.22	4.18E-02	118.49
MW-09	10 feet	12.5 feet	MW-09b	Water Table	Solid Slug	Rising Head	4.50E-02	127.56		
MW-09	10 feet	12.5 feet	MW-09c	Water Table	Solid Slug	Falling Head	4.20E-02	119.06		
MW-09	10 feet	12.5 feet	MW-09d	Water Table	Solid Slug	Rising Head	3.50E-02	99.21		
MW-09	10 feet	12.5 feet	MW-09e	Water Table	Solid Slug	Falling Head	4.60E-02	130.39		
MW-11	10 feet	11.8 feet	MW-11a	Water Table	Solid Slug	Rising Head	4.90E-03	13.89	5.00E-03	14.17
MW-11	10 feet	11.8 feet	MW-11b	Water Table	Solid Slug	Falling Head	5.10E-03	14.46		
MW-13D	10 feet	11.5 feet	MW-13Da	Water Table	Solid Slug	Rising Head	2.90E-03	8.22	2.85E-03	8.08
MW-13D	10 feet	11.5 feet	MW-13Db	Water Table	Solid Slug	Rising Head	2.80E-03	7.94		

TABLE 3-51
SUMMARY OF HYDRAULIC CONDUCTIVITY TESTING
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Monitoring Well Id[a]	Screen Length	Total Well Depth (BTOR)[2]	Data Set ID	Tested Horizon	Slug Type	Test Type	Estimated Horizontal Hydraulic Conductivity[c] (cm/sec)	Estimated Horizontal Hydraulic Conductivity (ft/day)	Average Horizontal Hydraulic Conductivity (cm/sec)	Average Horizontal Hydraulic Conductivity (ft/day)
MW-14	10 feet	12 feet	MW-14a	Water Table	Solid Slug	Rising Head	2.10E-03	5.95	1.63E-03	4.63
MW-14	10 feet	13 feet	MW-14b	Water Table	Solid Slug	Rising Head	1.10E-03	3.12		
MW-14	10 feet	14 feet	MW-14c	Water Table	Solid Slug	Rising Head	1.70E-03	4.82		
MW-15	10 feet	12 feet	MW-15	Water Table	Solid Slug	Rising Head	7.10E-05	0.20	7.10E-05	0.20
MW-16	10 feet	11.8 feet	MW-16a	Water Table	Solid Slug	Rising Head	1.90E-02	53.86	1.90E-02	53.86
MW-16	10 feet	11.8 feet	MW-16b	Water Table	Solid Slug	Rising Head	1.90E-02	53.86		
MW-17	10 Feet	12.3 feet	MW-17a	Water Table	Solid Slug	Rising Head	4.60E-04	1.30	5.10E-04	1.45
MW-17	10 Feet	12.3 feet	MW-17b	Water Table	Solid Slug	Rising Head	4.90E-04	1.39		
MW-17	10 Feet	12.3 feet	MW-17c	Water Table	Solid Slug	Rising Head	5.80E-04	1.64		
MW-18	10 feet	10.4 feet	MW-18a	Water Table	Solid Slug	Rising Head	1.20E-03	3.40	1.30E-03	3.69
MW-18	10 feet	10.4 feet	MW-18b	Water Table	Solid Slug	Rising Head	1.40E-03	3.97		
MW-19	10 feet	12 feet	MW-19a	Water Table	Pneumatic	Rising Head	3.10E-03	8.79	2.87E-03	8.13
MW-19	10 feet	12 feet	MW-19b	Water Table	Pneumatic	Rising Head	2.70E-03	7.65		
MW-19	10 feet	12 feet	MW-19c	Water Table	Pneumatic	Rising Head	2.80E-03	7.94		
MW-20	10 feet	12 feet	MW-20a	Water Table	Solid Slug	Rising Head	7.30E-03	20.69	7.65E-03	21.69
MW-20	10 feet	12 feet	MW-20b	Water Table	Solid Slug	Rising Head	8.00E-03	22.68		
MW-21	10 feet	12 feet	MW-21a	Water Table	Solid Slug	Rising Head	7.50E-04	2.13	7.50E-04	2.13
MW-21	10 feet	12 feet	MW021b	Water Table	Solid Slug	Rising Head	7.50E-04	2.13		
MW-22	10 feet	12 feet	MW-22a	Water Table	Pneumatic	Rising Head	2.80E-02	79.37	1.34E-02	37.98
MW-22	10 feet	12 feet	MW-22b	Water Table	Pneumatic	Rising Head	6.10E-03	17.29		
MW-22	10 feet	12 feet	MW-22c	Water Table	Pneumatic	Rising Head	6.10E-03	17.29		
MW-23	10 feet	12 feet	MW-23a	Water Table	Solid Slug	Falling Head	4.50E-04	1.28	4.85E-04	1.37
MW-23	10 feet	12 feet	MW-23b	Water Table	Solid Slug	Rising Head	5.20E-04	1.47		
MW-24	10 feet	10.9 feet	MW-24a	Water Table	Solid Slug	Falling Head	4.90E-03	13.89	4.75E-03	13.46
MW-24	10 feet	10.9 feet	MW-24b	Water Table	Solid Slug	Rising Head	4.60E-03	13.04		
MW-600D	10 Feet	15.1 feet	MW-600Da	Water Table	Pneumatic	Rising Head	1.20E-02	34.02	1.23E-02	34.72
MW-600D	10 Feet	15.1 feet	MW-600Db	Water Table	Pneumatic	Rising Head	1.30E-02	36.85		
MW-600D	10 Feet	15.1 feet	MW-600Dc	Water Table	Pneumatic	Rising Head	1.10E-02	31.18		
MW-600D	10 Feet	15.1 feet	MW-600Dd	Water Table	Pneumatic	Rising Head	1.30E-02	36.85		

TABLE 3-51
SUMMARY OF HYDRAULIC CONDUCTIVITY TESTING
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Monitoring Well Id[a]	Screen Length	Total Well Depth (BTOR)[2]	Data Set ID	Tested Horizon	Slug Type	Test Type	Estimated Horizontal Hydraulic Conductivity[c] (cm/sec)	Estimated Horizontal Hydraulic Conductivity (ft/day)	Average Horizontal Hydraulic Conductivity (cm/sec)	Average Horizontal Hydraulic Conductivity (ft/day)
MW-601D	10 feet	17.3 feet	MW-601Da	Water Table	Solid Slug	Rising Head	9.60E-03	27.21	9.60E-03	27.21
MW-601D	10 feet	17.3 feet	MW-601Db	Water Table	Solid Slug	Rising Head	9.60E-03	27.21		
MW-602D	10 feet	17.3 feet	MW-602Da	Water Table	Solid Slug	Falling Head	1.30E-02	36.85	1.38E-02	38.98
MW-602D	10 feet	17 feet	MW-602Db	Water Table	Solid Slug	Rising Head	1.20E-02	34.02		
MW-602D	10 feet	17 feet	MW-602Dc	Water Table	Solid Slug	Falling Head	1.50E-02	42.52		
MW-602D	10 feet	17 feet	MW-602Dd	Water Table	Solid Slug	Rising Head	1.50E-02	42.52		
MW-603D	10 feet	16.5 feet	MW-603Da	Water Table	Solid Slug	Falling Head	5.10E-03	14.46	4.93E-03	13.96
MW-603D	10 feet	16.5 feet	MW-603Db	Water Table	Solid Slug	Rising Head	5.10E-03	14.46		
MW-603D	10 feet	16.5 feet	MW-603Dc	Water Table	Solid Slug	Falling Head	5.10E-03	14.46		
MW-603D	10 feet	16.5 feet	MW-603Dd	Water Table	Solid Slug	Rising Head	4.40E-03	12.47		
MW-604D	10 feet	15.8 feet	MW-604Da	Water Table	Pneumatic	Rising Head	7.80E-03	22.11	5.47E-03	15.50
MW-604D	10 feet	15.8 feet	MW-604Db	Water Table	Pneumatic	Rising Head	3.00E-03	8.50		
MW-604D	10 feet	15.8 feet	MW-604Dc	Water Table	Pneumatic	Rising Head	5.60E-03	15.87		
MW-605D	10 feet	15.4 feet	MW-605Da	Water Table	Pneumatic	Rising Head	1.10E-02	31.18	1.20E-02	34.02
MW-605D	10 feet	15.4 feet	MW-605Db	Water Table	Pneumatic	Rising Head	1.10E-02	31.18		
MW-605D	10 feet	15.4 feet	MW-605Dc	Water Table	Pneumatic	Rising Head	1.40E-02	39.69		
MW-607D	10 feet	15.8 feet	MW-607Da	Water Table	Solid Slug	Rising Head	2.40E-03	6.80	2.50E-03	7.09
MW-607D	10 feet	15.8 feet	MW-607Db	Water Table	Solid Slug	Rising Head	2.60E-03	7.37		
						Geometric mean - All Data	**4.91E-03**	**13.92**		
						Geometric mean- Averages	**4.17E-03**	**11.83**		

Notes:

1. Well MW-606DR (hand recorded) and MW-26 are not included in this table.
2. Well Depth measured in feet from below top of rock (BTOR) to the bottom of the wellscreen.
3. Bouwer & Rice Model used.

cm/sec = centimeters per second
ft/day = feet per day
SD = Standard Deviation
CV = Coefficient of Variation
UCL = Upper Confidence Limit of the Mean
BTV = Background Threshold Value
UTL = Upper Threshold Limit

Statistical Summary[d]	
NumObs	75
Minimum	7.10E-05
Maximum	0.089
Mean	0.0105
Median	0.0051
Variance	2.35E-04
SD	0.0153
UCL	0.0171
UCL Method	95% H-UCL
BTV	0.0452
UTL	0.0263

TABLE 3-52
SUMMARY OF GROUNDWATER SAMPLES AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Monitoring Well ID	Sample ID	Round 1 Date Sampled	Round 2 Date Sampled	ANALYTICAL METHODS[a]					
				Alpha Spec		GFPC			
				Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	GROSS A/B BY GFPC SW846 9310 MOD	Solids, Total Suspended "TSS" (160_2)
MW-1	A02MW1-F	8/2/2007	11/14/2007	X	X	X	X	X	
	A02MW1-U	8/2/2007	11/14/2007	X	X	X	X	X	X
	A02MW51-F	Duplicate of sample collected 08/02/07	NA	X	X	X	X	X	
	A02MW51-U	Duplicate of sample collected 08/02/07	NA	X	X	X	X	X	X
MW-2	A02MW2-F	8/7/2007	11/14/2007	X	X	X	X	X	
	A02MW2-U	8/7/2007	11/14/2007	X	X	X	X	X	X
MW-3	A02MW3-F	8/7/2007	11/14/2007	X	X	X	X	X	
	A02MW3-U	8/7/2007	11/14/2007	X	X	X	X	X	X
MW-4	A02MW4-F	8/8/2007	11/15/2007	X	X	X	X	X	
	A02MW4-U	8/8/2007	11/15/2008	X	X	X	X	X	X
	A02MW54-F	NA	Duplicate of sample collected 11/15/07	X	X	X	X	X	
	A02MW54-U	NA	Duplicate of sample collected 11/15/07	X	X	X	X	X	X
MW-5	A02MW5-F	8/9/2007	11/14/2007	X	X	X	X	X	
	A02MW5-U	8/9/2007	11/14/2007	X	X	X	X	X	X
MW-06	A02MW06-F	8/2/2007	11/14/2007	X	X	X	X	X	
	A02MW06-U	8/2/2007	11/14/2007	X	X	X	X	X	X
MW-08	A02MW08-F	8/20/2007	11/14/2007	X	X	X	X	X	
	A02MW08-U	8/20/2007	11/14/2007	X	X	X	X	X	X
MW-09	A02MW09-F	8/7/2007	11/14/2007	X	X	X	X	X	
	A02MW09-U	8/7/2007	11/14/2007	X	X	X	X	X	X
MW-11	A02MW11-F	8/20/2007	11/14/2007	X	X	X	X	X	
	A02MW11-U	8/20/2007	11/14/2007	X	X	X	X	X	X
MW-13D	A03MW13D-F	8/6/2007	11/16/2007	X	X	X	X	X	
	A03MW13D-U	8/6/2007	11/16/2007	X	X	X	X	X	X
MW-14	A03MW14-F	8/1/2007	11/12/2007	X	X	X	X	X	
	A03MW14-U	8/1/2007	11/12/2007	X	X	X	X	X	X
MW-15	A03MW15-F	8/14/2007	11/13/2007	X	X	X	X	X	
	A03MW15-U	8/14/2007	11/13/2007	X	X	X	X	X	X
MW-16	A03MW16-F	8/1/2007	11/12/2007	X	X	X	X	X	
	A03MW16-U	8/1/2007	11/12/2007	X	X	X	X	X	X
MW-17	A03MW17-F	7/31/2007	11/12/2007	X	X	X	X	X	
	A03MW17-U	7/31/2007	11/12/2007	X	X	X	X	X	X
MW-18	A04BMW18-F	8/15/2007	11/15/2007	X	X	X	X	X	
	A04BMW18-U	8/15/2007	11/15/2007	X	X	X	X	X	X
MW-19	A04BMW19-F	8/6/2007	11/15/2007	X	X	X	X	X	
	A04BMW19-U	8/6/2007	11/15/2007	X	X	X	X	X	X
MW-20	A04AMW20-F	8/1/2007	11/13/2007	X	X	X	X	X	
	A04AMW20-U	8/1/2007	11/13/2007	X	X	X	X	X	X
	A04AMW70-F	NA	Duplicate of sample collected 11/13/07	X	X	X	X	X	
	A04AMW70-U	NA	Duplicate of sample collected 11/13/08	X	X	X	X	X	X
MW-21	A04AMW21-F	8/14/2007	11/13/2007	X	X	X	X	X	
	A04AMW21-U	8/14/2007	11/13/2007	X	X	X	X	X	X
	A04AMW71-F	Duplicate of sample collected 08/14/07	NA	X	X	X	X	X	
	A04AMW71-U	Duplicate of sample collected 08/14/07	NA	X	X	X	X	X	X
MW-22	A04AMW22-F	8/8/2007	11/15/2007	X	X	X	X	X	
	A04AMW22-U	8/8/2007	11/15/2007	X	X	X	X	X	X

TABLE 3-52
SUMMARY OF GROUNDWATER SAMPLES AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Monitoring Well ID	Sample ID	Round 1 Date Sampled	Round 2 Date Sampled	ANALYTICAL METHODS[a]					
				Alpha Spec		GFPC			
				Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	GROSS A/B BY GFPC SW846 9310 MOD	Solids, Total Suspended "TSS" (160_2)
MW-23	A04AMW23-F	8/10/2007	11/15/2007	X	X	X	X	X	
	A04AMW23-U	8/10/2007	11/15/2007	X	X	X	X	X	X
MW-24	A04DMW24-F	8/8/2007	11/15/2007	X	X	X	X	X	
	A04DMW24-U	8/8/2007	11/15/2007	X	X	X	X	X	X
MW-26	A04BMW26-F	8/9/2007	11/16/2007	X	X	X	X	X	
	A04BMW26-U	8/9/2007	11/16/2007	X	X	X	X	X	X
MW-600D	A05BMW600D-F	8/17/2007	11/13/2007	X	X	X	X	X	
	A05BMW600D-U	8/17/2007	11/13/2007	X	X	X	X	X	X
MW-601D	A04AMW601D-F	8/15/2007	11/13/2007	X	X	X	X	X	
	A04AMW601D-U	8/15/2007	11/13/2007	X	X	X	X	X	X
MW-602D	A04AMW602D-F	8/15/2007	11/15/2007	X	X	X	X	X	
	A04AMW602D-U	8/15/2007	11/15/2007	X	X	X	X	X	X
MW-603D	A04AMW603D-F	8/17/2007	11/14/2007	X	X	X	X	X	
	A04AMW603D-U	8/17/2007	11/14/2007	X	X	X	X	X	X
MW-604D	A04DMW604D-F	8/13/2007	11/15/2007	X	X	X	X	X	
	A04DMW604D-U	8/13/2007	11/15/2007	X	X	X	X	X	X
MW-605D	A04BMW605D-F	8/13/2007	11/16/2007	X	X	X	X	X	
	A04BMW605D-U	8/13/2007	11/16/2007	X	X	X	X	X	X
MW-606DR	A03MW606D-RF	NA	11/16/2007	X	X	X	X	X	
	A03MW606D-RU	NA	11/16/2007	X	X	X	X	X	X
MW-607D	A03MW607D-F	8/15/2007	11/13/2007	X	X	X	X	X	
	A03MW607D-U	8/15/2007	11/13/2007	X	X	X	X	X	X
Subtotals[b]				126	126	126	126	126	63
QA/QC[b]				8	8	8	8	8	4
Environmental Samples[b]				118	118	118	118	118	59

Notes:

[a] Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri

[b] Totals include sum of two rounds of groundwater sampling.

Alpha Spec = Alpha Spectroscopy
CT = Count
DOE = Department of Energy
EPA = Environmental Protection Agency
F = Filtered Sample
GFPC = Gas Flow Proportional Counting
Gross A/B = Gross Alpha/Beta
NA = Not Applicable
QA/QC = Quality Assurance/Quality Control
U = Unfiltered Sample

TABLE 3-53
MONITORING WELL INSPECTION LOG - July 17, 2007
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Well Number	Measured Depth to Bottom (ft)[a]	Installed Depth to Bottom (ft)[b]	Condition of Well	Recommend Sampling	Monitoring Well Stickup (measured above ground surface)
Existing Overburden Wells (SLC, 1981)					
MW-81-01	6.52	5.50	PVC is in good condition. Well has no protective casing. Has a j-plug but no lock.	No	~2.5 ft. above ground
MW-81-02	5.50	3.40	PVC is in good condition. Well has no protective casing or locking j-plug, just a pvc cap	No	~1.5 ft. above ground
MW-81-04	NM	5.50	Well is PVC with duct tape for a "cap". Duct tape was not removed to check for water and depth.	No	NM
MW-105[c]	7.02	5.00	Well is damaged. Surface seal is not intact. Well plug and casing cover were observed on the ground.	No	~2 ft. above ground
Excised Area Wells (DEC, 1997)					
MW-1	16.74	15.00	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~2 ft. above ground
MW-2	16.00	14.50	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~1.5 ft. above ground
MW-3	16.04	14.40	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~1.5 ft. above ground
MW-4	16.39	14.40	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~1.5 ft. above ground
MW-5	17.45	15.50	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~1.5 ft. above ground
Remedial Investigation/Feasibility Study Wells (DEC, 2006)					
MW-06	19.01	15.70	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~3 ft. above ground
MW-09	19.14	16.00	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~3 ft. above ground
MW-13D	19.40	16.03	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~3 ft. above ground
MW-14	19.61	15.95	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~3 ft. above ground
MW-16	20.10	17.00	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~3 ft. above ground
MW-17	20.08	16.76	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~3 ft. above ground
MW-19	23.26	20.02	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~3 ft. above ground
MW-20	20.20	17.00	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~3 ft. above ground
MW-22	20.19	17.00	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~3 ft. above ground
MW-23	19.6	16.00	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	~3 ft. above ground
MW-24	16.67	16.43	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	Flush Mount
MW-25	15.98	17.00	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	Flush Mount
MW-26	16.9	17.00	Surface seal is intact and pvc is in good condition. Well is secured with lock.	Yes	Flush Mount

Notes:

[a] Measurements were taken in from the top of the inner PVC casing.

[b] Depth below grade.

[c] Installed by NYSDEC, 1997

NYSDEC = New York State Department of Environmental Conservation

NM = Not measured.

SLC = Secure Landfill Contractors

TABLE 3-54
SUMMARY OF GROUNDWATER ELEVATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Well	Reference Point Elevation (ft AMSL)[a]	7/17/2007		9/11/2007		11/13/2007		3/7/2008[b]	
		Depth to Water (ft BTIC)	Elevation of Water (ft AMSL)	Depth to Water (ft BTIC)	Elevation of Water (ft AMSL)	Depth to Water (ft BTIC)	Elevation of Water (ft AMSL)	Depth to Water (ft BTIC)	Elevation of Water (ft AMSL)
MW-1	599.92	6.99	592.93	7.36	592.56	7.00	592.92	5.23	594.69
MW-2	598.78	8.95	589.83	8.64	590.14	8.65	590.13	8.10	590.68
MW-3	599.03	5.82	593.21	5.88	593.15	5.80	593.23	4.31	594.72
MW-4	599.52	NM	NM	5.78	593.74	5.86	593.66	4.30	595.22
MW-5	598.52	5.45	593.07	5.75	592.77	5.74	592.78	4.53	593.99
MW-06	600.68	7.51	593.17	7.76	592.92	7.43	593.25	5.00	595.68
MW-07	601.32	NM	NM	8.03	593.29	7.67	593.65	6.07	595.25
MW-08	601.37	NM	NM	9.38	591.99	9.06	592.31	8.10	593.27
MW-09	599.70	8.70	591.00	8.76	590.94	8.76	590.94	8.31	591.39
MW-10	601.92	NM	NM	8.90	593.02	8.45	593.47	6.42	595.50
MW-11	599.79	NM	NM	9.55	590.24	9.57	590.22	8.92	590.87
MW-12	600.01	NM	NM	6.50	593.51	6.75	593.26	5.30	594.71
MW-13S	603.62	NM	NM	dry	dry	dry	dry	NM	NM
MW-13D	603.47	8.05	595.42	9.45	594.02	9.10	594.37	4.25	599.22
MW-14	602.36	7.61	594.75	9.40	592.96	8.48	593.88	4.39	597.97
MW-15	608.09	NM	NM	13.49	594.60	13.14	594.95	8.00	600.09
MW-16	604.37	8.58	595.79	10.6	593.77	9.65	594.72	NM	NM
MW-17	606.97	9.11	597.86	10.87	596.10	10.05	596.92	3.91	603.06
MW-18	602.36	NM	NM	8.73	593.63	8.45	593.91	4.31	598.05
MW-19	601.36	10.60	590.76	11.20	590.16	10.54	590.82	4.47	596.89
MW-20	603.62	9.20	594.42	9.78	593.84	9.39	594.23	6.59	597.03
MW-21	608.46	NM	NM	13.90	594.56	13.84	594.62	9.46	599.00
MW-22	601.35	7.30	594.05	7.34	594.01	7.40	593.95	5.62	595.73
MW-23	600.50	6.17	594.33	6.14	594.36	6.37	594.13	4.70	595.80
MW-24	597.27	3.66	593.61	4.00	593.27	4.15	593.12	NM	NM
MW-25	597.22	2.81	594.41	2.92	594.30	3.29	593.93	NM	NM
MW-26	596.93	2.88	594.05	3.24	593.69	3.60	593.33	NM	NM
MW-601D	604.85	NM	NM	10.80	594.05	10.82	594.03	8.38	596.47
MW-602D	604.01	NM	NM	9.88	594.13	9.97	594.04	8.02	595.99
MW-603D	600.43	NM	NM	7.50	592.93	7.21	593.22	5.01	595.42
MW-604D	595.98	NM	NM	6.70	589.28	6.95	589.03	NM	NM
MW-605D	598.11	NM	NM	4.30	593.81	4.25	593.86	NM	NM
MW-606D	601.49	NM	NM	8.80	592.69	7.89	593.60	3.75	597.74
MW-606DR	602.21	NM	NM	NM	NM	8.91	593.30	4.26	597.95
MW-607D	600.38	NM	NM	8.78	591.60	7.89	592.49	3.39	596.99
MW-600S	613.45	NM	NM	NM	dry	NM	dry	4.40	NM
MW-600D	613.29	NM	NM	12.75	600.54	11.67	601.62	6.05	607.24
MW-81-01	NS	dry	dry	dry	dry	dry	dry	4.40	NS
MW-81-02	NS	dry	dry	NM	NM	dry	dry	3.41	NS
MW-105[c]	NS	5.36	NS	5.36	NS	NM	NM	7.80	NS
MW-81-04	NS	NM	NM	NM	NM	NM	NM	5.15	NS

Notes:

[a] Measured from top of inner casing.

[b] Provided by United States Army Corps of Engineers

[c] Well damaged.

ft AMSL = feet above mean sea level

ft BTIC = feet below top of inner casing

NM = not measured

NS = not surveyed

TABLE 3-55
SUMMARY OF PLANNED vs. ACTUAL SURFACE WATER AND SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area	FSP Estimated Locations per Area	Actual Locations per Area	Actual Surface Water Sample Quantity Per Area	Actual Sediment Sample Quantity Per Area
IA03	6	6	0	6
IA09	12	12	12	12
Subtotal	**18**	**18**	**12**	**18**
Interior Areas (IA01)				
IA08 (outside IA01)	6	13	7	13
Building 1 (basement)	4	7	6	7
Building 2	0	3	2	3
Building 3	8	14	13	14
Building 4/9	4	5	5	5
Building 6	2	2	0	2
Building 8	2	2	2	2
Building 24	6	7	0	7
Subtotal	**32**	**53**	**35**	**53**
Estimated Total (w/out contingency)	**50**	**71**	**47**	**71**
Contingency (20%)	**10**	**0**	**0**	**0**
TOTAL (including contingency)	**60**	**71**	**47**	**71**

Notes:
FSP = Field Sampling Plan

TABLE 3-56
SUMMARY OF IA08 SURFACE WATER SAMPLES AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]				
	Gamma Spec	Alpha Spec		GFPC	
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD
A08-A01-SW-001		X	X	X	X
A08-A01-SW-004		X	X	X	X
A08-A01-SW-005		X	X	X	X
A08-A01-SW-006		X	X	X	X
A08-A01-SW-056 (duplicate of A08-A01-SW-006)		X	X	X	X
A08-A01-SW-007		X	X	X	X
A08-A01-SW-011		X	X	X	X
A08-A01-SW-012		X	X	X	X
A08-B04&B09-SW-001		X	X	X	X
A08-B04&B09-SW-002		X	X	X	X
A08-B04&B09-SW-003		X	X	X	X
A08-B04&B09-SW-004		X	X	X	X
A08-B04&B09-SW-005		X	X	X	X
A08-B1-SW-001		X	X	X	X
A08-B1-SW-002		X	X	X	X
A08-B1-SW-003		X	X	X	X
A08-B1-SW-004		X	X	X	X
A08-B1-SW-005		X	X	X	X
A08-B1-SW-006		X	X	X	X
A08-B2-SW-001		X	X	X	X
A08-B2-SW-003		X	X	X	X
A08-B3-SW-001[b]	X			X	X
A08-B3-SW-003		X	X	X	X
A08-B3-SW-004		X	X	X	X
A08-B3-SW-005		X	X	X	X
A08-B3-SW-006		X	X	X	X
A08-B3-SW-056 (duplicate of A08-B3-SW-006)		X	X	X	X
A08-B3-SW-007		X	X	X	X
A08-B3-SW-008		X	X	X	X
A08-B3-SW-009		X	X	X	X
A08-B3-SW-011		X	X	X	X
A08-B3-SW-012		X	X	X	X
A08-B3-SW-013		X	X	X	X
A08-B3-SW-014		X	X	X	X
A08-B3-SW-015		X	X	X	X
A08-B8-SW-001		X	X	X	X
A08-B8-SW-002		X	X	X	X

Subtotals	1	36	36	37	37
QA/QC	NA	2	2	2	2
Environmental Samples	1	34	34	35	35

Notes:

[a] Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri

[b] Oil Sample (A08-B3-SW-001): Requested the following analysis that were unable to be run - Iso URANIUM (SHORT CT) DOE A-01-R MOD and Iso THORIUM (SHORT CT) DOE A-01-R MOD. The lab substituted Gamma Ra-226 & Hits By DOE GA-01-R Mod analysis.

Alpha Spec = Alpha Spectroscopy
CT = Count
DOE = Department of Energy
EPA = Environmental Protection Agency
Gamma Spec = Gamma Spectroscopy
GFPC = Gas Flow Proportional Counting
NA = Not Applicable
QA/QC = Quality Assurance/Quality Control

TABLE 3-57
SUMMARY OF IA08 SEDIMENT SAMPLES AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]					
	Gamma Spec	Alpha Spec		GFPC		
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Moisture, Percent (160_3)
A08-A01-SD-001R	X	X	X	X	X	
A08-A01-SD-002	X	X	X	X	X	
A08-A01-SD-003	X	X	X	X	X	
A08-A01-SD-004	X	X	X	X	X	
A08-A01-SD-005	X	X	X	X	X	
A08-A01-SD-006	X	X	X	X	X	
A08-A01-SD-056 (dup of A08-A01-SD-006)	X	X	X	X	X	
A08-A01-SD-007	X	X	X	X	X	
A08-A01-SD-008	X	X	X	X	X	
A08-A01-SD-009	X	X	X	X	X	
A08-A01-SD-010	X	X	X	X	X	
A08-A01-SD-011	X	X	X	X	X	
A08-A01-SD-012	X	X	X	X	X	
A08-A01-SD-013	X	X	X	X	X	
A08-B04&B09-SD-001	X	X	X	X	X	
A08-B04&B09-SD-002	X	X	X	X	X	
A08-B04&B09-SD-003	X	X	X	X	X	
A08-B04&B09-SD-004	X	X	X	X	X	
A08-B04&B09-SD-005	X	X	X	X	X	
A08-B1-SL-001[b]	X	X	X	X	X	
A08-B1-SD-001	X	X	X	X	X	
A08-B1-SD-002	X	X	X	X	X	
A08-B1-SD-003	X	X	X	X	X	
A08-B1-SD-004	X	X	X	X	X	
A08-B1-SD-005	X	X	X	Note C	Note C	
A08-B1-SD-006	X	X	X	X	X	
A08-B24-SD-001	X	X	X	X	X	X
A08-B24-SD-002	X	X	X	X	X	X
A08-B24-SD-003	X	X	X	X	X	X
A08-B24-SD-004	X	X	X	X	X	X
A08-B24-SD-005	X	X	X	X	X	X
A08-B24-SD-006	X	X	X	X	X	X
A08-B24-SD-007	X	X	X	X	X	X
A08-B2-SD-001	X	X	X	X	X	
A08-B2-SD-002	X	X	X	X	X	
A08-B2-SD-003	X	X	X	X	X	
A08-B3-SD-002	X	X	X	X	X	
A08-B3-SD-003	X	X	X	X	X	
A08-B3-SD-004	X	X	X	X	X	
A08-B3-SD-005	X	X	X	X	X	
A08-B3-SD-006	X	X	X	X	X	

TABLE 3-57
SUMMARY OF IA08 SEDIMENT SAMPLES AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]					
	Gamma Spec	Alpha Spec		GFPC		
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Moisture, Percent (160_3)
A08-B3-SD-056 (dup of A08-B3-SD-006)	X	X	X	X	X	
A08-B3-SD-007	X	X	X	X	X	
A08-B3-SD-008	X	X	X	X	X	
A08-B3-SD-009	X	X	X	X	X	
A08-B3-SD-010	X	X	X	X	X	
A08-B3-SD-011	X	X	X	X	X	
A08-B3-SD-012	X	X	X	X	X	
A08-B3-SD-013	X	X	X	X	X	
A08-B3-SD-014	X	X	X	X	X	
A08-B3-SD-015	X	X	X	X	X	
A08-B6-SD-001	X	X	X	X	X	
A08-B6-SD-002	X	X	X	X	X	
A08-B6-SD-052 (dup of A08-B6-SD-002)	X	X	X	X	X	
A08-B8-SD-001	X	X	X	X	X	
A08-B8-SD-002	X	X	X	X	X	
Subtotals	56	56	56	55	55	7
QA/QC Sample Totals	3	3	3	3	3	NA
Environmental Sample Totals	53	53	53	52	52	7

Notes:

[a] Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri

[b] Sample mislabeled with "SL" ID. Collected below drain, between Buildings 1 and 2.

[c] Analyses not requested/not performed for these samples

Alpha Spec = Alpha Spectroscopy
CT = Count
DOE = Department of Energy
EPA = Environmental Protection Agency
Gamma Spec = Gamma Spectroscopy
GFPC = Gas Flow Proportional Counting
QA/QC = Quality Assurance/Quality Control

TABLE 3-58
IA08 - SURFACE WATER (AQUEOUS) AND SEDIMENT (NON-AQUEOUS) SAMPLES - SAMPLE ID, DATE and DIMENSIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Date Collected	Media	IA08 Location	Feature Description	Feature Dimension (length-ft)	Feature Dimension (width-ft)	SW Depth (inches)	SD Thickness (inches)
A08-B1-SW-001	9/11/2007	SW	Building 1	Flooded Basement; W side of S room	-	-	12	4
A08-B1-SW-002	9/11/2007	SW	Building 1	Flooded Basement; at tunnel	-	-	12	4
A08-B1-SW-003	9/11/2007	SW	Building 1	Flooded Basement; NW corner of N room	-	-	12	4
A08-B1-SW-004	9/11/2007	SW	Building 1	Flooded Basement; W side of center room	-	-	12	4
A08-B1-SW-005	10/24/2007	SW	Building 1	Flooded Basement; center of S room	-	-	12	4
A08-B1-SW-006	10/24/2007	SW	Building 1	Flooded Basement; center of N room	-	-	12	4
A08-B1-SD-001	9/11/2007	SD	Building 1	Flooded Basement; W side of S room	-	-	-	-
A08-B1-SD-002	9/11/2007	SD	Building 1	Flooded Basement; at tunnel	-	-	-	-
A08-B1-SD-003	9/11/2007	SD	Building 1	Flooded Basement; NW corner of N room	-	-	-	-
A08-B1-SD-004	9/11/2007	SD	Building 1	Flooded Basement; W side of center room	-	-	-	-
A08-B1-SD-005	10/24/2007	SD	Building 1	Flooded Basement; center of S room	-	-	-	-
A08-B1-SD-006	10/24/2007	SD	Building 1	Flooded Basement; center of N room	-	-	-	-
A08-B1-SL-001	11/8/2007	Soil	Building 1	Drain Pipe; on ground surface below feature	-	-	-	-
A08-B2-SW-001	9/26/2007	SW	Building 2	Rectangular Basin; E side of S section	4.5	3.2	26	2
A08-B2-SW-003	9/26/2007	SW	Building 2	Round Manhole; NE corner of center section	1.5 (diameter)	-	24	10
A08-B2-SD-001	9/26/2007	SD	Building 2	Rectangular Basin; E side of S section	4.5	3.2	26	2
A08-B2-SD-002	9/26/2007	SD	Building 2	Floor Trench; W side N section	117	1	-	2
A08-B2-SD-003	9/26/2007	SD	Building 2	Round Manhole; NE corner of center section	1.5 (diameter)	-	24	10
A08-B3-SW-001	9/26/2007	SW	Building 3	Rectangular double basin; E side of S section (S basin)	4	2	12	-
A08-B3-SW-003	10/1/2007	SW	Building 3	Covered Floor Trench; N side of S section (E side of trench)	98	6	18	6
A08-B3-SW-004	10/1/2007	SW	Building 3	Covered Floor Trench; N side of S section (W side of trench)	98	6	18	6
A08-B3-SW-005	10/1/2007	SW	Building 3	Open Floor Trench; center of S section (N side of trench)	52	4.7	48	6
A08-B3-SW-006 (A08-B3-SW-056[a])	10/1/2007	SW	Building 3	Open Floor Trench; center of S section (NW side of trench)	8	8	18	3
A08-B3-SW-007	10/1/2007	SW	Building 3	Open Floor Trench; center of S section (SW side of trench)	18	9.0	18	3
A08-B3-SW-008	10/1/2007	SW	Building 3	Open Floor Trench; center of S section (S side of trench)	42	4.7	48	6
A08-B3-SW-009	10/1/2007	SW	Building 3	Square covered basin; S side of S section	4	3	17	6
A08-B3-SW-011	10/3/2007	SW	Building 3	Furnace pit; E side of S section	11	3	51/B[b]	6/B[b]
A08-B3-SW-012	10/3/2007	SW	Building 3	Furnace pit; E side of S section	9	3	98	6
A08-B3-SW-013	10/3/2007	SW	Building 3	Furnace pit; E side of S section	11	3	A/36[b]	A/6[b]
A08-B3-SW-014	10/3/2007	SW	Building 3	Furnace pit; E side of S section	8	3	40	6
A08-B3-SW-015	10/3/2007	SW	Building 3	Furnace pit; E side of S section	11	3	8/3[b]	6/6[b]
A08-B3-SD-002	9/26/2007	SD	Building 3	Rectangular double basin; E side of S section (N basin)	4	4	-	2
A08-B3-SD-003	10/1/2007	SD	Building 3	Covered Floor Trench; N side S section (E side of trench)	98	6	18	6
A08-B3-SD-004	10/1/2007	SD	Building 3	Covered Floor Trench; N side S section (W side of trench)	98	6	18	6
A08-B3-SD-005	10/1/2007	SD	Building 3	Open Floor Trench; center of S section (N side of trench)	52	4.7	48	6
A08-B3-SD-006 (A08-B3-SD-056[a])	10/1/2007	SD	Building 3	Open Floor Trench; center of S section (NW side of trench)	8	8	18	3
A08-B3-SD-007	10/1/2007	SD	Building 3	Open Floor Trench; center of S section (SW side of trench)	18	9	18	3
A08-B3-SD-008	10/1/2007	SD	Building 3	Open Floor Trench; center of S section (S side of trench)	42	4.7	48	6
A08-B3-SD-009	10/1/2007	SD	Building 3	Square covered basin; S side of S section	4	3	17	6
A08-B3-SD-010	10/1/2007	SD	Building 3	Furnace pit; SE corner of S section	2.8	1.3	-	6
A08-B3-SD-011	10/3/2007	SD	Building 3	Furnace pit; E side of S section	11	3	51/B	6/B
A08-B3-SD-012	10/3/2007	SD	Building 3	Furnace pit; E side of S section	9	3	98	6
A08-B3-SD-013	10/3/2007	SD	Building 3	Furnace pit; E side of S section	11	3	A/36[b]	A/6[b]
A08-B3-SD-014	10/3/2007	SD	Building 3	Furnace pit; E side of S section	8	3	40	6
A08-B3-SD-015	10/3/2007	SD	Building 3	Furnace pit; E side of S section	11	3	8/3[b]	6/6[b]

TABLE 3-58
IA08 - SURFACE WATER (AQUEOUS) AND SEDIMENT (NON-AQUEOUS) SAMPLES - SAMPLE ID, DATE and DIMENSIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Date Collected	Media	IA08 Location	Feature Description	Feature Dimension (length-ft)	Feature Dimension (width-ft)	SW Depth (inches)	SD Thickness (inches)
A08-B04&B09-SW-001	9/27/2007	SW	Building 4 & 9	Vault; S side	6	6	5	4
A08-B04&B09-SW-002	9/27/2007	SW	Building 4 & 9	Covered N-S Floor Trench; (S end of trench)	60	2.3	64	6
A08-B04&B09-SW-003	9/27/2007	SW	Building 4 & 9	Open N-S Floor Trench (northern of 2 open trenches)	36	4	43	6
A08-B04&B09-SW-004	9/27/2007	SW	Building 4 & 9	Open Rectangular Basin	12	6	3	1
A08-B04&B09-SW-005	9/27/2007	SW	Building 4 & 9	Open N-S Floor Trench (southern of 2 open trenches)	36	4	32	6
A08-B04&B09-SD-001	9/27/2007	SD	Building 4 & 9	Vault; S side	6	6	5	4
A08-B04&B09-SD-002	9/27/2007	SD	Building 4 & 9	Covered N-S Floor Trench; (S end of trench)	60	2.3	64	6
A08-B04&B09-SD-003	9/27/2007	SD	Building 4 & 9	Open N-S Floor Trench (Northern of 2 open trenches)	36	4	43	6
A08-B04&B09-SD-004	9/27/2007	SD	Building 4 & 9	Open Rectangular Basin	12	6	3	1
A08-B04&B09-SD-005	9/27/2007	SD	Building 4 & 9	Open N-S Floor Trench (southern of 2 open trenches)	36	4	32	6
A08-B6-SD-001	10/4/2007	SD	Building 6	Inaccessible due to health and safety reasons	-	-	-	-
A08-B6-SD-002	10/4/2007	SD	Building 6	Inaccessible due to health and safety reasons	-	-	-	-
A08-B8-SW-001	10/4/2007	SW	Building 8	Inaccessible due to health and safety reasons	-	-	-	-
A08-B8-SW-002	10/4/2007	SW	Building 8	Inaccessible due to health and safety reasons	-	-	-	-
A08-B8-SD-001	10/4/2007	SD	Building 8	Inaccessible due to health and safety reasons	-	-	-	-
A08-B8-SD-002	10/4/2007	SD	Building 8	Inaccessible due to health and safety reasons	-	-	-	-
A08-B24-SD-001	9/25/2007	SD	Building 24	Covered E-W Floor Trench in SW Area	50	1.7	-	2
A08-B24-SD-002	9/25/2007	SD	Building 24	Covered E-W Floor Trench in SW Area	30	1.7	8	2
A08-B24-SD-003	9/25/2007	SD	Building 24	Covered E-W Floor Trench in SW Area	21	1.7	-	2
A08-B24-SD-004	9/25/2007	SD	Building 24	Covered E-W Floor Trench in N Area	90	1.7	-	2
A08-B24-SD-005	9/25/2007	SD	Building 24	Covered E-W Floor Trench in SE Area	48	1.7	-	2
A08-B24-SD-006	9/25/2007	SD	Building 24	Covered E-W Floor Trench in SE Area	80	1.7	-	6
A08-B24-SD-007	9/25/2007	SD	Building 24	Covered E-W Floor Trench in SE Area	50	1.7	-	2
A08-A01-SW-001	9/28/2007	SW	IA02	Pump House Reservoir	28	21	16	Unable to Determine
A08-A01-SW-004	9/28/2007	SW	IA02	Unknown (large vault)	12	4.8	32	13
A08-A01-SW-005	9/28/2007	SW	IA02	Outfall into drainage swale; W side Bldg 9	-	-	-	-
A08-A01-SW-006 (A08-A01-SW-056[a])	9/28/2007	SW	IA02	Catch Basin	3	3	9	10
A08-A01-SW-007	9/28/2007	SW	IA02	Catch Basin	3	2	1	1
A08-A01-SW-011	10/3/2007	SW	IA02	Oil/water Separator	12	9	96	12
A08-A01-SW-012	9/28/2007	SW	IA02	Sewer Manhole	-	-	-	-
A08-A01-SD-001	10/3/2007	SD	IA04D	Pump House Reservoir	28	21	16	Unable to Determine
A08-A01-SD-001R	10/11/2007	SD	IA04D	Pump House Reservoir (resample due to low sample volume)	28	21	16	Unable to Determine
A08-A01-SD-002	9/28/2007	SD	IA01	Catch Basin; S side Bldg 3	2	2	-	Unable to Determine
A08-A01-SD-003	9/28/2007	SD	IA02	Down Spout; S side of Bldg 9	-	-	-	-
A08-A01-SD-004	9/28/2007	SD	IA04C	Vault	12	4.8	32	13
A08-A01-SD-005	9/28/2007	SD	IA04D	Outfall into drainage swale; W side Bldg 9	-	-	-	-
A08-A01-SD-006 (A08-A01-SD-056[a])	9/28/2007	SD	IA04A	Catch Basin	3	3	9	10
A08-A01-SD-007	9/28/2007	SD	IA04A	Catch Basin			-	
A08-A01-SD-008	9/28/2007	SD	IA04A	Catch Basin	3	2	-	6
A08-A01-SD-009	9/28/2007	SD	IA02	Catch Basin	1.8 (Top diameter)	2.8 (Bottom diameter)	2	8
A08-A01-SD-010	9/28/2007	SD	IA02	Catch Basin	2	2	-	18
A08-A01-SD-011	10/3/2007	SD	IA02	Oil/water Separator	12	9	96	12
A08-A01-SD-012	9/28/2007	SD	IA04C	Sewer Manhole	-	-	-	-
A08-A01-SD-013	9/28/2007	SD	IA02	Catch Basin	1.7	1.7	-	20

Notes:

[a] Field Duplicate Sample

[b] Furnaces have 2 sides, presented in table as (SideA/SideB). If no number is given for one side, it was inaccessible.

Bldg - Building

ft = feet

N - north, S - south, E - east, W - west

SD - Sediment

SW - Surface Water

SL - Sample collected immediately below drain pipe (inadvertantly labeled SL).

TABLE 3-59
SUMMARY OF IA09 SURFACE WATER SAMPLES AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods [a]			
	Alpha Spec		GFPC	
Sample ID	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD
A09-SW-001	X	X	X	X
A09-SW-002	X	X	X	X
A09-SW-003	X	X	X	X
A09-SW-004	X	X	X	X
A09-SW-005	X	X	X	X
A09-SW-006	X	X	X	X
A09-SW-007	X	X	X	X
A09-SW-008	X	X	X	X
A09-SW-058 (duplicate of A09-SW-008)	X	X	X	X
A09-SW-009	X	X	X	X
A09-SW-010	X	X	X	X
A09-SW-011	X	X	X	X
A09-SW-012	X	X	X	X
Subtotals	13	13	13	13
QA/QC Sample Totals	1	1	1	1
Environmental Sample Totals	12	12	12	12

Notes:
[a] Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri
Alpha Spec = Alpha Spectroscopy
CT = Count
DOE = Department of Energy
EPA = Environmental Protection Agency
GFPC = Gas Flow Proportional Counting
QA/QC = Quality Assurance/Quality Control

TABLE 3-60
SUMMARY OF IA03 and IA09 SEDIMENT SAMPLES AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]						
	Gamma Spec	Alpha Spec		GFPC			
Sample ID	Gamma Ra-226 & Hits By DOE GA-01-R Mod	Iso URANIUM (SHORT CT) DOE A-01-R MOD	Iso THORIUM (SHORT CT) DOE A-01-R MOD	Radium 226 by EPA 903_0 MOD	Radium 228 by GFPC EPA 904 MOD	Carbon, Total Organic "TOC" (9060)	Moisture, Percent (160_3)
A03-SD-001	X	X	X	X	X	X	X
A03-SD-002	X	X	X				
A03-SD-003	X	X	X	X	X	X	X
A03-SD-004	X	X	X				
A03-SD-005	X	X	X	X	X	X	X
A03-SD-006	X	X	X				
A09-SD-001	X	X	X	X	X	X	X
A09-SD-002	X	X	X				
A09-SD-003	X	X	X	X	X	X	X
A09-SD-004	X	X	X				
A09-SD-005	X	X	X	X	X	X	X
A09-SD-006	X	X	X				
A09-SD-007	X	X	X	X	X	X	X
A09-SD-008	X	X	X	X	X	X	X
A09-SD-058 (duplicate of A09-SD-008)	X	X	X	X	X	X	X
A09-SD-009	X	X	X				
A09-SD-010	X	X	X				
A09-SD-011	X	X	X	X	X	X	X
A09-SD-012	X	X	X				
Subtotals	19	19	19	10	10	10	10
QA/QC Sample Totals	1	1	1	1	1	1	1
Environmental Sample Totals	18	18	18	9	9	9	9

Notes:
[a] Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri
Alpha Spec = Alpha Spectroscopy
CT = Count
DOE = Department of Energy
EPA = Environmental Protection Agency
Gamma Spec = Gamma Spectroscopy
GFPC = Gas Flow Proportional Counting
QA/QC = Quality Assurance/Quality Control
TOC = Total Organic Carbon

TABLE 3-61
IDW SAMPLE ID AND ANALYSES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

	Analytical Methods[a]			
Client ID	Inductively Coupled Plasma (6010B Trace)	Mercury (7470A, Cold Vapor) - Liquid	PCBs (8082)	Volatile Organics, GC/MS (8260B)
100657-LIDW-001	X	X	X	X
Totals	1	1	1	1

Notes:

[a] Analyses by Test America Laboratories (formerly STL Inc.) St. Louis, Missouri

GC/MS = Gas chromatography/mass spectrometry

PCBs = Polychlorinated biphenyls

TABLE 3-62
LIST OF BLIND DUPLICATE SAMPLES AND CORRESPONDING SAMPLE IDs
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Blind Duplicate Sample ID	Sample ID	Matrix				
		Soil	Sediment	Surface Water	Building Material	Groundwater
A02SL-009-54	A02SL-009-04	X				
A02SL-019-56	A02SL-019-06	X				
A02SL-027-51	A02SL-027-01	X				
A02SL-703-51	A02SL-703-01	X				
A03SL-018-51	A03SL-018-01	X				
A03SL-036-51	A03SL-036-01	X				
A03SL-228-56	A03SL-228-06	X				
A03SL-232-56	A03SL-232-06	X				
A03SL-240-57	A03SL-240-07	X				
A04ASL-003-51	A04ASL-003-01	X				
A04ASL-038-51	A04ASL-038-01	X				
A04ASL-055-51	A04ASL-055-01	X				
A04ASL-224-60	A04ASL-224-10	X				
A04BSL-016-51	A04BSL-016-01	X				
A04BSL-027-51	A04BSL-027-01	X				
A04BSL-042-52	A04BSL-042-02	X				
A04BSL-304-53	A04BSL-304-03	X				
A04BSL-310-57	A04BSL-310-07	X				
A04CSL-011-53	A04CSL-011-03	X				
A04CSL-013-52	A04CSL-013-02	X				
A04DSL-021-51	A04DSL-021-01	X				
A04DSL-023-53	A04DSL-023-03	X				
A05ASL-004-51	A05ASL-004-01	X				
A05ASL-018-51	A05ASL-018-01	X				
A05ASL-020-51	A05ASL-020-01	X				
A05ASL-031-53	A05ASL-031-03	X				
A05ASL-304-63	A05ASL-304-13	X				
A05ASL-305-53	A05ASL-305-03	X				
A05BSL-001-63	A05BSL-001-13	X				
A05BSL-009-51	A05BSL-009-01	X				
A05BSL-011-51	A05BSL-011-01	X				
A10SL-303-52	A10SL-303-02	X				
B02SL-046-51	B02SL-046-01	X				
B03SL-018-52	B03SL-018-02	X				
B03SL-027-53	B03SL-027-03	X				
B04&B09SL-033-52	B04&B09SL-033-02	X				
B04&B09SL-036-52	B04&B09SL-036-02	X				
B06SL-021-55	B06SL-021-05	X				
B08SL-015-51	B08SL-015-01	X				
B08SL-021-56	B08SL-021-06	X				
B24SL-019-51	B24SL-019-01	X				
B24SL-028-51	B24SL-028-01	X				
B24SL-033-51	B24SL-033-01	X				
BKGSL-010-51	BKGSL-010-01	X				
A08-A01-SD-056	A08-A01-SD-006		X			
A08-B3-SD-056	A08-B3-SD-006		X			
A08-B6-SD-052	A08-B6-SD-002		X			
A09-SD-058	A09-SD-008		X			
A08-A01-SW-056	A08-A01-SW-006			X		
A08-B3-SW-056	A08-B3-SW-006			X		
A09-SW-058	A09-SW-008			X		
B06-BM-051	B06-BM-001				X	
B06-BM-052	B06-BM-002				X	
A02MW51*	A02MW1					X
A02MW54**	A02MW4					X
A04AMW70**	A04AMW20					X
A04AMW71*	A04AMW21					X

Notes:
* Round 1 Blind Duplicate Samples
**Round 2 Blind Duplicate Samples
Refer to tables 3-24, 3-43, 3-45, 3-52, 3-56, 3-57, 3-59, and 3-60 for analytical methods

TABLE 4-1
SUMMARY OF SURFACE WATER AND GROUNDWATER BACKGROUND CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Radionuclide	Concentration (pCi/L)[a]	
	Surface Water[b]	Groundwater[c]
^{226}Ra	0.13 ± 0.09[d]	1.31 ± 0.14[e]
^{228}Ra	0.3 ± 03[d]	2.1 ± 0.3[e]
^{228}Th	0.13 ± 0.08	0.04 ± 0.04
^{230}Th	0.18 ± 0.09	0.18 ± 0.07
^{232}Th	0.00 ± 0.04	0.00 ± 0.03
^{234}U	0.15 ± 0.07	0.96 ± 0.16
^{235}U	0.03 ± 0.05	0.07 ± 0.06
^{238}U	0.10 ± 0.06	0.85 ± 0.15

Notes:
[a] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[b] Weighted average of sample IDs A09-SW-010, A09-SW-011, and A09-SW-012.
[c] Weighted average of MW-600D samples, August 2007 and November 2007 sampling events.
[d] The combined ^{226}Ra/^{228}Ra concentration in surface water is (0.4 ± 0.3) pCi/L, which meets the relevant EPA drinking water maximum contaminant level of 5 pCi/L with a level of confidence greater than 95 percent.
[e] The combined ^{226}Ra/^{228}Ra concentration in groundwater is (3.4 ± 0.3) pCi/L, which meets the relevant EPA drinking water maximum contaminant level of 5 pCi/L with a level of confidence greater than 95 percent.

TABLE 4-2
SOIL SCREENING LEVELS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Nuclide	*Soil Concentration* [a b] *(pCi/g)*
^{226}Ra	0.7
^{228}Ra	1.1[c]
^{228}Th	4.7
^{230}Th	1.8
^{232}Th	1.1
^{234}U	13
^{235}U	8
^{238}U	14

Notes:
[a] These values represent surficial surface soil concentrations of individual radionuclides that would be deemed in compliance with the 25 mrem/y (0.25 mSv/y) unrestricted release dose limit in 10 CFR 20.1402. These values were derived using DANDD screening methodology (NUREG/CR–5512, Volume 3 [USNRC, 1999]). They were derived based on selection of the 90th percentile of the output dose distribution for each specific radionuclide (or radionuclide with the specific decay chain). Behavioral parameters were set at the mean of the distribution of the assumed critical group. The metabolic parameters were set at "Standard Man" or at the mean of the distribution for an average man. For radionuclides in a mixture, the "sum of fractions" rule applies; see Part 20, Appendix B, Note 4.
[b] SOURCE: Table B.2, Appendix B, Vol. 1, NUREG-1757 (USNRC, 2006).
[c] Table B.2, Appendix B, NUREG-1757 (USNRC, 2006) does not list a screening value for ^{228}Ra so it was set equal to the screening value of its parent radionuclide, ^{232}Th with its decay progeny present in equilibrium. The value is the concentration of the parent radionuclide but accounts for contributions from the complete chain of progeny in equilibrium with the parent radionuclide (NUREG/CR–5512 Volumes 1, 2, and 3 [USNRC, 1992; 2001; 1999]). Alternatively, RESRAD calculations performed separately for ^{226}Ra and ^{228}Ra with all other parameters held the same for each calculation result in a ratio of concentrations of ^{226}Ra:^{228}Ra::1:1.52 for the same dose equivalent. Multiplying the ^{226}Ra soil screening level by this factor produces the same result for the ^{228}Ra screening level, i.e., 1.52 × 0.7 pCi/g ≈ 1.1 pCi/g.

TABLE 4-3
SUM OF RATIOS FOR SURFACE SOIL CONCENTRATIONS DETERMINED BY ALPHA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A02SL-001-01	0.90 ± 0.08
A02SL-002-01	1.43 ± 0.12
A02SL-003-01	0.94 ± 0.06
A02SL-005-01	0.73 ± 0.07
A02SL-007-01	3.3 ± 0.2
A02SL-011-01	0
A02SL-014-01	1.55 ± 0.12
A02SL-015-01	1.0 ± 0.5
A02SL-016-01	0.9 ± 0.6
A02SL-020-01	1.0 ± 0.4
A02SL-022-01	0.78 ± 0.07
A02SL-023-01	0.8 ± 0.5
A02SL-024-01	2.88 ± 0.20
A02SL-025-01	0.79 ± 0.07
A02SL-026-01	0.81 ± 0.08
A02SL-029-01	1.29 ± 0.11
A02SL-030-01	0.46 ± 0.05
A02SL-032-01	2.47 ± 0.17
A02SL-033-01	0.98 ± 0.09
A02SL-034-01	0.32 ± 0.04
A02SL-035-01	1.4 ± 0.5
A02SL-038-01	0.32 ± 0.04
A02SL-041-01	1.9 ± 0.5
A02SL-042-01	0.29 ± 0.04
A02SL-043-01	1.36 ± 0.11
A02SL-215-01	1.3 ± 0.5
A02SL-216-01	1.0 ± 0.4
A02SL-234-01	5.4 ± 0.4
A03SL-002-01	0.8 ± 0.6
A03SL-009-01	1.2 ± 0.5
A03SL-011-01	2.5 ± 0.7
A03SL-018-01	0.8 ± 0.4
A03SL-021-01	1.5 ± 0.3
A03SL-026-01	1.49 ± 0.12
A03SL-027-01	0.56 ± 0.06
A03SL-028-01	0.80 ± 0.05
A03SL-029-01	0.76 ± 0.07
A03SL-031-01	3.5 ± 0.2
A03SL-033-01	0.78 ± 0.07
A03SL-035-01	0.96 ± 0.09
A03SL-036-01	0.42 ± 0.05
A03SL-037-01	1.4 ± 0.4
A03SL-038-01	8.7 ± 0.5
A03SL-040-01	0.74 ± 0.07
A03SL-042-01	1.1 ± 0.4
A03SL-203-01	1.3 ± 0.6
A03SL-209-01	2.14 ± 0.15
A03SL-217-01	0.38 ± 0.05
A03SL-221-01	0.45 ± 0.05

Sample ID [a]	Sum of Ratios [a b c]
A03SL-224-01	2.0 ± 0.4
A03SL-226-01	0.80 ± 0.08
A03SL-228-01	1.04 ± 0.09
A03SL-231-01	3.1 ± 0.2
A03SL-232-01	0.62 ± 0.06
A03SL-233-01	0.56 ± 0.06
A03SL-234-01	0.48 ± 0.05
A03SL-237-01	1.2 ± 0.4
A03SL-239-01	0.99 ± 0.09
A04ASL-003-01	1.13 ± 0.10
A04ASL-009-01	2.3 ± 0.3
A04ASL-014-01	2.06 ± 0.15
A04ASL-020-01	6.5 ± 0.6
A04ASL-024-01	0.89 ± 0.08
A04ASL-031-01	0
A04ASL-034-01	0
A04ASL-038-01	0.82 ± 0.08
A04ASL-044-01	1.37 ± 0.12
A04ASL-051-01	24.3 ± 1.3
A04ASL-054-01	2.33 ± 0.17
A04ASL-055-01	3.0 ± 0.2
A04ASL-056-01	12.6 ± 0.9
A04ASL-058-01	3.7 ± 0.4
A04ASL-059-01	1.0 ± 0.5
A04ASL-060-01	1.36 ± 0.11
A04ASL-061-01	0.62 ± 0.05
A04ASL-062-01	3.6 ± 0.5
A04ASL-203-01	0.73 ± 0.07
A04ASL-214-01	1.03 ± 0.09
A04ASL-220-01	2.03 ± 0.15
A04ASL-238-01	0.6 ± 0.4
A04ASL-241-01	2.47 ± 0.13
A04ASL-244-01	0.79 ± 0.08
A04ASL-276-01	10.5 ± 0.7
A04ASL-278-01	0.81 ± 0.08
A04ASL-318-01	1.50 ± 0.12
A04ASL-319-01	1.03 ± 0.09
A04ASL-320-01	10.1 ± 0.9
A04BSL-001-01	0
A04BSL-002-01	0
A04BSL-004-01	0
A04BSL-005-01	0.34 ± 0.05
A04BSL-006-01	0
A04BSL-008-01	0.22 ± 0.04
A04BSL-009-01	0
A04BSL-010-01	0
A04BSL-011-01	0.2 ± 0.4
A04BSL-013-01	0
A04BSL-014-01	0

TABLE 4-3
SUM OF RATIOS FOR SURFACE SOIL CONCENTRATIONS DETERMINED BY ALPHA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A04BSL-016-01	0.23 ± 0.04
A04BSL-019-01	0
A04BSL-021-01	0
A04BSL-025-01	0
A04BSL-027-01	0
A04BSL-028-01	0
A04BSL-033-01	0
A04BSL-039-01	0.7 ± 0.5
A04BSL-042-01	0.25 ± 0.15
A04BSL-043-01	1.04 ± 0.09
A04BSL-221-01	0
A04BSL-309-01	0
A04BSL-310-01	0
A04CSL-001-01	0.4 ± 0.3
A04CSL-002-01	0.9 ± 0.5
A04CSL-003-01	0.3 ± 0.4
A04CSL-005-01	0
A04CSL-006-01	0.5 ± 0.4
A04CSL-007-01	0
A04CSL-008-01	0
A04CSL-009-01	0.5 ± 0.4
A04CSL-011-01	0.6 ± 0.4
A04CSL-012-01	0.12 ± 0.13
A04CSL-013-01	0.12 ± 0.03
A04CSL-014-01	0
A04CSL-015-01	0
A04CSL-301-01	0.75 ± 0.16
A04CSL-305-01	0
A04CSL-307-01	0.2 ± 0.4
A04CSL-308-01	0.5 ± 0.5
A04CSL-309-01	2.1 ± 0.8
A04CSL-310-01	0.8 ± 0.5
A04CSL-312-01	0
A04DSL-015-01	0.6 ± 0.4
A04DSL-020-01	1.25 ± 0.10
A04DSL-021-01	0.9 ± 0.4
A04DSL-023-01	0.22 ± 0.04
A04DSL-024-01	0
A04DSL-026-01	1.4 ± 0.7
A04DSL-029-01	0.8 ± 0.6
A04DSL-220-01	2.05 ± 0.11
A04DSL-307-01	1.2 ± 0.5
A04DSL-308-01	1.1 ± 0.5
A04DSL-317-01	0.19 ± 0.15
A04DSL-326-01	3.1 ± 0.6
A05ASL-003-01	0.19 ± 0.10
A05ASL-004-01	0.31 ± 0.04
A05ASL-005-01	0.2 ± 0.4
A05ASL-007-01	0

Sample ID [a]	Sum of Ratios [a b c]
A05ASL-008-01	0.3 ± 0.4
A05ASL-011-01	0
A05ASL-012-01	0.5 ± 0.5
A05ASL-017-01	0
A05ASL-018-01	0.12 ± 0.13
A05ASL-019-01	1.4 ± 0.5
A05ASL-020-01	0.100 ± 0.018
A05ASL-021-01	0
A05ASL-022-01	0.6 ± 0.5
A05ASL-023-01	0
A05ASL-024-01	0.6 ± 0.5
A05ASL-025-01	0.14 ± 0.14
A05ASL-026-01	0.17 ± 0.14
A05ASL-029-01	0
A05ASL-210-01	0.23 ± 0.15
A05ASL-211-01	1.9 ± 0.6
A05ASL-219-01	1.2 ± 0.5
A05ASL-226-01	0
A05ASL-301-01	748 ± 32
A05ASL-302-01	1.35 ± 0.11
A05ASL-303-01	2.0 ± 0.5
A05ASL-304-01	1.9 ± 0.3
A05ASL-305-01	2.4 ± 0.8
A05ASL-307-01	0
A05ASL-308-01	1.3 ± 0.7
A05BSL-001-01	0
A05BSL-003-01	0.3 ± 0.5
A05BSL-004-01	0.7 ± 0.6
A05BSL-005-01	0.13 ± 0.15
A05BSL-006-01	0
A05BSL-007-01	0
A05BSL-008-01	0
A05BSL-009-01	0.6 ± 0.5
A05BSL-010-01	0
A05BSL-011-01	0
B02SL-020-01	2.3 ± 0.6
B02SL-046-01	0.9 ± 0.4
B02SL-721-01	2.43 ± 0.17
B02SL-739-01	3.6 ± 0.7
B03SL-014-01	4.8 ± 0.3
B03SL-016-01	6.0 ± 0.6
B03SL-020-01	2.9 ± 0.5
B03SL-030-01	1.84 ± 0.14
B03SL-037-01	0.105 ± 0.018
B04&B09SL-015-01	2.9 ± 0.4
B04&B09SL-017-01	1.7 ± 0.5
B04&B09SL-018-01	0.8 ± 0.4
B04&B09SL-026-01	1.24 ± 0.10
B06SL-003-01	1.30 ± 0.11

TABLE 4-3
SUM OF RATIOS FOR SURFACE SOIL CONCENTRATIONS DETERMINED BY ALPHA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
B06SL-005-01	10.2 ± 0.6
B06SL-021-01	46 ± 4
B08SL-003-01	502 ± 24
B08SL-023-01	42 ± 3
BKGSL-001-01	0
BKGSL-002-01	0.17 ± 0.14
BKGSL-003-01	0
BKGSL-004-01	0
BKGSL-005-01	0
BKGSL-006-01	0
BKGSL-007-01	0
BKGSL-008-01	0
BKGSL-009-01	0.14 ± 0.14
BKGSL-010-01	0.3 ± 0.4
BKGSL-011-01	0.4 ± 0.3
BKGSL-012-01	0

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1].
[b] "0" is recorded with none of the terms in the sum-of-ratios calculation is greater than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] The SORs for Sample ID A05ASL-301-01 were calculated with assumption that the ^{226}Ra concentrations above background were zero. GFPC results show that these assumptions are faulty for these sample IDs. See footnote to Section 4.9.1 for discussion of this discrepancy.

TABLE 4-4
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS
DETERMINED BY ALPHA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
A02SL-004-07	1.3 ± 0.5
A02SL-005-02	1.14 ± 0.10
A02SL-006-03	1.70 ± 0.13
A02SL-007-05	1.66 ± 0.13
A02SL-009-04	0.7 ± 0.3
A02SL-012-02	0.45 ± 0.05
A02SL-015-10	2.0 ± 0.4
A02SL-015-11	1.9 ± 0.4
A02SL-016-02	1.0 ± 0.3
A02SL-016-03	2.1 ± 0.4
A02SL-018-03	1.0 ± 0.3
A02SL-019-02	1.7 ± 0.4
A02SL-019-06	0.6 ± 0.3
A02SL-020-02	1.0 ± 0.3
A02SL-020-03	1.3 ± 0.4
A02SL-021-03	2.7 ± 0.3
A02SL-021-04	1.3 ± 0.4
A02SL-022-04	1.1 ± 0.3
A02SL-023-02	0.8 ± 0.3
A02SL-024-07	1.1 ± 0.3
A02SL-027-01	0.95 ± 0.18
A02SL-028-01	25 ± 1.1
A02SL-028-02	1.76 ± 0.10
A02SL-030-06	1.9 ± 0.4
A02SL-031-06	1.2 ± 0.3
A02SL-035-02	1.9 ± 0.3
A02SL-037-05	2.2 ± 0.4
A02SL-037-06	0.4 ± 0.2
A02SL-039-03	4.7 ± 0.4
A02SL-216-13	2.3 ± 0.4
A02SL-229-02	1.44 ± 0.12
A02SL-234-02	1.77 ± 0.14
A03SL-009-02	0.5 ± 0.3
A03SL-011-02	1.7 ± 0.4
A03SL-015-02	0.5 ± 0.3
A03SL-018-03	1.30 ± 0.10
A03SL-022-02	1.21 ± 0.18
A03SL-028-03	2.9 ± 0.6
A03SL-028-05	0.89 ± 0.08
A03SL-030-02	1.8 ± 0.2
A03SL-031-02	2.83 ± 0.19
A03SL-035-02	11.8 ± 0.7
A03SL-038-10	0.77 ± 0.07
A03SL-039-02	0.98 ± 0.09
A03SL-042-02	0.45 ± 0.05
A03SL-214-06	0.76 ± 0.12
A03SL-216-10	0.86 ± 0.08
A03SL-217-13	18.2 ± 1.0
A03SL-217-14	5.7 ± 0.4
A03SL-222-10	0.86 ± 0.08
A03SL-223-05	1.17 ± 0.17

Sample ID [a b]	Sum of Ratios [b c d]
A03SL-224-02	2.7 ± 0.4
A03SL-224-05	0.83 ± 0.08
A03SL-227-04	0.55 ± 0.06
A03SL-228-06	0.69 ± 0.07
A03SL-231-02	2.78 ± 0.19
A03SL-231-05	1.86 ± 0.14
A03SL-232-06	0.85 ± 0.08
A03SL-233-07	0.65 ± 0.06
A03SL-239-11	4.1 ± 0.5
A03SL-240-06	2.23 ± 0.16
A03SL-240-07	3.41 ± 0.16
A04ASL-003-03	3.6 ± 0.3
A04ASL-051-02	16.1 ± 1.0
A04ASL-052-02	0.6 ± 0.3
A04ASL-055-02	2.19 ± 0.16
A04ASL-056-04	1.5 ± 0.2
A04ASL-056-05	3.9 ± 0.3
A04ASL-058-02	3.3 ± 0.2
A04ASL-062-02	3.5 ± 0.3
A04ASL-063-03	3.6 ± 0.2
A04ASL-067-02	0.22 ± 0.04
A04ASL-203-06	2.7 ± 0.3
A04ASL-209-10	0.73 ± 0.16
A04ASL-214-05	31 ± 2
A04ASL-214-06	9.2 ± 0.6
A04ASL-214-09	5.5 ± 0.3
A04ASL-220-14	0.47 ± 0.05
A04ASL-224-10	9.6 ± 0.6
A04ASL-224-11	7.1 ± 0.3
A04ASL-224-14	0.51 ± 0.16
A04ASL-230-05	1.69 ± 0.19
A04ASL-236-09	1.78 ± 0.14
A04ASL-238-05	1.86 ± 0.15
A04ASL-239-03	0.9 ± 0.3
A04ASL-244-02	6.5 ± 0.4
A04ASL-250-04	2.6 ± 0.2
A04ASL-274-11	0.50 ± 0.16
A04ASL-276-05	1.77 ± 0.14
A04ASL-278-10	53 ± 3
A04ASL-309-01	1.86 ± 0.14
A04ASL-314-03	3.9 ± 0.5
A04ASL-318-02	3.7 ± 0.2
A04BSL-003-01	0
A04BSL-007-06	0.9 ± 0.4
A04BSL-008-03	0.11 ± 0.13
A04BSL-012-06	0.30 ± 0.18
A04BSL-013-07	0.66 ± 0.16
A04BSL-014-07	0.2 ± 0.2
A04BSL-015-06	1.0 ± 0.3
A04BSL-015-07	0.17 ± 0.14
A04BSL-016-03	0

TABLE 4-4
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS
DETERMINED BY ALPHA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
A04BSL-018-06	0.5 ± 0.3
A04BSL-018-07	0.4 ± 0.3
A04BSL-019-02	0.26 ± 0.04
A04BSL-020-06	0
A04BSL-025-03	1.28 ± 0.10
A04BSL-026-01	0.12 ± 0.20
A04BSL-031-06	0.69 ± 0.20
A04BSL-031-07	0.3 ± 0.2
A04BSL-032-06	0.6 ± 0.3
A04BSL-032-07	0.5 ± 0.3
A04BSL-036-05	0.8 ± 0.3
A04BSL-038-07	0.2 ± 0.2
A04BSL-040-03	1.7 ± 0.3
A04BSL-041-05	2.08 ± 0.15
A04BSL-042-02	0.24 ± 0.15
A04BSL-043-02	0.25 ± 0.04
A04BSL-219-03	0.42 ± 0.15
A04BSL-302-06	0.5 ± 0.3
A04BSL-303-01	0
A04BSL-304-03	0.41 ± 0.15
A04BSL-305-06	0
A04BSL-306-03	0.44 ± 0.05
A04BSL-307-01	0
A04BSL-308-01	0
A04BSL-308-02	0.8 ± 0.2
A04BSL-310-06	0.6 ± 0.3
A04BSL-310-07	0.23 ± 0.11
A04CSL-003-02	0.3 ± 0.2
A04CSL-004-02	0.8 ± 0.3
A04CSL-006-02	0.7 ± 0.3
A04CSL-006-03	0.6 ± 0.3
A04CSL-011-03	0.5 ± 0.3
A04CSL-011-04	0.5 ± 0.3
A04CSL-013-02	0.61 ± 0.15
A04CSL-302-05	1.4 ± 0.3
A04CSL-307-02	0.6 ± 0.3
A04CSL-308-02	0
A04CSL-309-05	0
A04CSL-310-02	0.7 ± 0.3
A04CSL-312-02	0.6 ± 0.3
A04DSL-008-05	1.4 ± 0.3
A04DSL-022-06	0.8 ± 0.3
A04DSL-023-03	1.5 ± 0.3
A04DSL-031-03	2.1 ± 0.5
A04DSL-210-02	0.8 ± 0.4
A04DSL-304-03	1.1 ± 0.3
A04DSL-306-02	0.8 ± 0.2
A04DSL-307-02	1.0 ± 0.3
A04DSL-311-02	0.21 ± 0.15
A04DSL-320-05	1.6 ± 0.4
A04DSL-324-03	0.4 ± 0.3

Sample ID [a b]	Sum of Ratios [b c d]
A04DSL-324-04	1.8 ± 0.4
A05ASL-004-02	0
A05ASL-007-03	0.4 ± 0.3
A05ASL-008-07	0.1 ± 0.2
A05ASL-009-01	0
A05ASL-009-07	0.3 ± 0.2
A05ASL-010-07	0.2 ± 0.2
A05ASL-010-08	0
A05ASL-011-06	0.4 ± 0.3
A05ASL-012-06	0.3 ± 0.3
A05ASL-012-07	0
A05ASL-017-03	0.11 ± 0.14
A05ASL-018-02	0.7 ± 0.2
A05ASL-022-03	0.11 ± 0.14
A05ASL-023-03	0.6 ± 0.3
A05ASL-024-02	0.3 ± 0.3
A05ASL-027-03	0
A05ASL-029-03	0
A05ASL-031-03	0
A05ASL-209-25	0.25 ± 0.19
A05ASL-219-02	0.71 ± 0.05
A05ASL-301-02	301 ± 13
A05ASL-301-06	36 ± 3
A05ASL-303-13	0.8 ± 0.3
A05ASL-303-14	0.8 ± 0.3
A05ASL-304-02	0.97 ± 0.08
A05ASL-304-13	0.39 ± 0.05
A05ASL-304-14	0.10 ± 0.03
A05ASL-305-02	0.6 ± 0.3
A05ASL-305-03	0.8 ± 0.2
A05ASL-305-13	0.1 ± 0.3
A05ASL-306-03	0.4 ± 0.4
A05BSL-001-12	0
A05BSL-001-13	0
A05BSL-002-11	0.4 ± 0.4
A05BSL-003-03	0.3 ± 0.3
A05BSL-004-03	0.19 ± 0.16
A05BSL-005-03	0.4 ± 0.3
A05BSL-006-11	0
A05BSL-007-03	0.2 ± 0.3
A05BSL-007-10	0
A05BSL-008-02	0
A05BSL-010-03	0
A05BSL-010-04	0
A05BSL-011-03	0.3 ± 0.3
A10SL-001-01	0
A10SL-003-01	0.3 ± 0.3
A10SL-004-01	0.1 ± 0.2
A10SL-004-02	0.4 ± 0.3
A10SL-005-01	0.27 ± 0.17
A10SL-006-01	0.4 ± 0.3

TABLE 4-4
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS
DETERMINED BY ALPHA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
A10SL-007-01	0.41 ± 0.18
A10SL-008-01	0.1 ± 0.2
A10SL-009-01	0
A10SL-009-02	0.4 ± 0.3
A10SL-010-01	0.20 ± 0.15
A10SL-010-02	0
A10SL-011-02	0
A10SL-012-01	0
A10SL-013-01	0.8 ± 0.3
A10SL-013-02	1.2 ± 0.3
A10SL-301-01	0.52 ± 0.06
A10SL-301-02	0
A10SL-302-02	0.10 ± 0.03
A10SL-302-13	0.13 ± 0.15
A10SL-303-01	0
A10SL-303-02	0.26 ± 0.03
A10SL-303-13	0
A10SL-303-18	0
B02SL-005-01	3.6 ± 0.4
B02SL-008-01	4.0 ± 0.3
B02SL-009-01	2.15 ± 0.16
B02SL-009-02	1.8 ± 0.4
B02SL-012-01	1.63 ± 0.13
B02SL-012-02	0.42 ± 0.05
B02SL-017-05	3.9 ± 0.3
B02SL-018-01	3.5 ± 0.5
B02SL-018-02	3.4 ± 0.6
B02SL-018-03	2.7 ± 0.5
B02SL-022-03	0.9 ± 0.4
B02SL-025-02	0.3 ± 0.3
B02SL-037-05	0.3 ± 0.3
B02SL-045-01	2.8 ± 0.6
B02SL-049-01	1.1 ± 0.4
B02SL-049-02	1.5 ± 0.4
B02SL-052-03	1.3 ± 0.4
B02SL-052-05	0.9 ± 0.4
B02SL-055-03	0.7 ± 0.2
B02SL-059-01	2.6 ± 0.3
B02SL-302-01	3.7 ± 0.3
B02SL-302-05	4.4 ± 0.4
B03SL-009-01	1.91 ± 0.10
B03SL-013-01	1.35 ± 0.17
B03SL-014-05	61 ± 5
B03SL-016-05	10.1 ± 0.6
B03SL-018-02	0.6 ± 0.3
B03SL-023-01	1.4 ± 0.3
B03SL-025-03	1.4 ± 0.3
B03SL-027-03	0.8 ± 0.3
B03SL-030-02	4.5 ± 0.3
B03SL-035-01	2.3 ± 0.3
B03SL-036-02	1.4 ± 0.3

Sample ID [a b]	Sum of Ratios [b c d]
B04&B09SL-009-02	0.59 ± 0.20
B04&B09SL-015-02	0.86 ± 0.15
B04&B09SL-017-02	1.16 ± 0.10
B04&B09SL-018-02	0.8 ± 0.3
B04&B09SL-020-01	0.7 ± 0.3
B04&B09SL-025-02	1.2 ± 0.3
B04&B09SL-027-01	1.1 ± 0.3
B04&B09SL-030-01	1.27 ± 0.11
B04&B09SL-032-01	0.5 ± 0.3
B04&B09SL-033-02	0.55 ± 0.20
B04&B09SL-034-01	0.53 ± 0.06
B04&B09SL-036-02	0.7 ± 0.3
B04&B09SL-038-02	0.7 ± 0.3
B04&B09SL-038-03	0.6 ± 0.3
B06SL-004-05	4.8 ± 0.3
B06SL-006-01	1.69 ± 0.13
B06SL-006-02	15.1 ± 0.9
B06SL-011-05	8.0 ± 0.6
B06SL-021-05	24 ± 2
B06SL-021-06	3.1 ± 0.5
B06SL-024-01	2.5 ± 0.3
B08SL-003-05	145 ± 7
B08SL-014-01	70 ± 5
B08SL-015-01	88 ± 6
B08SL-015-09	237 ± 12
B08SL-017-01	2836 ± 128
B08SL-017-05	528 ± 35
B08SL-021-06	47 ± 2
B08SL-022-01	37 ± 3
B08SL-023-03	69 ± 5
B08SL-026-02	21 ± 2
B24SL-018-02	0.5 ± 0.3
B24SL-018-03	0.4 ± 0.2
B24SL-019-01	0.7 ± 0.2
B24SL-019-02	1.9 ± 0.4
B24SL-021-01	2.45 ± 0.13
B24SL-021-02	0.38 ± 0.05
B24SL-022-01	0.77 ± 0.17
B24SL-023-02	0.5 ± 0.3
B24SL-025-02	1.0 ± 0.3
B24SL-026-01	0.88 ± 0.15
B24SL-026-02	0.5 ± 0.3
B24SL-028-01	0.4 ± 0.2
B24SL-033-01	1.93 ± 0.15
B24SL-034-01	1.4 ± 0.3
B35SL-001-01	1.5 ± 0.4
B35SL-003-07	2.5 ± 0.5
BKGSL-001-02	0
BKGSL-002-04	0
BKGSL-003-09	0
BKGSL-004-02	0

TABLE 4-4
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS
DETERMINED BY ALPHA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
BKGSL-005-02	0
BKGSL-006-03	0.3 ± 0.2
BKGSL-007-04	0
BKGSL-008-03	0.2 ± 0.2
BKGSL-009-03	0.1 ± 0.2
BKGSL-010-03	0.15 ± 0.13
BKGSL-011-08	0
BKGSL-012-04	0.2 ± 0.2

[a] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[b] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1].
[c] "0" is recorded with none of the terms in the sum-of-ratios calculation is greater than 0.1.
[d] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] The SORs for Sample ID A05ASL-301-02 and Sample ID A05ASL-301-06 were calculated with assumptions that the ^{226}Ra concentrations above background were zero. GFPC results show that these assumptions are faulty for these sample IDs. See footnote to Section 4.9.2 for discussion of this discrepancy.

TABLE 4-5
SUM OF RATIOS FOR SURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A02SL-001-01	0.70 ± 0.17
A02SL-002-01	1.3 ± 0.3
A02SL-003-01	0.90 ± 0.15
A02SL-004-01	0
A02SL-005-01	0.55 ± 0.13
A02SL-006-01	0
A02SL-007-01	2.0 ± 0.2
A02SL-008-01	0
A02SL-009-01	0
A02SL-010-01	0
A02SL-011-01	0.6 ± 0.4
A02SL-012-01	0.33 ± 0.11
A02SL-013-01	0
A02SL-014-01	1.24 ± 0.12
A02SL-015-01	2.2 ± 0.4
A02SL-016-01	1.3 ± 0.4
A02SL-017-01	0.26 ± 0.09
A02SL-018-01	0.24 ± 0.10
A02SL-019-01	0
A02SL-020-01	0.9 ± 0.4
A02SL-021-01	0.24 ± 0.10
A02SL-022-01	0.8 ± 0.4
A02SL-023-01	0.6 ± 0.4
A02SL-024-01	1.7 ± 0.2
A02SL-025-01	0.47 ± 0.14
A02SL-026-01	0.43 ± 0.15
A02SL-029-01	0.99 ± 0.17
A02SL-030-01	0.46 ± 0.10
A02SL-031-01	0.36 ± 0.09
A02SL-032-01	2.0 ± 0.3
A02SL-033-01	1.0 ± 0.2
A02SL-034-01	0.54 ± 0.11
A02SL-035-01	1.7 ± 0.5
A02SL-036-01	0
A02SL-037-01	0.28 ± 0.12
A02SL-038-01	1.3 ± 0.7
A02SL-039-01	0.7 ± 0.4
A02SL-040-01	0
A02SL-041-01	2.7 ± 0.5
A02SL-042-01	0.35 ± 0.11
A02SL-043-01	1.3 ± 0.7
A02SL-208-01	0.24 ± 0.10
A02SL-215-01	2.2 ± 0.5
A02SL-216-01	0.8 ± 0.5
A02SL-217-01	0
A02SL-223-01	0
A02SL-229-01	0
A02SL-234-01	3.6 ± 0.5
A03SL-001-01	0
A03SL-002-01	1.0 ± 0.4
A03SL-003-01	0
A03SL-004-01	0
A03SL-005-01	0.5 ± 0.7
A03SL-006-01	0.40 ± 0.11
A03SL-007-01	0
A03SL-008-01	0.30 ± 0.10
A03SL-009-01	1.6 ± 0.6
A03SL-010-01	0
A03SL-011-01	4.1 ± 0.6
A03SL-012-01	0
A03SL-013-01	0.6 ± 0.4
A03SL-014-01	0
A03SL-015-01	0
A03SL-016-01	0
A03SL-017-01	0.34 ± 0.15
A03SL-018-01	1.7 ± 0.5
A03SL-019-01	0
A03SL-020-01	0.7 ± 0.4
A03SL-021-01	0.57 ± 0.15
A03SL-022-01	0.52 ± 0.12
A03SL-023-01	0.26 ± 0.10
A03SL-024-01	1.05 ± 0.15
A03SL-025-01	0.29 ± 0.13
A03SL-026-01	1.21 ± 0.18
A03SL-027-01	0.59 ± 0.13
A03SL-028-01	0.74 ± 0.13
A03SL-029-01	0.72 ± 0.11
A03SL-030-01	0.24 ± 0.09
A03SL-031-01	2.26 ± 0.19
A03SL-032-01	0.33 ± 0.10
A03SL-033-01	0.73 ± 0.18
A03SL-034-01	0.33 ± 0.13
A03SL-035-01	0.49 ± 0.18
A03SL-036-01	0.63 ± 0.18
A03SL-037-01	2.4 ± 0.5
A03SL-038-01	6.0 ± 0.4
A03SL-039-01	0.50 ± 0.16
A03SL-040-01	0.85 ± 0.13
A03SL-041-01	0.31 ± 0.11
A03SL-042-01	1.5 ± 0.4
A03SL-201-01	0.25 ± 0.10
A03SL-202-01	0
A03SL-203-01	4.4 ± 0.8
A03SL-204-01	0
A03SL-205-01	0
A03SL-206-01	0.6 ± 0.4
A03SL-207-01	0.31 ± 0.12
A03SL-208-01	0.40 ± 0.14

TABLE 4-5
SUM OF RATIOS FOR SURFACE SOIL CONCENTRATIONS DETERMINED
BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A03SL-209-01	1.5 ± 0.2
A03SL-210-01	0.33 ± 0.11
A03SL-214-01	0
A03SL-215-01	0.25 ± 0.10
A03SL-216-01	0
A03SL-217-01	0.54 ± 0.11
A03SL-218-01	0.46 ± 0.12
A03SL-220-01	0.29 ± 0.10
A03SL-221-01	2.2 ± 0.5
A03SL-222-01	0
A03SL-223-01	0.32 ± 0.14
A03SL-224-01	1.4 ± 0.3
A03SL-225-01	0.28 ± 0.13
A03SL-226-01	0.8 ± 0.2
A03SL-228-01	0.75 ± 0.17
A03SL-230-01	0
A03SL-231-01	2.1 ± 0.2
A03SL-232-01	0.74 ± 0.11
A03SL-233-01	0.79 ± 0.12
A03SL-234-01	1.3 ± 0.4
A03SL-236-01	0.8 ± 0.4
A03SL-237-01	1.9 ± 0.6
A03SL-239-01	0.55 ± 0.16
A03SL-240-01	0.49 ± 0.15
A03SL-241-01	0.45 ± 0.13
A04ASL-001-01	0
A04ASL-002-01	0
A04ASL-003-01	1.3 ± 0.4
A04ASL-004-01	0
A04ASL-005-01	0.30 ± 0.12
A04ASL-006-01	1.0 ± 0.4
A04ASL-007-01	0.3 ± 0.4
A04ASL-008-01	0
A04ASL-009-01	1.11 ± 0.17
A04ASL-010-01	0
A04ASL-011-01	0.2 ± 0.3
A04ASL-012-01	1.0 ± 0.5
A04ASL-013-01	0
A04ASL-014-01	1.03 ± 0.17
A04ASL-015-01	1.3 ± 0.4
A04ASL-016-01	0.3 ± 0.4
A04ASL-017-01	0.5 ± 0.4
A04ASL-018-01	0
A04ASL-019-01	0
A04ASL-020-01	1.3 ± 0.2
A04ASL-021-01	0
A04ASL-022-01	0.4 ± 0.4
A04ASL-023-01	0.34 ± 0.12
A04ASL-024-01	0.68 ± 0.13

Sample ID [a]	Sum of Ratios [a b c]
A04ASL-025-01	0.33 ± 0.10
A04ASL-026-01	0.4 ± 0.4
A04ASL-027-01	0
A04ASL-028-01	0
A04ASL-029-01	0.3 ± 0.4
A04ASL-030-01	0.31 ± 0.11
A04ASL-031-01	15.8 ± 0.8
A04ASL-032-01	0.4 ± 0.4
A04ASL-033-01	0.34 ± 0.10
A04ASL-034-01	0
A04ASL-035-01	0.42 ± 0.11
A04ASL-036-01	0.29 ± 0.13
A04ASL-037-01	0
A04ASL-038-01	0.74 ± 0.20
A04ASL-039-01	0.48 ± 0.13
A04ASL-040-01	0
A04ASL-042-01	0.27 ± 0.11
A04ASL-044-01	1.34 ± 0.17
A04ASL-045-01	0
A04ASL-046-01	0
A04ASL-047-01	0
A04ASL-048-01	0.25 ± 0.12
A04ASL-051-01	12.1 ± 0.7
A04ASL-052-01	0.8 ± 0.4
A04ASL-053-01	0
A04ASL-054-01	2.1 ± 0.3
A04ASL-055-01	2.2 ± 0.3
A04ASL-056-01	11.5 ± 0.6
A04ASL-057-01	0
A04ASL-058-01	2.1 ± 0.2
A04ASL-059-01	0.69 ± 0.18
A04ASL-060-01	1.04 ± 0.17
A04ASL-061-01	0.81 ± 0.17
A04ASL-062-01	4.5 ± 0.6
A04ASL-063-01	0
A04ASL-064-01	0.43 ± 0.13
A04ASL-065-01	0
A04ASL-066-01	0.28 ± 0.10
A04ASL-067-01	0.6 ± 0.5
A04ASL-068-01	0.7 ± 0.4
A04ASL-069-01	0.24 ± 0.13
A04ASL-070-01	0
A04ASL-071-01	1.0 ± 0.4
A04ASL-072-01	0
A04ASL-073-01	0
A04ASL-076-01	0
A04ASL-077-01	0.31 ± 0.13
A04ASL-203-01	1.6 ± 0.5
A04ASL-208-01	0

TABLE 4-5
SUM OF RATIOS FOR SURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A04ASL-209-01	0
A04ASL-210-01	0
A04ASL-211-01	0
A04ASL-213-01	0
A04ASL-214-01	1.5 ± 0.3
A04ASL-215-01	0.23 ± 0.10
A04ASL-220-01	1.71 ± 0.16
A04ASL-224-01	0.44 ± 0.16
A04ASL-225-01	0.7 ± 0.4
A04ASL-228-01	0
A04ASL-230-01	0.37 ± 0.13
A04ASL-236-01	0
A04ASL-238-01	1.63 ± 0.19
A04ASL-239-01	0.38 ± 0.16
A04ASL-241-01	2.9 ± 0.5
A04ASL-243-01	0
A04ASL-244-01	1.3 ± 0.4
A04ASL-247-01	0
A04ASL-249-01	0
A04ASL-250-01	0.8 ± 0.3
A04ASL-271-01	0.6 ± 0.5
A04ASL-274-01	0.7 ± 0.3
A04ASL-275-01	0
A04ASL-276-01	5.7 ± 0.4
A04ASL-278-01	1.5 ± 0.4
A04ASL-301-01	0
A04ASL-302-01	0
A04ASL-303-01	0
A04ASL-304-01	0
A04ASL-305-01	0
A04ASL-310-01	0
A04ASL-311-01	0.22 ± 0.12
A04ASL-312-01	0
A04ASL-313-01	0.4 ± 0.5
A04ASL-314-01	0.5 ± 0.5
A04ASL-315-01	0
A04ASL-316-01	0.28 ± 0.12
A04ASL-317-01	0
A04ASL-318-01	0.82 ± 0.19
A04ASL-319-01	0.7 ± 0.2
A04ASL-320-01	6.7 ± 0.4
A04ASL-321-01	0
A04ASL-322-01	0
A04ASL-323-01	0.22 ± 0.11
A04BSL-001-01	0
A04BSL-002-01	0
A04BSL-004-01	0
A04BSL-005-01	0
A04BSL-006-01	0

Sample ID [a]	Sum of Ratios [a b c]
A04BSL-008-01	0
A04BSL-009-01	0
A04BSL-010-01	0
A04BSL-011-01	0.3 ± 0.4
A04BSL-012-01	0
A04BSL-013-01	0
A04BSL-014-01	0
A04BSL-015-01	0
A04BSL-016-01	0.24 ± 0.08
A04BSL-017-01	0
A04BSL-019-01	0
A04BSL-021-01	0
A04BSL-022-01	0
A04BSL-024-01	0
A04BSL-025-01	0
A04BSL-027-01	0
A04BSL-028-01	0
A04BSL-029-01	0
A04BSL-030-01	0
A04BSL-031-01	0
A04BSL-032-01	0
A04BSL-033-01	0
A04BSL-036-01	0
A04BSL-038-01	0
A04BSL-039-01	0.3 ± 0.4
A04BSL-040-01	0
A04BSL-042-01	3.7 ± 0.6
A04BSL-043-01	2.5 ± 0.6
A04BSL-219-01	0
A04BSL-221-01	0
A04BSL-309-01	0
A04BSL-310-01	0
A04BSL-311-01	0
A04BSL-312-01	0
A04CSL-001-01	0.5 ± 0.4
A04CSL-002-01	1.0 ± 0.4
A04CSL-003-01	0.4 ± 0.4
A04CSL-005-01	0.4 ± 0.3
A04CSL-006-01	0.5 ± 0.4
A04CSL-007-01	0
A04CSL-008-01	0
A04CSL-009-01	1.7 ± 0.5
A04CSL-010-01	0
A04CSL-011-01	0.8 ± 0.4
A04CSL-012-01	1.5 ± 0.6
A04CSL-013-01	0
A04CSL-014-01	0
A04CSL-015-01	0
A04CSL-301-01	1.2 ± 0.4

TABLE 4-5
SUM OF RATIOS FOR SURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A04CSL-302-01	0
A04CSL-303-01	0
A04CSL-304-01	0
A04CSL-305-01	1.3 ± 0.7
A04CSL-306-01	0.2 ± 0.7
A04CSL-307-01	0.8 ± 0.6
A04CSL-308-01	0.5 ± 0.5
A04CSL-309-01	2.5 ± 0.8
A04CSL-310-01	0.4 ± 0.2
A04CSL-311-01	0.22 ± 0.11
A04CSL-312-01	0.23 ± 0.14
A04CSL-313-01	0
A04DSL-001-01	0
A04DSL-002-01	0
A04DSL-003-01	0
A04DSL-004-01	0
A04DSL-005-01	0
A04DSL-007-01	0
A04DSL-009-01	0
A04DSL-010-01	0
A04DSL-012-01	0.7 ± 0.4
A04DSL-013-01	0
A04DSL-015-01	1.2 ± 0.4
A04DSL-016-01	0
A04DSL-017-01	0
A04DSL-018-01	0
A04DSL-019-01	0
A04DSL-020-01	0.62 ± 0.18
A04DSL-021-01	1.9 ± 0.5
A04DSL-022-01	1.1 ± 0.4
A04DSL-023-01	1.0 ± 0.4
A04DSL-024-01	0.9 ± 0.4
A04DSL-025-01	0.7 ± 0.4
A04DSL-026-01	1.8 ± 0.4
A04DSL-028-01	0.6 ± 0.5
A04DSL-029-01	1.2 ± 0.4
A04DSL-030-01	0
A04DSL-031-01	0
A04DSL-032-01	0
A04DSL-201-01	0
A04DSL-203-01	0.25 ± 0.11
A04DSL-204-01	0
A04DSL-209-01	0
A04DSL-210-01	0
A04DSL-212-01	0.2 ± 0.4
A04DSL-213-01	0
A04DSL-220-01	1.14 ± 0.16
A04DSL-223-01	0.6 ± 0.4
A04DSL-225-01	0
A04DSL-226-01	0
A04DSL-228-01	0.3 ± 0.4
A04DSL-301-01	0.6 ± 0.5
A04DSL-302-01	0.6 ± 0.4
A04DSL-303-01	0
A04DSL-304-01	0
A04DSL-305-01	0
A04DSL-306-01	0.6 ± 0.5
A04DSL-307-01	1.9 ± 0.6
A04DSL-308-01	1.6 ± 0.6
A04DSL-309-01	0
A04DSL-310-01	0.6 ± 0.6
A04DSL-311-01	0.23 ± 0.17
A04DSL-312-01	0.6 ± 0.4
A04DSL-313-01	0
A04DSL-314-01	0
A04DSL-315-01	0.5 ± 0.5
A04DSL-316-01	0
A04DSL-317-01	0.7 ± 0.5
A04DSL-318-01	0.23 ± 0.11
A04DSL-319-01	0
A04DSL-320-01	0
A04DSL-321-01	0
A04DSL-326-01	0.91 ± 0.17
A05ASL-001-01	0
A05ASL-002-01	0
A05ASL-003-01	0.4 ± 0.4
A05ASL-004-01	1.0 ± 0.5
A05ASL-005-01	0.6 ± 0.3
A05ASL-006-01	0
A05ASL-007-01	0
A05ASL-008-01	0.8 ± 0.5
A05ASL-010-01	0
A05ASL-011-01	0.6 ± 0.5
A05ASL-012-01	1.0 ± 0.5
A05ASL-013-01	0
A05ASL-014-01	0
A05ASL-015-01	0
A05ASL-016-01	0
A05ASL-017-01	0
A05ASL-018-01	0
A05ASL-019-01	0.96 ± 0.19
A05ASL-020-01	0.6 ± 0.5
A05ASL-021-01	0
A05ASL-022-01	0
A05ASL-023-01	0.5 ± 0.4
A05ASL-024-01	0.5 ± 0.3
A05ASL-025-01	0
A05ASL-026-01	0.4 ± 0.3

TABLE 4-5
SUM OF RATIOS FOR SURFACE SOIL CONCENTRATIONS DETERMINED
BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A05ASL-027-01	0
A05ASL-028-01	0
A05ASL-029-01	0
A05ASL-030-01	0
A05ASL-031-01	0
A05ASL-201-01	0
A05ASL-202-01	0
A05ASL-210-01	0.2 ± 0.5
A05ASL-211-01	1.8 ± 0.5
A05ASL-213-01	0
A05ASL-214-01	0
A05ASL-215-01	0
A05ASL-216-01	0
A05ASL-219-01	2.9 ± 0.6
A05ASL-226-01	0
A05ASL-228-01	0
A05ASL-301-01[d]	752 ± 7
A05ASL-302-01	1.6 ± 0.2
A05ASL-303-01	2.1 ± 0.7
A05ASL-304-01	2.3 ± 0.7
A05ASL-305-01	2.0 ± 0.8
A05ASL-306-01	0
A05ASL-307-01	0
A05ASL-308-01	1.7 ± 0.9
A05BSL-001-01	0.4 ± 0.4
A05BSL-002-01	0.3 ± 0.3
A05BSL-003-01	0.2 ± 0.5
A05BSL-004-01	0.3 ± 0.4
A05BSL-005-01	1.6 ± 0.4
A05BSL-006-01	0.6 ± 0.4
A05BSL-007-01	0.5 ± 0.4
A05BSL-008-01	0
A05BSL-009-01	0.4 ± 0.5
A05BSL-010-01	0
A05BSL-011-01	0.8 ± 0.4
B02SL-002-01	0
B02SL-020-01	2.3 ± 0.5
B02SL-022-01	0.32 ± 0.10
B02SL-027-01	0
B02SL-028-01	0
B02SL-030-01	0
B02SL-036-01	1.4 ± 0.4
B02SL-043-01	1.2 ± 0.4
B02SL-046-01	1.9 ± 0.6
B02SL-052-01	0
B02SL-056-01	0
B02SL-707-01	0
B02SL-709-01	0
B02SL-710-01	0

Sample ID [a]	Sum of Ratios [a b c]
B02SL-713-01	0
B02SL-714-01	0
B02SL-715-01	0
B02SL-716-01	0
B02SL-717-01	0.23 ± 0.06
B02SL-718-01	0
B02SL-719-01	0
B02SL-720-01	1.06 ± 0.19
B02SL-721-01	1.8 ± 0.3
B02SL-722-01	0
B02SL-723-01	0
B02SL-724-01	0.32 ± 0.09
B02SL-725-01	0
B02SL-726-01	0
B02SL-727-01	0.39 ± 0.10
B02SL-728-01	0.29 ± 0.09
B02SL-729-01	0.63 ± 0.12
B02SL-730-01	0.42 ± 0.10
B02SL-732-01	0.47 ± 0.12
B02SL-733-01	0.33 ± 0.10
B02SL-736-01	0.9 ± 0.4
B02SL-737-01	0.67 ± 0.19
B02SL-738-01	0.83 ± 0.19
B02SL-739-01	2.8 ± 0.5
B02SL-742-01	0.34 ± 0.11
B02SL-743-01	0
B02SL-745-01	0.9 ± 0.4
B02SL-746-01	0.36 ± 0.13
B02SL-748-01	0.83 ± 0.13
B02SL-749-01	0.23 ± 0.10
B02SL-750-01	0.38 ± 0.12
B02SL-751-01	0
B02SL-752-01	0.3 ± 0.4
B02SL-753-01	0
B02SL-754-01	0.37 ± 0.08
B02SL-755-01	0.31 ± 0.11
B02SL-756-01	0
B02SL-757-01	0
B02SL-758-01	0.7 ± 0.4
B03SL-001-01	0
B03SL-010-01	0.24 ± 0.15
B03SL-014-01	1.79 ± 0.19
B03SL-016-01	3.1 ± 0.6
B03SL-017-01	0.68 ± 0.13
B03SL-020-01	2.02 ± 0.20
B03SL-024-01	0.6 ± 0.4
B03SL-025-01	0.26 ± 0.11
B03SL-026-01	0
B03SL-027-01	0.28 ± 0.11

TABLE 4-5
SUM OF RATIOS FOR SURFACE SOIL CONCENTRATIONS DETERMINED
BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
B03SL-028-01	0
B03SL-029-01	0.30 ± 0.10
B03SL-030-01	1.5 ± 0.2
B03SL-031-01	0
B03SL-033-01	1.2 ± 0.7
B03SL-037-01	4.7 ± 0.5
B03SL-302-01	0.30 ± 0.12
B03SL-303-01	0.6 ± 0.7
B03SL-304-01	0
B03SL-306-01	0.33 ± 0.09
B03SL-307-01	0.46 ± 0.15
B03SL-701-01	0.51 ± 0.11
B03SL-702-01	0.29 ± 0.11
B03SL-704-01	0
B03SL-705-01	0.44 ± 0.12
B03SL-706-01	0.30 ± 0.10
B03SL-707-01	3.2 ± 0.2
B03SL-708-01	0.64 ± 0.15
B03SL-709-01	0.87 ± 0.15
B03SL-710-01	1.45 ± 0.19
B03SL-711-01	0.75 ± 0.17
B03SL-712-01	8.6 ± 0.6
B03SL-713-01	3.2 ± 0.2
B03SL-715-01	1.15 ± 0.13
B03SL-717-01	5.3 ± 0.4
B03SL-718-01	0.85 ± 0.08
B03SL-719-01	4.9 ± 0.4
B03SL-720-01	6.4 ± 0.7
B03SL-721-01	9.9 ± 0.6
B03SL-722-01	1.3 ± 0.2
B03SL-723-01	6.6 ± 0.3
B03SL-724-01	0.74 ± 0.18
B03SL-725-01	2.7 ± 0.3
B03SL-726-01	0.43 ± 0.16
B03SL-727-01	0.35 ± 0.13
B03SL-728-01	0.53 ± 0.13
B03SL-729-01	0.39 ± 0.13
B03SL-730-01	0.37 ± 0.13
B03SL-731-01	1.7 ± 0.2
B03SL-732-01	0.38 ± 0.15
B03SL-733-01	0.76 ± 0.16
B03SL-734-01	0.38 ± 0.14
B03SL-735-01	0.52 ± 0.13
B03SL-736-01	0.45 ± 0.11
B03SL-737-01	1.07 ± 0.14
B03SL-738-01	1.17 ± 0.15
B03SL-739-01	0.23 ± 0.10
B04&B09SL-008-01	0
B04&B09SL-015-01	1.5 ± 0.2

Sample ID [a]	Sum of Ratios [a b c]
B04&B09SL-017-01	2.0 ± 0.4
B04&B09SL-018-01	2.0 ± 0.7
B04&B09SL-019-01	0
B04&B09SL-026-01	1.02 ± 0.19
B04&B09SL-305-01	1.8 ± 0.7
B04&B09SL-702-01	1.19 ± 0.16
B04&B09SL-703-01	2.3 ± 0.2
B04&B09SL-704-01	1.08 ± 0.13
B04&B09SL-705-01	0
B04&B09SL-707-01	3.6 ± 0.2
B04&B09SL-708-01	0
B04&B09SL-710-01	0.54 ± 0.14
B04&B09SL-711-01	4.2 ± 0.3
B04&B09SL-712-01	0.33 ± 0.07
B04&B09SL-713-01	0.35 ± 0.09
B04&B09SL-714-01	0.75 ± 0.12
B04&B09SL-715-01	2.0 ± 0.4
B04&B09SL-716-01	1.4 ± 0.2
B04&B09SL-717-01	1.6 ± 0.4
B04&B09SL-719-01	0
B04&B09SL-720-01	0.22 ± 0.11
B04&B09SL-721-01	0.41 ± 0.14
B04&B09SL-722-01	1.29 ± 0.19
B04&B09SL-723-01	2.33 ± 0.15
B04&B09SL-724-01	1.8 ± 0.2
B04&B09SL-725-01	1.28 ± 0.16
B04&B09SL-727-01	0
B04&B09SL-728-01	0.22 ± 0.07
B04&B09SL-729-01	2.6 ± 0.3
B04&B09SL-730-01	7.2 ± 0.4
B04&B09SL-731-01	1.55 ± 0.19
B04&B09SL-732-01	0.30 ± 0.09
B04&B09SL-733-01	0.43 ± 0.10
B04&B09SL-734-01	1.55 ± 0.19
B04&B09SL-736-01	0.75 ± 0.15
B04&B09SL-738-01	0
B04&B09SL-739-01	0.22 ± 0.09
B04&B09SL-740-01	0.29 ± 0.08
B04&B09SL-741-01	1.78 ± 0.18
B06SL-003-01	1.2 ± 0.2
B06SL-004-01	0.55 ± 0.15
B06SL-005-01	6.5 ± 0.4
B06SL-010-01	0
B06SL-011-01	0.6 ± 0.4
B06SL-021-01	45.6 ± 1.8
B06SL-023-01	0
B06SL-301-01	0
B06SL-702-01	7.0 ± 0.7
B06SL-707-01	5.4 ± 0.5

TABLE 4-5
SUM OF RATIOS FOR SURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
B06SL-708-01	8.5 ± 0.6
B06SL-709-01	2.5 ± 0.4
B06SL-717-01	3.4 ± 0.6
B08SL-002-01	2.6 ± 0.3
B08SL-003-01	300 ± 3
B08SL-004-01	2.1 ± 0.4
B08SL-005-01	0.48 ± 0.17
B08SL-010-01	2.2 ± 0.2
B08SL-011-01	0.34 ± 0.11
B08SL-023-01	44.9 ± 1.2
B08SL-026-01	17.5 ± 0.8
B08SL-028-01	1.9 ± 0.3
B08SL-301-01	4.3 ± 0.3
B08SL-725-01	2.6 ± 0.3
B24SL-701-01	0
B24SL-704-01	0
B24SL-715-01	0
B24SL-716-01	0
B24SL-718-01	1.15 ± 0.19
B24SL-720-01	0
B24SL-722-01	0.27 ± 0.09
B24SL-723-01	3.9 ± 0.3
B24SL-731-01	9.3 ± 0.6
B24SL-732-01	6.6 ± 0.5
BKGSL-001-01	0.3 ± 0.4
BKGSL-002-01	0.4 ± 0.3
BKGSL-003-01	0.4 ± 0.4
BKGSL-004-01	1.1 ± 0.4
BKGSL-005-01	0
BKGSL-006-01	0.8 ± 0.4
BKGSL-007-01	0.7 ± 0.4
BKGSL-008-01	0.8 ± 0.4
BKGSL-009-01	0.5 ± 0.7
BKGSL-010-01	0.3 ± 0.5
BKGSL-011-01	0
BKGSL-012-01	0

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1].
[b] "0" is recorded with none of the terms in the sum-of-ratios calculation is greater than 0.1.
[c] Refer to Section 4.1.2.3 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] The SORs for Sample ID A05ASL-301-01 were calculated with assumptions that the ^{226}Ra and ^{230}Th concentrations above background were zero. GFPC results show that these assumptions are faulty for these Sample IDs. See footnote to Section 4.9.1 for discussion of this discrepancy.

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
A02SL-001-03	1.3 ± 0.4
A02SL-002-02	0.49 ± 0.16
A02SL-004-06	0.3 ± 0.4
A02SL-004-07	1.5 ± 0.5
A02SL-005-02	0.74 ± 0.16
A02SL-006-03	3.4 ± 0.5
A02SL-007-05	1.30 ± 0.17
A02SL-008-02	0
A02SL-009-03	1.6 ± 0.4
A02SL-009-04	2.2 ± 0.6
A02SL-010-02	1.3 ± 0.5
A02SL-011-02	0
A02SL-012-02	1.3 ± 0.4
A02SL-013-03	0.4 ± 0.4
A02SL-014-06	1.0 ± 0.6
A02SL-015-10	2.6 ± 0.5
A02SL-015-11	2.9 ± 0.4
A02SL-016-02	2.2 ± 0.5
A02SL-016-03	3.6 ± 0.5
A02SL-017-02	1.3 ± 0.5
A02SL-018-03	1.8 ± 0.4
A02SL-018-05	1.5 ± 0.4
A02SL-019-02	2.9 ± 0.5
A02SL-019-06	2.2 ± 0.4
A02SL-020-02	1.6 ± 0.4
A02SL-020-03	1.7 ± 0.6
A02SL-021-03	3.3 ± 0.6
A02SL-021-04	1.4 ± 0.4
A02SL-022-03	0.3 ± 0.4
A02SL-022-04	3.4 ± 0.6
A02SL-023-02	1.4 ± 0.6
A02SL-024-03	0.48 ± 0.16
A02SL-024-06	0
A02SL-024-07	1.7 ± 0.4
A02SL-025-06	0.2 ± 0.4
A02SL-025-07	0
A02SL-026-07	0
A02SL-027-01	0.72 ± 0.12
A02SL-027-06	0.3 ± 0.3
A02SL-028-01	36.5 ± 1.2
A02SL-028-02	2.6 ± 0.2
A02SL-030-06	2.5 ± 0.6
A02SL-031-06	2.4 ± 0.5
A02SL-031-07	0
A02SL-032-03	0.8 ± 0.3
A02SL-033-03	0.25 ± 0.10
A02SL-034-03	0.9 ± 0.5
A02SL-035-02	2.3 ± 0.4
A02SL-036-03	0
A02SL-036-05	0
A02SL-037-05	5.6 ± 0.6
A02SL-037-06	1.6 ± 0.4
A02SL-038-03	2.8 ± 0.5
A02SL-038-04	1.7 ± 0.4
A02SL-039-03	4.3 ± 0.5
A02SL-039-06	0.9 ± 0.4
A02SL-040-04	0.8 ± 0.4
A02SL-041-02	0
A02SL-042-06	1.2 ± 0.5
A02SL-043-06	0.5 ± 0.4
A02SL-208-06	2.6 ± 0.5
A02SL-208-07	2.8 ± 0.7
A02SL-215-10	3.6 ± 0.7
A02SL-215-11	3.3 ± 0.6
A02SL-216-10	4.8 ± 0.6
A02SL-216-13	3.7 ± 0.7
A02SL-217-02	0.36 ± 0.19
A02SL-229-02	1.6 ± 0.3
A02SL-234-02	1.1 ± 0.2
A03SL-001-02	0.28 ± 0.10
A03SL-003-02	0.6 ± 0.4
A03SL-006-02	0
A03SL-007-02	0
A03SL-008-03	0.9 ± 0.5
A03SL-008-05	0.29 ± 0.10
A03SL-009-02	1.2 ± 0.8
A03SL-010-06	0
A03SL-011-02	2.9 ± 0.5
A03SL-011-03	1.0 ± 0.4
A03SL-012-02	0
A03SL-013-02	0
A03SL-015-02	1.7 ± 0.5
A03SL-016-02	0.24 ± 0.10
A03SL-018-02	0.37 ± 0.11
A03SL-018-03	1.4 ± 0.4
A03SL-019-10	0
A03SL-019-11	0
A03SL-020-02	0.7 ± 0.4
A03SL-021-02	0.51 ± 0.10
A03SL-022-02	1.05 ± 0.15
A03SL-023-03	0.47 ± 0.11
A03SL-025-02	0.36 ± 0.14
A03SL-027-02	0.26 ± 0.09
A03SL-028-03	5.9 ± 0.7
A03SL-028-05	3.0 ± 0.4
A03SL-029-11	0.7 ± 0.4
A03SL-030-02	1.18 ± 0.18
A03SL-031-02	1.92 ± 0.18

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
A03SL-032-02	0.24 ± 0.14
A03SL-033-02	0.54 ± 0.17
A03SL-033-03	0.65 ± 0.12
A03SL-035-02	8.0 ± 0.5
A03SL-036-02	0
A03SL-037-02	0.9 ± 0.4
A03SL-038-10	0.99 ± 0.16
A03SL-038-11	0.8 ± 0.5
A03SL-039-02	4.5 ± 0.4
A03SL-041-02	0
A03SL-042-02	1.3 ± 0.5
A03SL-201-02	0.26 ± 0.09
A03SL-202-05	0
A03SL-203-02	0.9 ± 0.4
A03SL-207-06	0.38 ± 0.11
A03SL-208-09	0.40 ± 0.11
A03SL-209-06	0
A03SL-210-06	0
A03SL-214-06	0.65 ± 0.15
A03SL-215-06	0.39 ± 0.12
A03SL-216-10	1.5 ± 0.4
A03SL-216-14	0.9 ± 0.6
A03SL-217-13	12.9 ± 0.7
A03SL-217-14	4.0 ± 0.3
A03SL-218-10	0
A03SL-220-02	1.1 ± 0.3
A03SL-222-10	4.7 ± 0.7
A03SL-222-13	0
A03SL-223-05	1.2 ± 0.4
A03SL-224-02	0.7 ± 0.2
A03SL-224-05	1.8 ± 0.4
A03SL-225-10	0.7 ± 0.4
A03SL-226-25	0
A03SL-227-04	0.71 ± 0.17
A03SL-227-18	0.53 ± 0.12
A03SL-228-06	0.67 ± 0.16
A03SL-230-06	0.8 ± 0.4
A03SL-231-02	4.6 ± 0.6
A03SL-231-05	1.7 ± 0.4
A03SL-232-06	1.6 ± 0.4
A03SL-233-07	4.9 ± 0.5
A03SL-233-09	0.5 ± 0.5
A03SL-234-13	1.6 ± 0.4
A03SL-237-10	0
A03SL-239-10	3.8 ± 0.5
A03SL-239-11	7.1 ± 0.8
A03SL-239-13	0.9 ± 0.4
A03SL-240-06	3.2 ± 0.5
A03SL-240-07	2.6 ± 0.3

Sample ID [a b]	Sum of Ratios [b c d]
A04ASL-001-03	1.9 ± 0.6
A04ASL-001-05	0.27 ± 0.12
A04ASL-002-03	0
A04ASL-002-04	0.5 ± 0.4
A04ASL-003-03	5.6 ± 0.6
A04ASL-004-03	0.6 ± 0.4
A04ASL-004-04	0.8 ± 0.5
A04ASL-005-03	0
A04ASL-006-03	0
A04ASL-007-06	0
A04ASL-008-02	1.0 ± 0.4
A04ASL-009-06	2.2 ± 0.3
A04ASL-011-03	0.4 ± 0.4
A04ASL-011-04	0
A04ASL-012-03	0
A04ASL-012-04	1.1 ± 0.5
A04ASL-013-02	0
A04ASL-016-03	0.3 ± 0.4
A04ASL-016-04	0
A04ASL-017-03	0
A04ASL-018-03	0.6 ± 0.4
A04ASL-019-06	0.28 ± 0.11
A04ASL-021-03	0.3 ± 0.5
A04ASL-021-04	0
A04ASL-022-03	0.5 ± 0.4
A04ASL-026-03	0
A04ASL-027-03	1.1 ± 0.4
A04ASL-027-04	1.3 ± 0.5
A04ASL-028-02	0.8 ± 0.4
A04ASL-029-03	0
A04ASL-030-02	0.23 ± 0.11
A04ASL-031-02	22.6 ± 0.7
A04ASL-031-03	11.6 ± 0.9
A04ASL-031-04	5.5 ± 0.7
A04ASL-031-05	9.7 ± 0.5
A04ASL-031-06	2.9 ± 0.3
A04ASL-031-07	0.57 ± 0.14
A04ASL-031-08	0.38 ± 0.11
A04ASL-031-09	16.6 ± 0.7
A04ASL-031-10	15.1 ± 0.5
A04ASL-031-11	0.40 ± 0.11
A04ASL-031-12	0.27 ± 0.11
A04ASL-032-03	0.4 ± 0.4
A04ASL-032-04	0.5 ± 0.4
A04ASL-033-03	1.1 ± 0.2
A04ASL-033-04	1.7 ± 0.4
A04ASL-036-02	1.2 ± 0.5
A04ASL-037-02	0.35 ± 0.10
A04ASL-038-02	1.13 ± 0.19

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
A04ASL-039-02	0.7 ± 0.4
A04ASL-042-03	0.9 ± 0.4
A04ASL-045-03	0
A04ASL-046-06	0
A04ASL-047-02	0.9 ± 0.4
A04ASL-048-02	2.1 ± 0.5
A04ASL-051-02	13.9 ± 0.8
A04ASL-052-02	1.2 ± 0.5
A04ASL-053-02	0
A04ASL-055-02	2.1 ± 0.3
A04ASL-056-04	8.7 ± 0.7
A04ASL-056-05	3.9 ± 0.5
A04ASL-057-05	0
A04ASL-057-06	0
A04ASL-058-02	3.5 ± 0.9
A04ASL-059-02	1.2 ± 0.4
A04ASL-061-02	1.9 ± 0.4
A04ASL-062-02	5.6 ± 0.7
A04ASL-063-03	2.0 ± 0.2
A04ASL-064-02	0.83 ± 0.16
A04ASL-065-02	0.55 ± 0.16
A04ASL-066-03	0.4 ± 0.5
A04ASL-067-02	1.4 ± 0.4
A04ASL-068-02	0
A04ASL-069-02	0
A04ASL-073-02	0.4 ± 0.4
A04ASL-076-02	0.3 ± 0.3
A04ASL-076-03	0
A04ASL-077-06	0
A04ASL-077-07	0
A04ASL-203-06	3.5 ± 0.8
A04ASL-203-09	0.6 ± 0.4
A04ASL-208-15	0
A04ASL-209-10	0.7 ± 0.2
A04ASL-210-03	0.6 ± 0.4
A04ASL-211-06	0
A04ASL-213-14	0
A04ASL-213-17	0
A04ASL-214-03	1.1 ± 0.4
A04ASL-214-05	17.4 ± 0.8
A04ASL-214-06	8.6 ± 0.6
A04ASL-214-09	5.1 ± 0.5
A04ASL-215-03	1.0 ± 0.5
A04ASL-215-05	0.77 ± 0.17
A04ASL-218-04	0
A04ASL-218-15	0
A04ASL-218-17	0
A04ASL-220-14	0.69 ± 0.12
A04ASL-220-15	1.6 ± 0.4

Sample ID [a b]	Sum of Ratios [b c d]
A04ASL-223-06	1.12 ± 0.14
A04ASL-224-10	9.2 ± 0.7
A04ASL-224-11	8.6 ± 0.6
A04ASL-224-14	1.2 ± 0.5
A04ASL-224-15	0.4 ± 0.4
A04ASL-225-06	1.21 ± 0.17
A04ASL-228-02	0
A04ASL-230-05	3.5 ± 0.5
A04ASL-230-06	1.7 ± 0.5
A04ASL-236-09	3.6 ± 0.6
A04ASL-236-10	0
A04ASL-238-05	2.3 ± 0.5
A04ASL-239-03	1.6 ± 0.6
A04ASL-239-04	1.22 ± 0.17
A04ASL-240-02	0
A04ASL-241-06	1.0 ± 0.4
A04ASL-241-07	0.72 ± 0.18
A04ASL-243-03	1.3 ± 0.4
A04ASL-244-02	6.2 ± 0.4
A04ASL-244-03	1.40 ± 0.17
A04ASL-247-03	2.8 ± 0.5
A04ASL-247-04	2.3 ± 0.7
A04ASL-249-03	1.9 ± 0.4
A04ASL-249-06	0.3 ± 0.4
A04ASL-250-04	1.7 ± 0.2
A04ASL-266-02	2.1 ± 0.5
A04ASL-270-03	0.4 ± 0.3
A04ASL-271-03	0
A04ASL-274-02	1.4 ± 0.4
A04ASL-274-10	1.0 ± 0.4
A04ASL-274-11	1.2 ± 0.5
A04ASL-275-03	3.2 ± 0.4
A04ASL-276-05	2.4 ± 0.5
A04ASL-278-10	39.0 ± 0.9
A04ASL-278-19	1.2 ± 0.2
A04ASL-301-06	0.71 ± 0.14
A04ASL-301-07	0.4 ± 0.4
A04ASL-302-06	0.97 ± 0.15
A04ASL-302-07	0.7 ± 0.5
A04ASL-303-03	1.6 ± 0.4
A04ASL-304-03	0
A04ASL-305-14	0
A04ASL-305-17	0
A04ASL-306-01	0
A04ASL-306-03	0
A04ASL-307-01	0
A04ASL-307-06	0.6 ± 0.5
A04ASL-307-07	0
A04ASL-308-01	0.3 ± 0.5

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
A04ASL-308-06	0
A04ASL-308-07	0.6 ± 0.4
A04ASL-309-01	1.5 ± 0.2
A04ASL-309-06	0
A04ASL-310-02	2.3 ± 0.5
A04ASL-310-09	0
A04ASL-311-06	1.2 ± 0.5
A04ASL-311-07	0
A04ASL-312-03	0.8 ± 0.4
A04ASL-312-04	0.7 ± 0.7
A04ASL-313-06	0
A04ASL-314-03	6.6 ± 1.1
A04ASL-314-07	0
A04ASL-315-03	1.5 ± 0.5
A04ASL-315-05	0.3 ± 0.5
A04ASL-316-06	0.5 ± 0.4
A04ASL-317-02	0.7 ± 0.6
A04ASL-318-02	3.2 ± 0.4
A04ASL-319-02	1.5 ± 0.2
A04ASL-320-03	0.9 ± 0.7
A04ASL-321-03	0.22 ± 0.14
A04ASL-322-03	0.26 ± 0.13
A04ASL-322-09	0
A04BSL-001-05	0
A04BSL-002-05	0
A04BSL-003-01	0
A04BSL-003-03	0
A04BSL-004-02	0
A04BSL-005-02	0
A04BSL-006-06	0
A04BSL-007-06	1.2 ± 0.4
A04BSL-008-03	0.5 ± 0.4
A04BSL-009-06	0
A04BSL-012-06	0.6 ± 0.4
A04BSL-013-07	1.7 ± 0.5
A04BSL-014-07	0.8 ± 0.4
A04BSL-015-06	0.6 ± 0.3
A04BSL-015-07	0.8 ± 0.4
A04BSL-016-03	0.6 ± 0.3
A04BSL-017-02	0
A04BSL-018-01	0
A04BSL-018-06	1.8 ± 0.6
A04BSL-018-07	0.6 ± 0.4
A04BSL-019-02	0.29 ± 0.12
A04BSL-020-01	0
A04BSL-020-06	0
A04BSL-022-03	0
A04BSL-023-01	0
A04BSL-023-02	0

Sample ID [a b]	Sum of Ratios [b c d]
A04BSL-024-06	0.3 ± 0.3
A04BSL-025-03	1.17 ± 0.20
A04BSL-026-01	0
A04BSL-026-06	0
A04BSL-029-03	0
A04BSL-030-02	0
A04BSL-031-06	0.7 ± 0.4
A04BSL-031-07	0.5 ± 0.4
A04BSL-032-06	0.8 ± 0.3
A04BSL-032-07	0.5 ± 0.5
A04BSL-033-06	0
A04BSL-034-01	0
A04BSL-034-05	0
A04BSL-035-01	0
A04BSL-035-06	0
A04BSL-036-05	0.25 ± 0.12
A04BSL-037-01	0
A04BSL-037-05	0.26 ± 0.10
A04BSL-038-07	0.5 ± 0.3
A04BSL-040-03	0.7 ± 0.4
A04BSL-041-01	0
A04BSL-041-05	1.8 ± 0.2
A04BSL-042-02	0.7 ± 0.5
A04BSL-043-02	0.40 ± 0.12
A04BSL-219-03	1.0 ± 0.5
A04BSL-301-01	0
A04BSL-301-11	0
A04BSL-302-01	0
A04BSL-302-06	0.6 ± 0.4
A04BSL-303-01	0
A04BSL-303-06	0
A04BSL-303-07	0
A04BSL-304-01	0
A04BSL-304-02	0
A04BSL-304-03	0.6 ± 0.4
A04BSL-305-01	0
A04BSL-305-06	0
A04BSL-306-01	0
A04BSL-306-03	2.3 ± 0.4
A04BSL-307-01	0
A04BSL-307-02	0
A04BSL-308-01	0
A04BSL-308-02	1.0 ± 0.4
A04BSL-309-03	0
A04BSL-310-06	2.4 ± 0.6
A04BSL-310-07	0.5 ± 0.5
A04BSL-311-05	0.26 ± 0.13
A04BSL-312-02	1.4 ± 0.6
A04CSL-003-02	0.5 ± 0.4

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
A04CSL-004-02	1.7 ± 0.5
A04CSL-006-02	1.4 ± 0.5
A04CSL-006-03	1.5 ± 0.4
A04CSL-011-03	0.7 ± 0.4
A04CSL-011-04	1.6 ± 0.5
A04CSL-013-02	2.4 ± 0.7
A04CSL-302-05	2.5 ± 0.5
A04CSL-303-05	0
A04CSL-304-03	0
A04CSL-304-13	0
A04CSL-305-06	0
A04CSL-306-06	0
A04CSL-307-02	1.4 ± 0.6
A04CSL-308-02	0.5 ± 0.6
A04CSL-309-02	0.3 ± 0.5
A04CSL-309-05	0.6 ± 0.6
A04CSL-310-02	0.61 ± 0.20
A04CSL-311-02	0.31 ± 0.13
A04CSL-312-02	0.7 ± 0.6
A04CSL-313-03	0.3 ± 0.5
A04DSL-002-05	0
A04DSL-003-02	0
A04DSL-005-02	0.23 ± 0.11
A04DSL-005-03	1.4 ± 0.5
A04DSL-006-01	0
A04DSL-006-02	0.3 ± 0.4
A04DSL-006-03	0
A04DSL-007-02	0.3 ± 0.4
A04DSL-007-03	0.6 ± 0.4
A04DSL-008-01	0
A04DSL-008-05	2.7 ± 0.5
A04DSL-008-06	0
A04DSL-010-02	0.7 ± 0.4
A04DSL-011-01	0
A04DSL-011-03	1.0 ± 0.4
A04DSL-011-04	0.7 ± 0.5
A04DSL-013-02	0.28 ± 0.11
A04DSL-014-01	0
A04DSL-014-02	1.3 ± 0.4
A04DSL-015-02	1.2 ± 0.5
A04DSL-015-03	0.6 ± 0.4
A04DSL-016-02	0
A04DSL-017-02	1.2 ± 0.6
A04DSL-018-03	1.6 ± 0.4
A04DSL-018-04	0.9 ± 0.4
A04DSL-019-06	1.0 ± 0.4
A04DSL-019-07	0.3 ± 0.4
A04DSL-021-02	0.9 ± 0.5
A04DSL-021-03	1.7 ± 0.4

Sample ID [a b]	Sum of Ratios [b c d]
A04DSL-022-06	2.2 ± 0.4
A04DSL-022-07	0.5 ± 0.4
A04DSL-023-03	2.6 ± 0.6
A04DSL-023-04	1.1 ± 0.4
A04DSL-024-02	1.6 ± 0.5
A04DSL-024-03	1.6 ± 0.4
A04DSL-024-04	1.4 ± 0.6
A04DSL-026-02	0.7 ± 0.4
A04DSL-027-01	0.8 ± 0.4
A04DSL-027-02	0
A04DSL-028-02	2.0 ± 0.5
A04DSL-029-02	0
A04DSL-030-02	1.3 ± 0.5
A04DSL-030-05	0.7 ± 0.5
A04DSL-031-03	3.6 ± 0.7
A04DSL-031-04	0.7 ± 0.5
A04DSL-032-02	0
A04DSL-201-02	0
A04DSL-203-06	1.5 ± 0.4
A04DSL-204-03	0
A04DSL-209-06	0
A04DSL-210-02	1.9 ± 0.6
A04DSL-212-02	1.0 ± 0.4
A04DSL-213-02	0
A04DSL-214-01	0
A04DSL-214-02	1.9 ± 0.5
A04DSL-223-02	1.9 ± 0.5
A04DSL-225-05	0.8 ± 0.4
A04DSL-226-02	0.6 ± 0.5
A04DSL-228-02	1.6 ± 0.4
A04DSL-301-02	0
A04DSL-301-05	0
A04DSL-303-06	0
A04DSL-304-03	3.0 ± 0.8
A04DSL-304-05	0.5 ± 0.4
A04DSL-305-02	1.2 ± 0.4
A04DSL-306-02	2.4 ± 0.7
A04DSL-306-03	0.8 ± 0.5
A04DSL-307-02	2.3 ± 0.7
A04DSL-307-03	0
A04DSL-308-02	1.3 ± 0.5
A04DSL-309-02	1.4 ± 0.6
A04DSL-311-02	2.5 ± 0.7
A04DSL-311-03	0.5 ± 0.5
A04DSL-312-02	1.2 ± 0.6
A04DSL-313-02	0.9 ± 0.6
A04DSL-314-02	1.7 ± 0.6
A04DSL-315-02	1.8 ± 0.6
A04DSL-316-02	1.2 ± 0.5

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
A04DSL-317-03	0.9 ± 0.6
A04DSL-317-05	0.3 ± 0.6
A04DSL-318-02	1.7 ± 0.6
A04DSL-319-06	0
A04DSL-320-05	2.1 ± 0.7
A04DSL-321-02	0.8 ± 0.5
A04DSL-322-01	0
A04DSL-322-06	0
A04DSL-323-01	0.6 ± 0.6
A04DSL-323-06	0
A04DSL-324-01	0
A04DSL-324-03	4.7 ± 1.1
A04DSL-324-04	2.2 ± 1.0
A04DSL-325-01	0
A04DSL-325-02	1.1 ± 0.5
A04DSL-326-02	0.54 ± 0.12
A04DSL-326-03	0.73 ± 0.11
A05ASL-003-02	0.3 ± 0.4
A05ASL-003-03	0
A05ASL-004-02	1.0 ± 0.4
A05ASL-004-03	0.3 ± 0.5
A05ASL-006-06	0
A05ASL-007-03	1.5 ± 0.6
A05ASL-008-06	0
A05ASL-008-07	0.9 ± 0.5
A05ASL-008-08	0
A05ASL-009-01	0
A05ASL-009-07	0.6 ± 0.5
A05ASL-009-12	0
A05ASL-009-16	0
A05ASL-010-07	1.5 ± 0.5
A05ASL-010-08	0.8 ± 0.5
A05ASL-010-09	0
A05ASL-011-06	1.2 ± 0.4
A05ASL-011-12	0
A05ASL-012-06	1.2 ± 0.5
A05ASL-012-07	0.5 ± 0.4
A05ASL-015-02	0.3 ± 0.3
A05ASL-017-03	0.5 ± 0.5
A05ASL-018-02	1.0 ± 0.5
A05ASL-018-03	0.5 ± 0.4
A05ASL-021-06	0.3 ± 0.3
A05ASL-022-02	0
A05ASL-022-03	0.4 ± 0.4
A05ASL-023-03	1.0 ± 0.4
A05ASL-024-02	1.2 ± 0.4
A05ASL-025-02	0
A05ASL-027-03	0.8 ± 0.4
A05ASL-029-03	0.8 ± 0.5
A05ASL-029-04	0
A05ASL-031-03	0.6 ± 0.4
A05ASL-201-06	0
A05ASL-201-15	0
A05ASL-202-14	0.3 ± 0.3
A05ASL-209-01	0
A05ASL-209-14	0
A05ASL-209-25	1.2 ± 0.6
A05ASL-210-11	0
A05ASL-210-15	0
A05ASL-211-07	0
A05ASL-211-11	0
A05ASL-213-06	0.3 ± 0.4
A05ASL-213-17	0
A05ASL-214-06	0
A05ASL-214-09	0
A05ASL-216-06	0.3 ± 0.4
A05ASL-216-10	0
A05ASL-219-02	1.5 ± 0.4
A05ASL-226-02	0
A05ASL-228-23	0
A05ASL-301-02[e]	316 ± 4
A05ASL-301-06[e]	43.2 ± 1.6
A05ASL-302-10	0
A05ASL-302-13	0
A05ASL-302-14	0
A05ASL-303-13	0.5 ± 0.4
A05ASL-303-14	0.3 ± 0.5
A05ASL-304-02	2.0 ± 0.6
A05ASL-304-13	0.3 ± 0.2
A05ASL-304-14	0.39 ± 0.13
A05ASL-305-02	2.4 ± 0.6
A05ASL-305-03	1.2 ± 0.8
A05ASL-305-13	0.9 ± 0.9
A05ASL-305-14	0
A05ASL-306-03	0.7 ± 0.7
A05ASL-308-04	0.3 ± 0.4
A05BSL-001-11	0
A05BSL-001-12	0
A05BSL-001-13	0
A05BSL-002-10	0
A05BSL-002-11	0.7 ± 0.4
A05BSL-003-03	1.1 ± 0.4
A05BSL-003-06	0
A05BSL-003-08	0
A05BSL-004-03	0.7 ± 0.4
A05BSL-004-04	0
A05BSL-005-03	0
A05BSL-005-04	0

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
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Sample ID [a b]	Sum of Ratios [b c d]
A05BSL-005-06	0
A05BSL-006-11	0.5 ± 0.4
A05BSL-006-13	0.2 ± 0.3
A05BSL-007-03	0.7 ± 0.4
A05BSL-007-10	0.5 ± 0.5
A05BSL-008-03	0.5 ± 0.4
A05BSL-008-06	0
A05BSL-008-07	0
A05BSL-009-03	0
A05BSL-009-04	0
A05BSL-010-03	0.8 ± 0.4
A05BSL-010-04	0.2 ± 0.3
A05BSL-011-03	0.8 ± 0.3
A05BSL-011-04	0.2 ± 0.4
A10SL-001-01	0.3 ± 0.4
A10SL-002-01	0
A10SL-003-01	0.9 ± 0.4
A10SL-003-02	0
A10SL-004-01	0
A10SL-004-02	0.3 ± 0.4
A10SL-005-01	0
A10SL-006-01	0
A10SL-006-06	0
A10SL-007-01	0.5 ± 0.4
A10SL-007-06	0
A10SL-008-01	1.0 ± 0.4
A10SL-009-01	0.3 ± 0.4
A10SL-009-02	0.5 ± 0.4
A10SL-010-01	0
A10SL-010-02	0
A10SL-011-01	0
A10SL-011-02	0.3 ± 0.4
A10SL-012-01	0.6 ± 0.4
A10SL-012-02	0
A10SL-013-01	7.0 ± 0.9
A10SL-013-02	7.3 ± 0.9
A10SL-301-01	1.1 ± 0.8
A10SL-301-02	0
A10SL-301-13	0
A10SL-302-01	0
A10SL-302-02	0.6 ± 0.4
A10SL-302-13	0.29 ± 0.14
A10SL-302-15	0
A10SL-303-01	0.47 ± 0.14
A10SL-303-02	0.30 ± 0.12
A10SL-303-13	0.32 ± 0.15
A10SL-303-18	0
A10SL-303-25	0
B02SL-001-01	0.5 ± 0.3
B02SL-002-03	0
B02SL-003-01	1.2 ± 0.5
B02SL-003-03	1.0 ± 0.5
B02SL-004-01	0
B02SL-004-02	1.1 ± 0.4
B02SL-005-01	4.0 ± 0.5
B02SL-006-01	1.13 ± 0.17
B02SL-006-02	0.38 ± 0.12
B02SL-007-01	0.30 ± 0.09
B02SL-007-02	1.0 ± 0.4
B02SL-008-01	2.1 ± 0.2
B02SL-008-02	2.0 ± 0.5
B02SL-008-03	1.7 ± 0.5
B02SL-009-01	1.3 ± 0.2
B02SL-009-02	5.0 ± 0.8
B02SL-010-01	0.34 ± 0.18
B02SL-010-02	0.9 ± 0.4
B02SL-011-01	1.0 ± 0.4
B02SL-012-01	1.3 ± 0.2
B02SL-012-02	1.8 ± 0.5
B02SL-013-01	0.5 ± 0.4
B02SL-014-01	0.30 ± 0.12
B02SL-014-02	0
B02SL-015-01	0
B02SL-016-01	1.4 ± 0.6
B02SL-017-01	0.66 ± 0.13
B02SL-017-05	4.0 ± 0.4
B02SL-018-01	6.9 ± 0.8
B02SL-018-02	5.2 ± 0.7
B02SL-018-03	7.2 ± 0.8
B02SL-019-01	0.7 ± 0.4
B02SL-019-02	1.3 ± 0.5
B02SL-020-03	0
B02SL-022-03	2.7 ± 0.6
B02SL-022-04	2.3 ± 0.5
B02SL-023-01	0.4 ± 0.3
B02SL-023-02	0.5 ± 0.3
B02SL-023-03	0.6 ± 0.4
B02SL-024-01	0.6 ± 0.5
B02SL-024-02	0.7 ± 0.5
B02SL-025-01	0
B02SL-025-02	3.9 ± 0.8
B02SL-026-01	0.7 ± 0.4
B02SL-026-02	0.3 ± 0.4
B02SL-027-03	0
B02SL-029-01	0.5 ± 0.4
B02SL-029-02	0.5 ± 0.4
B02SL-031-01	0.9 ± 0.5
B02SL-031-02	1.3 ± 0.6

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
B02SL-032-01	0.4 ± 0.3
B02SL-033-01	1.5 ± 0.6
B02SL-033-02	1.6 ± 0.4
B02SL-034-01	0.7 ± 0.4
B02SL-035-01	0
B02SL-035-02	0.8 ± 0.4
B02SL-036-02	0
B02SL-037-02	2.4 ± 0.7
B02SL-037-05	2.7 ± 0.5
B02SL-037-06	0
B02SL-038-01	0.5 ± 0.3
B02SL-040-01	0.7 ± 0.5
B02SL-040-03	1.4 ± 0.5
B02SL-041-01	1.3 ± 0.5
B02SL-041-02	0.7 ± 0.4
B02SL-042-01	1.5 ± 0.4
B02SL-043-02	0.8 ± 0.4
B02SL-044-01	0
B02SL-045-01	3.3 ± 0.6
B02SL-046-02	0.5 ± 0.4
B02SL-047-01	0.7 ± 0.4
B02SL-048-01	1.0 ± 0.7
B02SL-048-02	1.3 ± 0.5
B02SL-049-01	4.3 ± 0.7
B02SL-049-02	5.3 ± 0.8
B02SL-050-01	0
B02SL-050-02	0
B02SL-051-01	1.0 ± 0.4
B02SL-051-02	2.5 ± 0.5
B02SL-051-05	2.3 ± 0.5
B02SL-052-03	4.4 ± 0.6
B02SL-052-05	2.5 ± 0.6
B02SL-052-06	3.8 ± 0.6
B02SL-053-01	0
B02SL-053-02	0
B02SL-054-01	2.5 ± 0.6
B02SL-054-02	1.4 ± 0.4
B02SL-055-01	0
B02SL-055-02	1.7 ± 0.4
B02SL-055-03	2.8 ± 0.6
B02SL-055-05	0.5 ± 0.4
B02SL-057-05	0.5 ± 0.4
B02SL-058-01	0.5 ± 0.4
B02SL-059-01	2.9 ± 0.4
B02SL-059-02	1.4 ± 0.4
B02SL-301-01	1.4 ± 0.6
B02SL-301-02	0
B02SL-302-01	1.9 ± 0.3
B02SL-302-05	2.8 ± 0.3

Sample ID [a b]	Sum of Ratios [b c d]
B02SL-303-01	2.4 ± 0.5
B02SL-303-06	0
B03SL-001-02	1.0 ± 0.4
B03SL-002-01	1.7 ± 0.5
B03SL-002-02	1.8 ± 0.5
B03SL-003-01	1.3 ± 0.6
B03SL-003-02	1.6 ± 0.5
B03SL-004-01	0
B03SL-004-02	0.8 ± 0.5
B03SL-005-01	1.1 ± 0.5
B03SL-006-01	0
B03SL-006-03	0
B03SL-007-01	0.6 ± 0.5
B03SL-008-01	1.9 ± 0.5
B03SL-009-01	1.57 ± 0.20
B03SL-010-02	0
B03SL-011-01	0.8 ± 0.4
B03SL-011-02	0.9 ± 0.4
B03SL-013-01	2.2 ± 0.5
B03SL-013-02	0.3 ± 0.3
B03SL-014-05	28.0 ± 1.0
B03SL-014-08	0
B03SL-015-01	0.7 ± 0.4
B03SL-015-02	0.9 ± 0.4
B03SL-016-05	6.8 ± 0.6
B03SL-016-07	0
B03SL-017-02	0
B03SL-017-03	1.4 ± 0.6
B03SL-018-01	1.0 ± 0.4
B03SL-018-02	1.8 ± 0.6
B03SL-019-01	0
B03SL-020-02	0.3 ± 0.3
B03SL-021-01	0.42 ± 0.12
B03SL-021-02	0.34 ± 0.18
B03SL-022-01	1.4 ± 0.5
B03SL-022-02	1.0 ± 0.5
B03SL-023-01	4.9 ± 0.7
B03SL-024-03	1.1 ± 0.5
B03SL-024-04	0.3 ± 0.3
B03SL-025-02	0.8 ± 0.5
B03SL-025-03	2.1 ± 0.4
B03SL-026-02	1.8 ± 0.5
B03SL-027-02	1.8 ± 0.5
B03SL-027-03	2.3 ± 0.6
B03SL-028-02	0
B03SL-029-06	0.8 ± 0.4
B03SL-030-02	3.3 ± 0.3
B03SL-031-05	0
B03SL-032-01	0

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
B03SL-032-02	0.2 ± 0.9
B03SL-033-03	0.9 ± 0.8
B03SL-033-05	0.37 ± 0.12
B03SL-034-01	0
B03SL-035-01	3.6 ± 0.6
B03SL-036-01	1.6 ± 0.6
B03SL-036-02	1.7 ± 0.7
B03SL-301-01	0
B03SL-301-06	0
B03SL-303-06	0
B03SL-304-02	0
B03SL-305-01	0
B03SL-305-02	0
B03SL-306-10	0.6 ± 0.5
B03SL-306-11	0
B04&B09SL-001-01	1.1 ± 0.4
B04&B09SL-001-02	1.0 ± 0.4
B04&B09SL-002-01	0.6 ± 0.4
B04&B09SL-002-02	0.6 ± 0.4
B04&B09SL-003-01	0
B04&B09SL-004-01	0
B04&B09SL-005-01	1.1 ± 0.5
B04&B09SL-006-01	1.3 ± 0.4
B04&B09SL-006-02	1.0 ± 0.4
B04&B09SL-007-01	0.7 ± 0.5
B04&B09SL-007-05	0.9 ± 0.5
B04&B09SL-008-03	0
B04&B09SL-009-01	1.4 ± 0.5
B04&B09SL-009-02	1.5 ± 0.5
B04&B09SL-009-06	0.5 ± 0.4
B04&B09SL-010-01	0.8 ± 0.4
B04&B09SL-010-05	1.2 ± 0.4
B04&B09SL-011-01	1.3 ± 0.5
B04&B09SL-012-01	0.7 ± 0.4
B04&B09SL-012-02	0.6 ± 0.5
B04&B09SL-013-01	0.9 ± 0.4
B04&B09SL-014-01	1.4 ± 0.4
B04&B09SL-015-02	1.4 ± 0.4
B04&B09SL-016-01	0
B04&B09SL-017-02	1.06 ± 0.18
B04&B09SL-018-02	2.7 ± 0.6
B04&B09SL-019-07	0
B04&B09SL-020-01	2.0 ± 0.6
B04&B09SL-020-02	0.8 ± 0.4
B04&B09SL-021-01	0.4 ± 0.5
B04&B09SL-021-05	0.4 ± 0.4
B04&B09SL-022-01	0.6 ± 0.4
B04&B09SL-022-05	0.6 ± 0.4
B04&B09SL-023-01	0

Sample ID [a b]	Sum of Ratios [b c d]
B04&B09SL-024-01	1.9 ± 0.5
B04&B09SL-025-01	0
B04&B09SL-025-02	1.6 ± 0.7
B04&B09SL-026-02	0.25 ± 0.10
B04&B09SL-026-05	0.35 ± 0.15
B04&B09SL-026-06	0
B04&B09SL-027-01	2.1 ± 0.4
B04&B09SL-027-02	0.5 ± 0.4
B04&B09SL-028-01	0.39 ± 0.12
B04&B09SL-029-01	0.8 ± 0.3
B04&B09SL-029-05	0.8 ± 0.4
B04&B09SL-030-01	1.8 ± 0.3
B04&B09SL-030-02	0
B04&B09SL-031-01	1.6 ± 0.5
B04&B09SL-031-05	0
B04&B09SL-032-01	2.0 ± 0.7
B04&B09SL-032-02	0
B04&B09SL-033-01	0
B04&B09SL-033-02	1.3 ± 0.4
B04&B09SL-034-01	2.0 ± 0.5
B04&B09SL-035-01	0.3 ± 0.4
B04&B09SL-035-02	1.2 ± 0.4
B04&B09SL-036-01	0
B04&B09SL-036-02	2.0 ± 0.4
B04&B09SL-037-01	1.7 ± 0.5
B04&B09SL-037-02	0.6 ± 0.4
B04&B09SL-038-01	0.6 ± 0.4
B04&B09SL-038-02	1.5 ± 0.5
B04&B09SL-038-03	2.1 ± 0.5
B04&B09SL-039-01	0.9 ± 0.4
B04&B09SL-039-06	0.9 ± 0.4
B04&B09SL-040-01	1.8 ± 0.5
B04&B09SL-040-02	0.6 ± 0.4
B04&B09SL-041-01	1.0 ± 0.4
B04&B09SL-041-02	0.6 ± 0.3
B04&B09SL-041-03	0.6 ± 0.4
B04&B09SL-041-04	0.4 ± 0.4
B04&B09SL-301-01	0.32 ± 0.09
B04&B09SL-301-02	0.8 ± 0.5
B04&B09SL-302-01	0.26 ± 0.17
B04&B09SL-302-02	1.6 ± 0.6
B04&B09SL-302-05	0
B04&B09SL-303-01	0
B04&B09SL-303-02	0.4 ± 0.4
B04&B09SL-304-01	0.9 ± 0.5
B04&B09SL-304-02	1.4 ± 0.7
B04&B09SL-304-06	1.3 ± 0.6
B04&B09SL-305-02	2.4 ± 0.7
B04&B09SL-305-03	0

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
B06SL-001-01	0
B06SL-001-02	0.4 ± 0.3
B06SL-002-01	0.2 ± 0.3
B06SL-002-02	0.9 ± 0.4
B06SL-003-03	0
B06SL-004-05	4.2 ± 0.3
B06SL-005-03	0
B06SL-006-01	2.1 ± 0.3
B06SL-006-02	11.8 ± 0.5
B06SL-007-01	0
B06SL-007-02	1.5 ± 0.4
B06SL-008-01	0
B06SL-008-14	0.6 ± 0.3
B06SL-009-01	0.6 ± 0.5
B06SL-009-06	0.7 ± 0.4
B06SL-010-02	0
B06SL-011-02	0.9 ± 0.4
B06SL-011-05	6.3 ± 0.6
B06SL-012-01	0
B06SL-012-06	0.5 ± 0.5
B06SL-013-01	0
B06SL-013-02	0
B06SL-014-01	0
B06SL-014-05	0.4 ± 0.3
B06SL-015-01	0
B06SL-015-06	0.6 ± 0.4
B06SL-016-01	0.51 ± 0.15
B06SL-016-05	0.6 ± 0.2
B06SL-017-01	0.25 ± 0.09
B06SL-017-02	0
B06SL-018-01	0.22 ± 0.09
B06SL-019-01	0
B06SL-020-01	0
B06SL-020-02	0.22 ± 0.10
B06SL-021-05	37.4 ± 1.7
B06SL-021-06	5.3 ± 0.6
B06SL-021-07	1.4 ± 0.4
B06SL-022-01	0.37 ± 0.15
B06SL-022-06	1.5 ± 0.4
B06SL-023-03	0
B06SL-024-01	3.5 ± 0.7
B06SL-024-04	0.3 ± 0.4
B06SL-301-02	0
B06SL-302-01	0
B08SL-001-01	4.2 ± 0.6
B08SL-001-02	1.5 ± 0.5
B08SL-002-02	4.6 ± 0.5
B08SL-003-05	81.5 ± 1.5
B08SL-004-02	0

Sample ID [a b]	Sum of Ratios [b c d]
B08SL-005-02	0.9 ± 0.4
B08SL-006-01	0.58 ± 0.19
B08SL-006-02	1.2 ± 0.5
B08SL-007-01	1.6 ± 0.4
B08SL-007-02	1.2 ± 0.5
B08SL-008-01	1.7 ± 0.2
B08SL-008-02	1.0 ± 0.4
B08SL-009-01	1.6 ± 0.2
B08SL-009-02	2.3 ± 0.5
B08SL-010-02	1.0 ± 0.5
B08SL-011-03	0.9 ± 0.6
B08SL-012-01	2.3 ± 0.3
B08SL-012-02	1.9 ± 0.5
B08SL-013-01	1.1 ± 0.4
B08SL-013-02	0.9 ± 0.5
B08SL-014-01	35.5 ± 1.1
B08SL-014-05	14.0 ± 0.7
B08SL-015-01	56.6 ± 1.3
B08SL-015-09	156 ± 2
B08SL-015-10	2.1 ± 0.5
B08SL-016-01	3.1 ± 0.3
B08SL-016-06	1.1 ± 0.4
B08SL-017-01	835 ± 5
B08SL-017-05	356 ± 4
B08SL-018-01	1.2 ± 0.2
B08SL-018-02	0.32 ± 0.13
B08SL-019-01	0.36 ± 0.16
B08SL-019-03	0
B08SL-020-01	15.3 ± 0.8
B08SL-021-01	11.7 ± 0.7
B08SL-021-06	46.9 ± 0.9
B08SL-022-01	21.9 ± 0.9
B08SL-022-02	4.1 ± 0.5
B08SL-023-03	67.2 ± 1.6
B08SL-023-07	9.8 ± 0.8
B08SL-023-08	2.8 ± 0.5
B08SL-024-01	0.30 ± 0.11
B08SL-024-03	0.5 ± 0.4
B08SL-025-01	0.5 ± 0.3
B08SL-026-02	25.1 ± 1.0
B08SL-027-01	15.2 ± 0.7
B08SL-027-02	11.3 ± 0.7
B08SL-028-05	2.9 ± 0.5
B08SL-028-06	0
B08SL-301-02	0
B08SL-302-01	0
B08SL-302-03	0.63 ± 0.13
B08SL-304-01	49 ± 3
B08SL-304-06	0.22 ± 0.12

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
B08SL-305-01	6.3 ± 0.5
B24SL-001-01	0
B24SL-001-03	0
B24SL-002-01	0
B24SL-003-01	0
B24SL-003-02	0
B24SL-004-01	0
B24SL-005-01	0
B24SL-005-02	0
B24SL-006-01	0.35 ± 0.11
B24SL-007-01	0
B24SL-008-01	0
B24SL-008-02	0
B24SL-009-01	0
B24SL-009-02	0
B24SL-010-01	0
B24SL-010-02	0
B24SL-011-01	0
B24SL-011-02	0
B24SL-012-01	0
B24SL-013-01	0
B24SL-014-01	0
B24SL-014-02	0
B24SL-015-01	0
B24SL-016-01	0
B24SL-017-01	0
B24SL-018-01	0.7 ± 0.4
B24SL-018-02	1.4 ± 0.5
B24SL-018-03	1.6 ± 0.5
B24SL-019-01	1.9 ± 0.6
B24SL-019-02	3.2 ± 0.5
B24SL-021-01	3.0 ± 0.3
B24SL-021-02	1.3 ± 0.5
B24SL-022-01	1.9 ± 0.5
B24SL-023-01	0
B24SL-023-02	1.8 ± 0.6
B24SL-025-01	1.0 ± 0.4
B24SL-025-02	2.0 ± 0.6
B24SL-026-01	1.3 ± 0.4
B24SL-026-02	1.4 ± 0.4
B24SL-027-01	1.2 ± 0.5
B24SL-027-02	0.7 ± 0.4
B24SL-028-01	1.6 ± 0.5
B24SL-028-02	0
B24SL-029-01	0.45 ± 0.13
B24SL-029-02	0.42 ± 0.13
B24SL-030-01	1.3 ± 0.4
B24SL-030-02	0
B24SL-031-01	0.22 ± 0.13
B24SL-031-02	0.4 ± 0.4
B24SL-032-01	1.4 ± 0.4
B24SL-033-01	1.9 ± 0.2
B24SL-034-01	1.5 ± 0.5
B24SL-034-02	0.7 ± 0.5
B24SL-301-01	1.11 ± 0.20
B24SL-301-02	7.5 ± 0.5
B24SL-302-01	0.7 ± 0.2
B24SL-302-05	0
B24SL-303-01	1.9 ± 0.3
B24SL-303-02	0
B24SL-304-01	0.33 ± 0.07
B24SL-305-01	0
B24SL-305-03	0
B35SL-001-01	1.9 ± 0.5
B35SL-001-05	6.2 ± 0.7
B35SL-001-07	0.2 ± 0.4
B35SL-002-01	2.3 ± 0.5
B35SL-002-06	0.4 ± 0.4
B35SL-002-07	0
B35SL-003-01	2.5 ± 0.6
B35SL-003-07	3.3 ± 0.6
B35SL-003-09	0
B35SL-004-01	0.5 ± 0.4
B35SL-004-06	5.0 ± 0.6
B35SL-004-07	0.4 ± 0.3
B35SL-301-01	0
B35SL-301-07	4.2 ± 0.5
B35SL-302-01	0.3 ± 0.5
B35SL-302-06	3.4 ± 0.6
B35SL-303-01	0
B35SL-303-03	1.7 ± 0.4
B35SL-303-05	0.9 ± 0.4
B35SL-304-01	0.67 ± 0.15
B35SL-304-07	2.9 ± 0.5
B35SL-305-01	0
B35SL-305-03	2.3 ± 0.5
B35SL-305-05	0
BKGSL-001-02	0
BKGSL-001-03	0.8 ± 0.6
BKGSL-001-04	0.2 ± 0.4
BKGSL-001-05	0
BKGSL-001-06	0
BKGSL-001-07	0
BKGSL-001-08	0
BKGSL-001-09	0
BKGSL-001-10	0
BKGSL-002-02	0
BKGSL-002-03	0.4 ± 0.4

TABLE 4-6
SUM OF RATIOS FOR SUBSURFACE SOIL CONCENTRATIONS DETERMINED BY ONSITE GAMMA SPECTROSCOPY
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [b c d]
BKGSL-002-04	0
BKGSL-002-05	0
BKGSL-002-06	0
BKGSL-002-07	0
BKGSL-003-02	0.6 ± 0.4
BKGSL-003-03	0.8 ± 0.5
BKGSL-003-04	0.4 ± 0.5
BKGSL-003-05	0
BKGSL-003-06	0
BKGSL-003-07	0
BKGSL-003-08	0
BKGSL-003-09	0.6 ± 0.4
BKGSL-003-10	0
BKGSL-003-11	0
BKGSL-003-12	0
BKGSL-004-02	0
BKGSL-004-03	0.2 ± 0.4
BKGSL-004-04	0
BKGSL-004-05	0
BKGSL-004-06	0
BKGSL-005-02	0.5 ± 0.4
BKGSL-005-03	0
BKGSL-005-04	0
BKGSL-005-05	0
BKGSL-005-06	0
BKGSL-005-07	0
BKGSL-005-08	0
BKGSL-005-09	0
BKGSL-005-10	0
BKGSL-006-02	0.7 ± 0.5
BKGSL-006-03	0.9 ± 0.5
BKGSL-006-04	0
BKGSL-006-05	0
BKGSL-006-06	0
BKGSL-006-07	0
BKGSL-006-08	0
BKGSL-006-09	0
BKGSL-007-02	1.3 ± 0.4
BKGSL-007-03	0.5 ± 0.4
BKGSL-007-04	0.5 ± 0.3
BKGSL-007-05	0
BKGSL-007-06	0
BKGSL-008-02	0
BKGSL-008-03	0.4 ± 0.4
BKGSL-008-04	0
BKGSL-008-05	0
BKGSL-008-06	0
BKGSL-008-07	1.0 ± 0.4
BKGSL-008-08	0
BKGSL-008-09	0
BKGSL-008-10	0
BKGSL-008-11	0
BKGSL-009-02	0.6 ± 0.7
BKGSL-009-03	0.4 ± 0.4
BKGSL-009-04	0
BKGSL-009-05	0
BKGSL-009-06	0
BKGSL-009-07	0
BKGSL-009-08	0
BKGSL-009-09	0
BKGSL-009-10	0
BKGSL-010-02	0.7 ± 0.4
BKGSL-010-03	1.6 ± 0.5
BKGSL-010-04	0.5 ± 0.3
BKGSL-010-05	0
BKGSL-010-06	0
BKGSL-010-07	0
BKGSL-010-08	0
BKGSL-010-09	0
BKGSL-011-02	0.9 ± 0.5
BKGSL-011-03	0.3 ± 0.5
BKGSL-011-04	0
BKGSL-011-05	0
BKGSL-011-06	0
BKGSL-011-07	0
BKGSL-011-08	0.8 ± 0.5
BKGSL-011-09	0
BKGSL-011-10	0
BKGSL-012-02	0.3 ± 0.5
BKGSL-012-03	1.5 ± 0.5
BKGSL-012-04	0.3 ± 0.4
BKGSL-012-05	0

[a] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[b] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1].
[c] "0" is recorded with none of the terms in the sum-of-ratios calculation is greater than 0.1.
[d] Refer to Section 4.1.2.3 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] The SORs for Sample ID A05ASL-301-02 and Sample ID A05ASL-301-06 were calculated with assumptions that the ^{226}Ra and ^{230}Th concentrations above background were zero. GFPC results show that these assumptions are faulty for these sample IDs. See footnote to Section 4.9.2 for discussion of this discrepancy.

TABLE 4-7
SUMMARY OF STATIC MEASUREMENTS OF AVERAGE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Surface Concentration (dpm/100 cm^2):				Measured Surface Concentration (dpm/100 cm^2)[c]		
		Between 1,000 and 5,000 [a]		More than 5,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
Building 1								
Class 2 Floors and Interior lower walls	55	0	2	0	0	–2	–280	1,300 β
Class 3 Interior upper walls and ceilings	70	0	12	0	0	–4	340	1,900 β
East Side Door #1 surfaces	14	0	0	0	0	8	–570	91 β
East Side Door #2 surfaces	13	0	0	0	0	6	–570	12 α
East Side Door #3 surfaces	12	0	0	0	0	3	180	380 β
East Side Window	12	0	0	0	0	6	530	760 β
Exterior/outer walls North, South, East and West sides	35	0	5	0	0	3	310	2,200 β
Stacks #1 and #2 Exterior surfaces at exhaust opening	7	0	0	0	0	1	171	830 β
Work Room Class 1 floors	7	0	1	0	2	52	5000	21,000 β
Building 1 Totals	*225*	*0*	*20*	*0*	*2*	*2*	*217*	*21,000 β*
Building 2								
Ceiling Cross Beams Class 1 area	20	0	14	0	1	21	1900	14,000 β
Center Section Floors	94	0	9	0	0	27	350	1,900 β
Center Section Roof	90	0	12	0	2	14	670	16,000 β
Center Section Walls	42	0	10	0	0	8	320	3,300 β
Center Section, Class 1, Floor Hot Spot #2	20	0	6	0	0	14	610	1,800 β
Center Section, Class 1, Floor Hot Spot #3	24	1	11	0	2	180	7800	140,000 β

TABLE 4-7
SUMMARY OF STATIC MEASUREMENTS OF AVERAGE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Surface Concentration (dpm/100 cm^2):				Measured Surface Concentration (dpm/100 cm^2)[c]		
		Between 1,000 and 5,000 [a]		More than 5,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
Center Section, Floor Hot Spot #1, West Room	20	0	0	0	0	160	12	2700 α
Class 3 South Section Exterior Roof	16	0	0	0	0	8	360	680 β
Class 3 South Section Exterior South Wall	18	0	0	0	0	8	390	640 β
East Side Door #1	10	0	0	0	0	8	180	860 β
East Side Door #3 entry surfaces	14	0	0	0	0	12	120	770 β
East Side Door #4 entry surfaces	12	0	0	0	0	4	–160	160 β
East Side Door #5 entry surfaces	14	0	0	0	0	15	–220	560 β
East Side Door #6 entry surfaces	20	0	1	0	0	2	94	1,100 β
East Side Door #7 entry surfaces	24	0	0	0	0	9	–490	24 α
East side door Ground at opening	5	0	0	0	0	–4	–65	340 β
East side Window and Door	11	0	0	0	0	–2	140	430 β
East side Window frame surfaces	12	0	2	0	0	54	290	1,400 β
East side Window frame surfaces	20	0	3	0	0	2	620	1,300 β
Exterior Walls North, East, South, West	81	0	23	0	0	21	300	2,500 β
North and Center Section Class 1 Floors	19	0	2	0	0	10	530	1,500 β
North Boiler room and South Section Stacks	24	0	0	0	0	7	44	390 β
North End Roll-Up Door entry surfaces	32	0	0	0	0	6	–960	22 α

TABLE 4-7
SUMMARY OF STATIC MEASUREMENTS OF AVERAGE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Surface Concentration (dpm/100 cm^2):				Measured Surface Concentration (dpm/100 cm^2)[c]		
		Between 1,000 and 5,000 [a]		More than 5,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
North Section and Boiler Room Floors	62	0	0	0	0	–8	–55	520 β
North Section Boiler Room Furnaces	8	0	0	0	0	12	–64	71 β
North Section Boiler Room lower walls and boilers	22	0	0	0	0	2	–70	270 β
North Section Chemical Vat Exhausts	10	0	0	0	0	18	–80	250 β
North Section Roof	45	0	14	0	0	14	721	1,700 β
North Side Door #2 entry surfaces	10	0	0	0	0	7	–70	230 β
North West and South Section Stacks	8	0	0	0	0	0	–390	31 α
Railroad Tunnel Between Building 2 and Building 3	60	0	4	0	0	12	–150	1,700 β
Room 4- Locker Room, Shop 1, Shop 2	50	0	1	0	0	14	94	1,400 β
Rooms 2, 3, 9, 10, 11, 12, 13	20	0	1	0	0	2	180	1,800 β
South Section Class 1 - Floor Hot Spot	23	0	0	0	0	–5	25	320 β
South Section east side Furnace #4	12	0	0	0	0	–4	–860	12 α
South Section Floors	57	0	1	0	0	15	160	1,000 β
South Section Hood south end of building	35	0	2	0	0	14	190	1,200 β
South Section Interior Lower Walls	33	0	6	0	0	15	180	3,000 β

TABLE 4-7
SUMMARY OF STATIC MEASUREMENTS OF AVERAGE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Surface Concentration (dpm/100 cm^2):				Measured Surface Concentration (dpm/100 cm^2)[c]		
		Between 1,000 and 5,000 [a]		More than 5,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
South Section west side Furnace #1	30	0	0	0	0	9	–270	240 β
South Section west side Furnace #2	12	0	0	0	0	5	–43	420 β
South Section west side Furnace #3	12	0	0	0	0	5	10	100 β
South Section west side Oven Hood	12	0	5	0	2	40	2700	14,000 β
South Side Boiler Room Door #8 entry surfaces	12	0	0	0	0	–1	1	380 β
South Side Roll-Up Door	24	0	0	0	0	3	460	760 β
West Side Door #10 entry surfaces	10	0	0	0	0	1	210	510 β
West Side Door #11 entry surfaces	20	0	3	0	0	10	260	1,600 β
West Side Door #12 entry surfaces	10	0	0	0	0	28	–85	240 β
West Side Door #14 entry surfaces	10	0	0	0	0	–9	–128	400 β
West Side Door #15 entry surfaces	10	0	2	0	0	6	350	1,500 β
West Side Door #16 entry surfaces	10	0	0	0	0	6	260	870 β
West Side Door #17 entry surfaces	18	0	0	0	0	12	-340	210 β
West Side Door #18 entry surfaces (Class 3 Area)	18	0	0	0	0	6	320	960 β
West Side Door #19 entry surfaces (Class 3 Area)	16	0	4	0	0	–2	500	1,600 β
West Side Door #9 entry surfaces	12	0	0	0	0	8	–290	650 β
West Side Sliding Door #13 entry surfaces	34	0	5	0	0	–27	530	1,400 β
West Side Windows	13	0	0	0	0	3	380	490 β

TABLE 4-7
SUMMARY OF STATIC MEASUREMENTS OF AVERAGE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Surface Concentration (dpm/100 cm^2):				Measured Surface Concentration (dpm/100 cm^2)[c]		
		Between 1,000 and 5,000 [a]		More than 5,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
Building 2 Totals	*1,380*	*1*	*137*	*0*	*7*	*15*	*340*	*140,000 β*
Building 3								
Ceiling surfaces Between Building 6 & Building 8	25	0	1	0	24	47	21,000	64,000 β
Ceiling surfaces, cross beams and lights	171	2	43	0	53	88	8900	130,000 β
East Side Door #1 entry surfaces	14	0	0	0	0	–8	–405	29 β
East Side Door #2	18	0	1	0	0	11	-170	1,300 β
East Side Door #3 entry surfaces	20	0	2	0	1	–5	410	14,000 β
East Side Door #4 entry surfaces	24	0	0	0	0	22	–180	700 β
East Side Door #5 entry surfaces	10	0	0	0	0	–4	210	360 β
Floor Hot Spot #3	20	0	12	0	5	40	4500	34,000 β
Floor Hot Spot #4	28	0	21	1	2	1500	7500	150,000 β
Furnaces/boilers and Rollers	21	0	6	0	4	1	1400	6,600 β
Hot Spot #5	20	0	3	0	17	230	24,000	98,000 β
North and South Section Class 2 Floors	263	0	46	0	14	7	1100	9,500 β
North and South Sections Class 1 Floor	246	0	83	0	76	22	4300	60,000 β
North and South Sections Class 2 Ceiling surfaces	66	0	5	0	0	–2	130	1,200 β
North and South Sections Stacks	41	0	0	0	0	5	–120	880 β
North Door Entry Surfaces	24	0	0	0	0	1	–426	570 β
North Section Exterior Surfaces	21	0	0	0	0	6	–188	320 β
North Section Furnaces	119	0	0	0	0	29	–65	870 β

TABLE 4-7
SUMMARY OF STATIC MEASUREMENTS OF AVERAGE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Surface Concentration (dpm/100 cm^2):				Measured Surface Concentration (dpm/100 cm^2)[c]		
		Between 1,000 and 5,000 [a]		More than 5,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
North Section Re-Class 1 Ceiling surfaces	90	0	37	0	33	25	5000	26,000 β
Overhead Cranes	15	0	8	0	0	27	1200	3,300 β
Rollers East Wall	10	0	3	0	7	61	12,000	43,000 β
South Section east side Furnaces	20	0	3	0	0	0	–120	3,100 β
South Section Floor Hot Spot #2	20	0	7	0	13	81	24,000	120,000 β
South Section Floor Hot Spot #6	20	0	7	0	13	74	8400	27,000 β
South Section Furnace Stacks	12	0	3	0	0	32	400	2,600 β
South Section Hot Spot #1	20	0	7	0	2	96	1600	8,300 β
South Section Trench, Columns, and room walls	50	0	14	0	4	24	1600	31,000 β
Trench Wall Surfaces	20	0	0	0	1	1	–140	6,300 β
Walls	53	0	4	0	0	6	–174	1,900 β
Walls	80	0	7	0	1	17	–700	5,700 β
Building 3 Totals	*1,561*	*2*	*323*	*1*	*270*	*55*	*3500*	*150,000 β*
Buildings 4 and 9								
Center Class 1 Floor	125	0	52	0	5	9	1200	16,000 β
Center Class one floor	12	0	2	0	1	15	2700	31,000 β
Center Furnace Exhaust	12	0	3	0	1	19	1300	5,700 β
Door One North	14	0	1	0	0	16	57	1,100 β
Door Two North	12	0	0	0	0	6	–260	140 β
Furnace exhaust	12	0	0	0	0	11	–700	54 α
Loading Dock and Walls	48	0	21	0	0	–5	870	3,900 β
North East Ceiling Strut	12	0	2	0	8	67	8700	17,000 β
North Roll-up Door	28	0	0	0	0	9	69	620 β
Rolling Mill Trench Walls	31	0	1	0	0	0	–5	1,800 β

TABLE 4-7
SUMMARY OF STATIC MEASUREMENTS OF AVERAGE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Surface Concentration (dpm/100 cm^2):				Measured Surface Concentration (dpm/100 cm^2)[c]		
		Between 1,000 and 5,000 [a]		More than 5,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
South Door Entry Surfaces	12	0	0	0	0	28	–830	-6 α
South Furnace #2	16	0	2	0	0	–7	210	3,900 β
South Furnace #2	18	0	8	0	0	6	1200	3,700 β
South Wall Roof Surfaces	25	0	3	0	0	–3	4	3,100 β
Top of Furnace	9	0	1	0	0	30	–67	1,200 β
Western Center class 1 floors	142	0	81	0	3	5	1400	8,800 β
Western Center Class 2 Ceiling	60	0	12	0	11	26	2400	17,000 β
Western Center class 2 floors	177	0	59	0	0	–5	750	3,800 β
Western North and South Furnaces #1 and #2	48	0	15	0	0	1	670	3,500 β
Buildings 4 and 9 Totals	*813*	*0*	*263*	*0*	*29*	*5*	*1100*	*31,000 β*
Building 5								
Class 2 walls	10	0	10	0	0	6	1400	2,000 β
Western Center Class 2 Ceiling	28	0	5	0	0	–1	590	1,100 β
Building 5 Totals	38	0	15	0	0	1	810	2,000 β
Building 6								
Exterior Wall Surfaces	43	0	4	0	0	22	–48	1,600 β
Building 7								
Lab work surfaces, floors and common areas	60	0	1	0	0	–2	380	1,700 β
Building 8								
Exterior Wall Surfaces	58	0	0	0	0	15	–240	970 β
Floor surfaces	13	0	0	0	11	190	20,000	50,000 β
Building 8 Totals	*71*	*0*	*0*	*0*	*11*	*47*	*3400*	*50,000 β*
Building 24								
Column Pedestal Surfaces	80	0	42	0	32	17	5600	21,000 β
Floor Surfaces Hot Spot #2	20	0	12	0	8	71	12,000	40,000 β

TABLE 4-7
SUMMARY OF STATIC MEASUREMENTS OF AVERAGE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Surface Concentration (dpm/100 cm^2):				Measured Surface Concentration (dpm/100 cm^2)[c]		
		Between 1,000 and 5,000 [a]		More than 5,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
Floor Surfaces Hot Spot #1	24	0	8	6	0	54	6900	38,000 β
Interior Ceiling Surfaces	125	0	3	0	55	59	17,000	120,000 β
Roofing Joist Surfaces	8	0	0	0	3	230	3500	9,700 β
North Section upper and lower wall surfaces	50	0	1	0	0	–1	–330	1,700 β
Northwest Section Floor surfaces	63	0	0	0	0	0	57	930 β
Northeast Section Floor surfaces	63	0	21	0	0	10	660	1,600 β
Sothern Floor surfaces	60	0	17	0	1	13	910	14,000 β
South Section upper and lower wall surfaces	33	0	1	0	0	9	–450	1,100 β
North Roll-Up Door Entry Surfaces	15	0	0	0	0	2	210	380 β
Building 24 Totals	*541*	*0*	*105*	*6*	*99*	*28*	*5600*	*120,000 β*
Building 35								
Exterior Walls	8	0	2	0	0	18	660	2,300 β
Interior Walls and Floors	35	0	9	0	0	3	500	2,900 β
North Side Rollup Door	28	0	0	0	0	4	270	870 β
South Side Door	12	0	0	0	0	0	200	820 β
Stacks #1 thru #4 Exterior surfaces at exhaust opening	12	0	0	0	0	8	–2	410 β
West Side Rollup Door	28	0	0	0	0	–10	44	810 β
Building 35 Totals	*123*	*0*	*11*	*0*	*0*	*2*	*280*	*2,900 β*
Grand Totals	**4,741**	**3**	**876**	**7**	**407**	**27**	**2100**	**150,000 β**

Notes:
[a] These results exceed thorium surface screening levels but not uranium surface screening levels.
[b] These results exceed all surface screening levels.
[c] Surface concentrations rounded to two significant digits.

TABLE 4-8
SUMMARY OF SWIPE MEASUREMENT OF REMOVABLE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Removable Surface Concentration (dpm/100 cm^2):				Measured Removable Surface Contamination (dpm/100 cm^2)[c]		
		Between 200 and 1,000 [a]		More than 1,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
Building 1								
Class 2 Floors and Interior lower walls	55	0	0	0	0	0.06	0.81	7 ± 9 β
Class 3 Interior upper walls and ceilings	70	0	0	0	0	0.15	0.46	8 ± 10 β
East Side Door #1 surfaces	14	0	0	0	0	0.15	0.72	8 ± 10 β
East Side Door #2 surfaces	13	0	0	0	0	–0.04	0.29	4 ± 8 β
East Side Door #3 surfaces	12	0	0	0	0	–0.26	–0.58	2 ± 6 β
East Side Window	12	0	0	0	0	–0.26	0.75	6 ± 9 β
Exterior/outer walls North, South, East and West sides	35	0	0	0	0	0.47	1.1	6 ± 9 β
Stacks #1 and #2 Exterior surfaces at exhaust opening	7	0	0	0	0	–0.26	–0.58	2 ± 6 β
Work Room Class 1 floors	7	0	0	0	0	0.97	13	60 ± 20 β
Building 1 Totals	*225*	*0*	*0*	*0*	*0*	*0.14*	*0.96*	*60 ± 20 β*
Building 2								
Ceiling Cross Beams Class 1 area	20	0	0	0	0	2.5	3.5	18 ± 13 β
Center Section Floors	94	0	0	0	0	0.32	0.99	11 ± 11 β
Center Section Roof	89	0	0	0	0	0.48	1.6	8 ± 10 β
Center Section Walls	42	0	0	0	0	–0.04	0.34	8 ± 10 β
Center Section, Class 1, Floor Hot Spot #2	20	0	0	0	0	0.31	2.8	13 ± 12 β
Center Section, Class 1, Floor Hot Spot #3	24	0	0	0	0	0.70	1.0	13 ± 12 β
Center Section, Floor Hot Spot #1, West Room	20	0	0	0	0	0.03	1.3	4 ± 8 β

TABLE 4-8
SUMMARY OF SWIPE MEASUREMENT OF REMOVABLE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Removable Surface Concentration (dpm/100 cm^2):				Measured Removable Surface Contamination (dpm/100 cm^2)[c]		
		Between 200 and 1,000 [a]		More than 1,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
Class 3 South Section Exterior Roof	16	0	0	0	0	0.28	0.41	4 ± 8 β
Class 3 South Section Exterior South Wall	18	0	0	0	0	0.70	1.6	6 ± 9 β
East Side Door #1	—	—	—	—	—	—	—	—
East Side Door #3 entry surfaces	14	0	0	0	0	0.36	0.23	8 ± 10 β
East Side Door #4 entry surfaces	12	0	0	0	0	–0.02	0.74	4 ± 8 β
East Side Door #5 entry surfaces	14	0	0	0	0	0.56	0.88	6 ± 9 β
East Side Door #6 entry surfaces	20	0	0	0	0	0.17	0.90	6 ± 9 β
East Side Door #7 entry surfaces	24	0	0	0	0	0.34	0.65	8 ± 6 β
East side door Ground at opening	5	0	0	0	0	–0.26	1.2	6 ± 9 β
East side Window and Door	11	0	0	0	0	0.05	0.86	6 ± 9 β
East side Window frame surfaces	12	0	0	0	0	–0.02	0.93	4 ± 8 β
East side Window frame surfaces	20	0	0	0	0	0.74	–0.12	8 ± 10 β
Exterior Walls North, East, South, West	71	0	0	0	0	–0.05	0.38	6 ± 9 β
North and Center Section Class 1 Floors	19	0	0	0	0	0.50	2.0	11 ± 11 β
North Boiler room and South Section Stacks	24	0	0	0	0	0.22	0.93	8 ± 10 β
North End Roll-Up Door entry surfaces	32	0	0	0	0	0.10	1.0	6 ± 9 β
North Section and Boiler Room Floors	62	0	0	0	0	0.11	0.88	8 ± 10 β
North Section Boiler Room Furnaces	8	0	0	0	0	0.46	0.84	4 ± 8 β

TABLE 4-8
SUMMARY OF SWIPE MEASUREMENT OF REMOVABLE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Removable Surface Concentration (dpm/100 cm^2):				Measured Removable Surface Contamination (dpm/100 cm^2)[c]		
		Between 200 and 1,000 [a]		More than 1,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
North Section Boiler Room lower walls and boilers	22	0	0	0	0	0.26	–0.37	4 ± 8 β
North Section Chemical Vat Exhausts	10	0	0	0	0	0.03	0.10	4 ± 8 β
North Section Roof	45	0	0	0	0	0.51	1.8	18 ± 13 β
North Side Door #2 entry surfaces	10	0	0	0	0	–0.26	1.9	6 ± 9 β
North West and South Section Stacks	8	0	0	0	0	0.10	0.84	4 ± 8 β
Railroad Tunnel Between Building 2 and Building 3	60	0	0	0	0	0.07	0.37	6 ± 9 β
Room 4- Locker Room, Shop 1, Shop 2	49	0	0	0	0	0.59	0.44	8 ± 10 β
Rooms 2, 3, 9, 10, 11, 12, 13	20	0	0	0	0	0.60	1.7	13 ± 12 β
South Section Class 1 - Floor Hot Spot	23	0	0	0	0	1.5	1.2	6 ± 9 β
South Section east side Furnace #4	12	0	0	0	0	0.94	0.93	8 ± 10 β
South Section Floors	57	0	0	0	0	0.60	1.5	13 ± 12 β
South Section Hood south end of building	35	0	0	0	0	0.81	–0.02	13 ± 12 β
South Section Interior Lower Walls	33	0	0	0	0	0.44	1.6	18 ± 14 β
South Section west side Furnace #1	31	0	0	0	0	0.48	1.5	13 ± 12 β
South Section west side Furnace #2	15	0	0	0	0	0.12	1.2	8 ± 10 β
South Section west side Furnace #3	12	0	0	0	0	–0.02	1.1	4 ± 8 β
South Section west side Oven Hood	12	0	0	0	0	0.94	2.8	6 ± 9 β
South Side Boiler Room Door #8 entry surfaces	12	0	0	0	0	0.22	1.3	6 ± 9 β

TABLE 4-8
SUMMARY OF SWIPE MEASUREMENT OF REMOVABLE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Removable Surface Concentration (dpm/100 cm^2):				Measured Removable Surface Contamination (dpm/100 cm^2)[c]		
		Between 200 and 1,000 [a]		More than 1,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
South Side Roll-Up Door	23	0	0	0	0	–0.01	0.31	8 ± 10 β
West Side Door #10 entry surfaces	10	0	0	0	0	–0.26	1.0	6 ± 9 β
West Side Door #11 entry surfaces	20	0	0	0	0	0.03	0.78	6 ± 9 β
West Side Door #12 entry surfaces	10	0	0	0	0	0.60	0.78	4 ± 8 β
West Side Door #14 entry surfaces	10	0	0	0	0	0.03	–0.12	4 ± 8 β
West Side Door #15 entry surfaces	10	0	0	0	0	0.31	1.9	6 ± 9 β
West Side Door #16 entry surfaces	10	0	0	0	0	–0.26	3.5	8 ± 10 β
West Side Door #17 entry surfaces	18	0	0	0	0	0.06	1.1	6 ± 9 β
West Side Door #18 entry surfaces (Class 3 Area)	17	0	0	0	0	0.25	–0.84	6 ± 8 β
West Side Door #19 entry surfaces (Class 3 Area)	16	0	0	0	0	–0.08	0.56	11 ± 11 β
West Side Door #9 entry surfaces	12	0	0	0	0	0.70	1.1	8 ± 10 β
West Side Sliding Door #13 entry surfaces	34	0	0	0	0	0.25	0.36	6 ± 9 β
West Side Windows	13	0	0	0	0	0.84	1.5	11 ± 11 β
Building 2 Totals	*1,360*	*0*	*0*	*0*	*0*	*0.36*	*1.0*	*18 ± 13 β*
Building 3								
Ceiling surfaces Between Building 6 & Building 8	25	0	1	0	0	14	33	280 ± 50 β
Ceiling surfaces, cross beams and lights	171	0	0	0	0	2.9	6.6	70 ± 20 β
East Side Door #1 entry surfaces	14	0	0	0	0	0.36	2.0	8 ± 10 β
East Side Door #2	18	0	0	0	0	0.22	3.1	11 ± 11 β
East Side Door #3 entry surfaces	20	0	0	0	0	0.46	0.67	6 ± 9 β

TABLE 4-8
SUMMARY OF SWIPE MEASUREMENT OF REMOVABLE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Removable Surface Concentration (dpm/100 cm^2):				Measured Removable Surface Contamination (dpm/100 cm^2)[c]		
		Between 200 and 1,000 [a]		More than 1,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
East Side Door #4 entry surfaces	24	0	0	0	0	–0.02	0.65	6 ± 9 β
East Side Door #5 entry surfaces	10	0	0	0	0	1.5	0.78	6 ± 9 β
Floor Hot Spot #3	20	0	0	0	0	8.1	17	120 ± 30 β
Floor Hot Spot #4	—	—	—	—	—	—	—	—
Furnaces/boilers and Rollers	21	0	0	0	0	0.29	1.9	8 ± 10 β
Hot Spot #5	8	0	0	0	0	0.82	3.7	11 ± 11 β
North and South Section Class 2 Floors	103	0	0	0	0	2.3	6.8	70 ± 20 β
North and South Sections Class 1 Floor	243	0	0	0	0	4.0	12	90 ± 30 β
North and South Sections Class 2 Ceiling surfaces	89	0	0	0	0	0.38	0.39	8 ± 10 β
North and South Sections Stacks	40	0	0	0	0	0.10	0.56	8 ± 10 β
North Door Entry Surfaces	24	0	0	0	0	0.94	1.8	8 ± 10 β
North Section Exterior Surfaces	21	0	0	0	0	0.15	–0.04	6 ± 9 β
North Section Furnaces	113	0	0	0	0	0.65	1.9	20 ± 14 β
North Section Re-Class 1 Ceiling surfaces	90	0	0	0	0	1.8	4.5	15 ± 13 β
Overhead Cranes	15	0	0	0	0	1.7	0.03	6 ± 9 β
Rollers East Wall	10	0	0	0	0	6.6	25	60 ± 20 β
South Section east side Furnaces	20	0	0	0	0	1.3	3.5	13 ± 12 β
South Section Floor Hot Spot #1	—	—	—	—	—	—	—	—
South Section Floor Hot Spot #2	20	0	0	0	0	3.0	6.3	38 ± 19 β
South Section Floor Hot Spot #6	10	0	0	0	0	2.0	6.9	20 ± 14 β
South Section Furnace Stacks	12	0	0	0	0	–0.26	0.74	6 ± 9 β
South Section Hot Spot #1	—	—	—	—	—	—	—	—

TABLE 4-8
SUMMARY OF SWIPE MEASUREMENT OF REMOVABLE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Removable Surface Concentration (dpm/100 cm^2):				Measured Removable Surface Contamination (dpm/100 cm^2)[c]		
		Between 200 and 1,000 [a]		More than 1,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
South Section Trench, Columns, and room walls	53	0	0	0	0	3.6	7.5	130 ± 30 β
Trench Wall Surfaces	20	0	0	0	0	0.46	1.2	8 ± 10 β
Walls	53	0	0	0	0	0.17	0.28	8 ± 10 β
Walls	81	0	0	0	0	0.45	0.74	13 ± 12 β
Building 3 Totals	*1,348*	*0*	*1*	*0*	*0*	*2.2*	*5.8*	*280 ± 50 β*
Buildings 4 and 9								
Center Class 1 Floor	125	0	0	0	0	1.0	3.0	24 ± 16 β
Center Class one floor	12	0	0	0	0	0.46	0.37	4 ± 8 β
Center Furnace Exhaust	139	0	0	0	0	0.50	1.6	13 ± 12 β
Door One North	14	0	0	0	0	0.77	2.3	11 ± 11 β
Door Two North	12	0	0	0	0	0.22	2.3	11 ± 11 β
Furnace exhaust	12	0	0	0	0	0.46	2.1	8 ± 10 β
Loading Dock and Walls	40	0	0	0	0	0.17	0.78	8 ± 10 β
North East Ceiling Strut	11	0	0	0	0	1.3	2.1	11 ± 11 β
North Roll-up Door	28	0	0	0	0	0.56	0.47	6 ± 9 β
Rolling Mill Trench Walls	31	0	0	0	0	0.11	0.30	11 ± 11 β
South Door Entry Surfaces	—	—	—	—	—	—	—	—
South Furnace #2	16	0	0	0	0	0.28	1.4	4 ± 8 β
South Furnace #2	18	0	0	0	0	0.06	0.68	8 ± 10 β
South Wall Roof Surfaces	25	0	0	0	0	1.1	0.24	14 ± 13 α
Top of Furnace	10	0	0	0	0	0.60	1.5	6 ± 9 β
Western Center class 1 floors	142	0	0	0	0	0.77	3.6	45 ± 20 β
Western Center Class 2 Ceiling	60	0	0	0	0	1.7	2.8	27 ± 16 β
Western Center class 2 floors	178	0	0	0	0	0.72	2.5	15 ± 13 β
Western North and South Furnaces #1 and #2	29	0	0	0	0	0.14	1.5	6 ± 9 β
Buildings 4 and 9 Totals	*902*	*0*	*0*	*0*	*0*	*0.72*	*2.2*	*45 ± 20 β*

TABLE 4-8
SUMMARY OF SWIPE MEASUREMENT OF REMOVABLE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Removable Surface Concentration (dpm/100 cm^2):				Measured Removable Surface Contamination (dpm/100 cm^2)[c]		
		Between 200 and 1,000 [a]		More than 1,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
Building 5								
Class 2 walls	10	0	0	0	0	–.026	0.10	4 ± 8 β
Western Center Class 2 Ceiling	28	0	0	0	0	0.05	–0.01	6 ± 9 β
Building 5 Totals	*38*	*0*	*0*	*0*	*0*	*–0.03*	*0.02*	*6 ± 9 β*
Building 6								
Exterior Wall Surfaces	41	0	0	0	0	0.79	0.20	8 ± 10 α
Building 7								
Lab work surfaces, floors and common areas	30	0	0	0	0	0.12	0.78	8 ± 10 β
Building 8								
Exterior Wall Surfaces	39	0	0	0	0	0.84	0.58	8 ± 10 β
Floor surfaces	13	0	0	0	0	19	52	170 ± 40 β
Building 8 Totals	*52*	*0*	*0*	*0*	*0*	*5.4*	*14*	*170 ± 40 β*
Building 24								
Column Pedestal Surfaces	80	0	0	0	0	1.7	2.6	22 ± 15 β
Floor Surfaces Hot Spot #1	24	0	0	0	0	2.6	5.4	18 ± 14 β
Floor Surfaces Hot Spot #2	20	0	0	0	0	8.5	25	130 ± 30 β
Interior Ceiling Surfaces	125	0	0	0	0	10	25	160 ± 40 β
North Roll-Up Door Entry Surfaces	15	0	0	0	0	0.12	2.9	11 ± 11 β
North Section upper and lower wall surfaces	50	0	0	0	0	0.03	0.83	11 ± 11 β
Northeast Section Floor surfaces	63	0	0	0	0	0.20	0.21	13 ± 12 β
Northwest Section Floor surfaces	63	0	0	0	0	0.42	1.4	13 ± 12 β
Roofing Joist Surfaces	8	0	2	0	0	23	68	260 ± 50 β
Southern Floor surfaces	60	0	0	0	0	1.3	3.8	29 ± 15 β

TABLE 4-8
SUMMARY OF SWIPE MEASUREMENT OF REMOVABLE SURFACE CONTAMINATION FOR IA01 BUILDINGS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Area or Location	Number of Measurements	Number with Removable Surface Concentration (dpm/100 cm^2):				Measured Removable Surface Contamination (dpm/100 cm^2)[c]		
		Between 200 and 1,000 [a]		More than 1,000 [b]		Average		Maximum
		Alpha	Beta	Alpha	Beta	Alpha	Beta	
South Section upper and lower wall surfaces	30	0	0	0	0	1.2	1.5	8 ± 10 *α*
Building 24 Totals	*538*	*0*	*2*	*0*	*0*	*3.7*	*9.2*	*260 ± 50 β*
Building 35								
Exterior Walls	8	0	0	0	0	0.10	–0.01	3 ± 5 *α*
Interior Walls and Floors	34	0	0	0	0	–0.09	0.69	6 ± 9 *β*
North Side Rollup Door	28	0	0	0	0	0.05	0.88	8 ± 10 *β*
South Side Door	—	—	—	—	—	—	—	—
Stacks #1 thru #4 Exterior surfaces at exhaust opening	21	0	0	0	0	1.1	0.72	5 ± 8 *α*
West Side Rollup Door	27	0	0	0	0	–0.05	0.18	6 ± 9 *β*
Building 35 Totals	*118*	*0*	*0*	*0*	*0*	*0.18*	*0.57*	*8 ± 10 β*
Grand Totals	**4654**	**0**	**3**	**0**	**0**	**1.4**	**3.7**	**280 ± 50 *β***

Notes:
[a] These results exceed thorium surface screening levels but not uranium surface screening levels.
[b] These results exceed all surface screening levels.
[c] Uncertainties are two standard deviations.

TABLE 4-9
COPC CONCENTRATIONS IN BUILDING 1 BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Matrix	Concentration (pCi/g)								
		^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th		^{238}U
		GFPC[b]	Gamma[c]	GFPC	Gamma	Alpha[d]	Alpha	Alpha	Gamma	Alpha
B01-BM-001	Concrete	0.32 ± 0.15	0.45 ± 0.11	0.4 ± 0.4	0.26 ± 0.13	0.39 ± 0.16	0.61 ± 0.19	0.48 ± 0.17	0.3 ± 0.3	0.32 ± 0.12
B01-BM-002	Metal	0.07 ± 0.09	0.0 ± 1.3	-0.6 ± 0.4	-0.03 ± 0.11	0.02 ± 0.06	0.16 ± 0.10	0.00 ± 0.03	0.0 ± 0.2	0.11 ± 0.07
B01-BM-003	Wallboard	0.56 ± 0.18	0.0 ± 0.3	-0.1 ± 0.4	0.00 ± 0.16	0.14 ± 0.09	0.15 ± 0.09	0.06 ± 0.05	0.0 ± 0.3	0.74 ± 0.19

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Gas Flow Proportional Counting
[c] Gamma Spectroscopy
[d] Alpha Spectroscopy

TABLE 4-10
COPC CONCENTRATIONS IN BUILDING 1 SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)[b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A08-B1-SW-001	0.09 ± 0.13	0.0 ± 0.3	0.4 ± 0.3	0.4 ± 0.2	-0.01 ± 0.08	11.6 ± 1.8	0.31 ± 0.20	12.4 ± 1.9
A08-B1-SW-002	0.06 ± 0.11	0.3 ± 0.3	0.2 ± 0.2	0.21 ± 0.18	0.02 ± 0.09	11.5 ± 1.7	0.8 ± 0.3	12.6 ± 1.9
A08-B1-SW-003	0.12 ± 0.14	0.6 ± 0.4	0.11 ± 0.18	0.10 ± 0.14	0.02 ± 0.10	16 ± 2	0.8 ± 0.3	18 ± 3
A08-B1-SW-004	0.08 ± 0.10	0.0 ± 0.2	0.4 ± 0.3	0.18 ± 0.16	0.03 ± 0.09	12.7 ± 2.0	0.6 ± 0.3	13.0 ± 2.0
A08-B1-SW-005	0.07 ± 0.10	0.3 ± 0.4	0.04 ± 0.17	0.18 ± 0.18	0.02 ± 0.10	27 ± 4	1.4 ± 0.4	28 ± 4
A08-B1-SW-006	0.00 ± 0.09	0.3 ± 0.3	0.09 ± 0.12	0.7 ± 0.3	0.06 ± 0.10	28 ± 4	1.0 ± 0.4	31 ± 4

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

Table 4-11
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS
IN BUILDING 1 SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration	
	Combined Ra (pCi/L)[b,c]	U (µg/L)[d]
A08-B1-SW-001	0.1 ± 0.3	37 ± 6
A08-B1-SW-002	0.4 ± 0.3	38 ± 6
A08-B1-SW-003	0.7 ± 0.3	55 ± 8
A08-B1-SW-004	0.1 ± 0.3	39 ± 6
A08-B1-SW-005	0.3 ± 0.4	85 ± 11
A08-B1-SW-006	0.3 ± 0.4	91 ± 12

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[c] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting. Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-12
COPC CONCENTRATIONS IN BUILDING 1 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC [b]	Gamma [c]	GFPC	Gamma	Alpha [d]	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A08-B1-SD-001	0.42 ± 0.18	0.31 ± 0.10	0.6 ± 0.4	0.20 ± 0.15	0.25 ± 0.11	0.38 ± 0.15	0.24 ± 0.11	0.20 ± 0.15	—	7.5 ± 1.0	0.34 ± 0.13	0.23 ± 0.20	8.4 ± 1.1	—
A08-B1-SD-002	0.30 ± 0.13	0.24 ± 0.09	0.5 ± 0.5	0.25 ± 0.14	0.24 ± 0.14	0.28 ± 0.14	0.18 ± 0.11	0.25 ± 0.14	—	3.0 ± 0.5	0.08 ± 0.07	0.13 ± 0.16	3.6 ± 0.6	—
A08-B1-SD-003	0.27 ± 0.12	0.33 ± 0.17	0.8 ± 0.5	0.3 ± 0.3	0.40 ± 0.14	0.36 ± 0.13	0.35 ± 0.13	0.3 ± 0.3	—	48 ± 7	2.8 ± 1.2	3.2 ± 0.6	52 ± 8	—
A08-B1-SD-004	1.82 ± 0.30	1.5 ± 0.3	1.4 ± 0.5	0.9 ± 0.4	1.2 ± 0.3	0.8 ± 0.2	0.8 ± 0.2	0.9 ± 0.4	—	69 ± 7	3.3 ± 0.9	5.4 ± 1.1	78 ± 8	—
A08-B1-SD-005	0.31 ± 0.14	0.23 ± 0.09	0.3 ± 0.2	0.18 ± 0.14	0.27 ± 0.10	0.36 ± 0.11	0.28 ± 0.10	0.18 ± 0.14	—	23 ± 2	1.2 ± 0.2	0.8 ± 0.2	25 ± 2	—
A08-B1-SD-006	0.53 ± 0.12	0.20 ± 0.12	0.34 ± 0.20	0.32 ± 0.15	0.36 ± 0.14	0.60 ± 0.18	0.41 ± 0.14	0.32 ± 0.15	—	12 ± 2	0.7 ± 0.2	0.3 ± 0.3	13.8 ± 1.8	—
A08-B1-SL-001 [e]	0.22 ± 0.09	0.14 ± 0.06	-0.08 ± 0.19	0.13 ± 0.10	0.31 ± 0.09	0.34 ± 0.10	0.37 ± 0.10	0.13 ± 0.10	—	1.5 ± 0.2	0.09 ± 0.05	0.12 ± 0.16	1.7 ± 0.2	—

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Gas Flow Proportional Counting
[c] Gamma Spectroscopy
[d] Alpha Spectroscopy
[e] "SL" designation was an inadvertent nomenclature error

TABLE 4-13
SOR FOR BUILDING 1 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-B1-SD-001	1.07 ± 0.011
A08-B1-SD-002	0.38 ± 0.06
A08-B1-SD-003	7.7 ± 0.9
A08-B1-SD-004	11.1 ± 0.8
A08-B1-SD-005	3.6 ± 0.3
A08-B1-SD-006	1.83 ± 0..18
A08-B1-SL-001	0

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha spectroscopy laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-14
COPC CONCENTRATIONS IN BUILDING 2 BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Matrix	Concentration (pCi/g)[b]											
		^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th		^{234}U	^{235}U		^{238}U
		GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Alpha	Alpha	Gamma	Alpha
B02-BM-001	Concrete	4.2 ± 0.6	61 ± 4	1.0 ± 0.4	11.6 ± 1.4	1.3 ± 0.3	4.1 ± 0.7	1.3 ± 0.3	11.6 ± 1.4	3.4 ± 0.5	0.17 ± 0.09	2.5 ± 1.1	3.5 ± 0.6
B02-BM-002	Concrete	0.66 ± 0.20	0.53 ± 0.15	0.0 ± 0.4	0.30 ± 0.16	0.38 ± 0.15	0.65 ± 0.19	0.29 ± 0.12	0.30 ± 0.16	0.53 ± 0.16	0.03 ± 0.04	0.1 ± 0.2	0.44 ± 0.14
B02-BM-003	Concrete	0.9 ± 0.2	0.60 ± 0.15	-0.1 ± 0.4	0.20 ± 0.18	0.34 ± 0.14	1.0 ± 0.2	0.14 ± 0.08	0.20 ± 0.18	0.9 ± 0.2	0.02 ± 0.04	0.2 ± 0.3	0.9 ± 0.2
B02-BM-004	Concrete	0.26 ± 0.16	0.17 ± 0.10	-0.5 ± 0.4	0.09 ± 0.15	0.23 ± 0.11	0.43 ± 0.14	0.22 ± 0.10	0.09 ± 0.15	0.26 ± 0.10	0.01 ± 0.03	-0.1 ± 0.3	0.35 ± 0.12
B02-BM-005	Concrete	0.30 ± 0.16	0.26 ± 0.12	-0.2 ± 0.5	0.24 ± 0.19	0.26 ± 0.11	0.41 ± 0.14	0.29 ± 0.12	0.24 ± 0.19	0.43 ± 0.14	0.01 ± 0.03	0.04 ± 0.19	0.47 ± 0.15
B02-BM-006	Concrete	0.54 ± 0.20	0.66 ± 0.16	0.2 ± 0.4	0.25 ± 0.19	0.41 ± 0.15	0.53 ± 0.16	0.28 ± 0.11	0.25 ± 0.19	1.5 ± 0.3	0.08 ± 0.07	0.2 ± 0.2	1.5 ± 0.3
B02-BM-007	Concrete	0.30 ± 0.15	0.30 ± 0.13	0.2 ± 0.4	0.40 ± 0.17	0.51 ± 0.16	0.39 ± 0.13	0.32 ± 0.12	0.40 ± 0.17	0.29 ± 0.11	0.01 ± 0.03	0.0 ± 0.2	0.31 ± 0.11
B02-BM-008	Brick	1.4 ± 0.3	1.02 ± 0.18	0.7 ± 0.3	1.7 ± 0.3	1.3 ± 0.3	0.9 ± 0.3	1.2 ± 0.3	1.7 ± 0.3	0.8 ± 0.2	0.07 ± 0.07	0.1 ± 0.4	0.7 ± 0.2
B02-BM-009	Brick	1.0 ± 0.3	0.9 ± 0.2	0.7 ± 0.4	1.2 ± 0.3	1.4 ± 0.4	0.9 ± 0.3	1.0 ± 0.3	1.2 ± 0.3	0.58 ± 0.18	0.03 ± 0.04	0.0 ± 0.3	0.73 ± 0.20
B02-BM-010	Particle Board	0.15 ± 0.12	0.5 ± 0.5	0.0 ± 0.3	0.2 ± 0.9	0.25 ± 0.11	0.27 ± 0.12	0.26 ± 0.11	0.2 ± 0.9	2.2 ± 0.4	0.07 ± 0.06	0.2 ± 0.6	2.6 ± 0.4

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy

TABLE 4-15
COPC CONCENTRATIONS IN BUILDING 2 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B02SL-002-01	—	—	—	—	—	—	—	—	-0.006 ± 0.006	—	—	—	—	0.3 ± 0.3
B02SL-020-01	—	—	—	—	0.8 ± 0.3	1.1 ± 0.3	1.3 ± 0.3	—	1.3 ± 0.3	9.2 ± 1.0	0.52 ± 0.18	—	9.7 ± 1.0	7.4 ± 1.2
B02SL-022-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	2.9 ± 0.7
B02SL-027-01	—	—	—	—	—	—	—	—	0.45 ± 0.15	—	—	—	—	1.4 ± 0.6
B02SL-028-01	—	—	—	—	—	—	—	—	0.64 ± 0.18	—	—	—	—	1.8 ± 0.5
B02SL-030-01	—	—	—	—	—	—	—	—	0.46 ± 0.16	—	—	—	—	0.4 ± 0.3
B02SL-036-01	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	2.2 ± 0.6
B02SL-043-01	—	—	—	—	—	—	—	—	0.90 ± 0.17	—	—	—	—	4.9 ± 1.2
B02SL-046-01	1.03 ± 0.21	—	1.3 ± 0.4	—	1.2 ± 0.2	1.1 ± 0.2	0.98 ± 0.20	—	1.2 ± 0.3	3.7 ± 0.4	0.21 ± 0.08	—	3.8 ± 0.4	5.1 ± 1.0
B02SL-052-01	—	—	—	—	—	—	—	—	0.19 ± 0.14	—	—	—	—	1.8 ± 0.7
B02SL-056-01	—	—	—	—	—	—	—	—	0.45 ± 0.14	—	—	—	—	0.6 ± 0.7
B02SL-707-01	—	—	—	—	—	—	—	—	0.06 ± 0.13	—	—	—	—	0.9 ± 0.4
B02SL-709-01	—	—	—	—	—	—	—	—	0.21 ± 0.12	—	—	—	—	2.0 ± 0.5
B02SL-710-01	—	—	—	—	—	—	—	—	0.08 ± 0.07	—	—	—	—	0.4 ± 0.3
B02SL-713-01	—	—	—	—	—	—	—	—	-0.04 ± 0.18	—	—	—	—	0.06 ± 0.05
B02SL-714-01	—	—	—	—	—	—	—	—	0.11 ± 0.09	—	—	—	—	1.2 ± 0.4
B02SL-715-01	—	—	—	—	—	—	—	—	-0.01 ± 0.15	—	—	—	—	1.2 ± 0.4
B02SL-716-01	—	—	—	—	—	—	—	—	0.17 ± 0.14	—	—	—	—	2.2 ± 0.6
B02SL-717-01	—	—	—	—	—	—	—	—	0.10 ± 0.12	—	—	—	—	2.3 ± 0.4
B02SL-718-01	—	—	—	—	—	—	—	—	0.06 ± 0.07	—	—	—	—	1.9 ± 0.5
B02SL-719-01	—	—	—	—	—	—	—	—	0.09 ± 0.11	—	—	—	—	0.8 ± 0.4
B02SL-720-01	—	—	—	—	—	—	—	—	0.55 ± 0.18	—	—	—	—	7.7 ± 1.2
B02SL-721-01	—	—	—	—	0.80 ± 0.15	0.66 ± 0.13	0.80 ± 0.15	—	0.78 ± 0.14	16.1 ± 1.6	1.0 ± 0.3	—	16.7 ± 1.6	10.4 ± 1.0
B02SL-722-01	—	—	—	—	—	—	—	—	0.32 ± 0.08	—	—	—	—	1.6 ± 0.4
B02SL-723-01	—	—	—	—	—	—	—	—	0.36 ± 0.15	—	—	—	—	1.7 ± 0.7
B02SL-724-01	—	—	—	—	—	—	—	—	0.41 ± 0.14	—	—	—	—	2.9 ± 0.6
B02SL-725-01	—	—	—	—	—	—	—	—	0.26 ± 0.09	—	—	—	—	1.6 ± 0.4
B02SL-726-01	—	—	—	—	—	—	—	—	0.75 ± 0.18	—	—	—	—	1.5 ± 0.6
B02SL-727-01	—	—	—	—	—	—	—	—	0.39 ± 0.12	—	—	—	—	3.4 ± 0.6
B02SL-728-01	—	—	—	—	—	—	—	—	0.35 ± 0.12	—	—	—	—	2.7 ± 0.6

TABLE 4-15
COPC CONCENTRATIONS IN BUILDING 2 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B02SL-729-01	—	—	—	—	—	—	—	—	0.69 ± 0.15	—	—	—	—	4.9 ± 0.8
B02SL-730-01	—	—	—	—	—	—	—	—	0.32 ± 0.16	—	—	—	—	3.5 ± 0.7
B02SL-732-01	—	—	—	—	—	—	—	—	0.28 ± 0.11	—	—	—	—	3.9 ± 0.8
B02SL-733-01	—	—	—	—	—	—	—	—	0.63 ± 0.14	—	—	—	—	3.0 ± 0.6
B02SL-736-01	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	2.3 ± 0.8
B02SL-737-01	—	—	—	—	—	—	—	—	0.61 ± 0.16	—	—	—	—	5.2 ± 1.2
B02SL-738-01	—	—	—	—	—	—	—	—	0.41 ± 0.15	—	—	—	—	6.2 ± 1.2
B02SL-739-01	—	—	—	—	2.0 ± 0.4	1.7 ± 0.3	2.0 ± 0.4	—	1.7 ± 0.2	5.3 ± 0.7	0.25 ± 0.12	—	5.3 ± 0.7	5.4 ± 0.9
B02SL-742-01	—	—	—	—	—	—	—	—	0.43 ± 0.13	—	—	—	—	3.0 ± 0.7
B02SL-743-01	—	—	—	—	—	—	—	—	0.35 ± 0.13	—	—	—	—	1.6 ± 0.4
B02SL-745-01	—	—	—	—	—	—	—	—	0.92 ± 0.18	—	—	—	—	3.0 ± 0.7
B02SL-746-01	—	—	—	—	—	—	—	—	0.71 ± 0.17	—	—	—	—	3.2 ± 0.8
B02SL-748-01	—	—	—	—	—	—	—	—	0.48 ± 0.15	—	—	—	—	6.2 ± 0.9
B02SL-749-01	—	—	—	—	—	—	—	—	0.44 ± 0.13	—	—	—	—	2.3 ± 0.6
B02SL-750-01	—	—	—	—	—	—	—	—	0.09 ± 0.08	—	—	—	—	3.3 ± 0.8
B02SL-751-01	—	—	—	—	—	—	—	—	0.23 ± 0.10	—	—	—	—	0.9 ± 0.3
B02SL-752-01	—	—	—	—	—	—	—	—	0.78 ± 0.18	—	—	—	—	1.7 ± 0.6
B02SL-753-01	—	—	—	—	—	—	—	—	0.17 ± 0.10	—	—	—	—	2.0 ± 0.6
B02SL-754-01	—	—	—	—	—	—	—	—	0.50 ± 0.15	—	—	—	—	3.2 ± 0.5
B02SL-755-01	—	—	—	—	—	—	—	—	0.46 ± 0.10	—	—	—	—	2.8 ± 0.7
B02SL-756-01	—	—	—	—	—	—	—	—	0.06 ± 0.05	—	—	—	—	1.0 ± 0.4
B02SL-757-01	—	—	—	—	—	—	—	—	0.22 ± 0.10	—	—	—	—	2.0 ± 0.5
B02SL-758-01	—	—	—	—	—	—	—	—	0.78 ± 0.20	—	—	—	—	3.5 ± 0.7

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] "-700-" series sample IDs are "detritus" samples.

[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes on site gamma spectroscopy

TABLE 4-16
SOR FOR BUILDING 2 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
B02SL-002-01	—	0
B02SL-020-01	2.3 ± 0.6	2.3 ± 0.5
B02SL-022-01	—	0.32 ± 0.10
B02SL-027-01	—	0
B02SL-028-01	—	0
B02SL-030-01	—	0
B02SL-036-01	—	1.4 ± 0.4
B02SL-043-01	—	1.2 ± 0.4
B02SL-046-01	0.9 ± 0.4	1.9 ± 0.6
B02SL-052-01	—	0
B02SL-056-01	—	0
B02SL-707-01	—	0
B02SL-709-01	—	0
B02SL-710-01	—	0
B02SL-713-01	—	0
B02SL-714-01	—	0
B02SL-715-01	—	0
B02SL-716-01	—	0
B02SL-717-01	—	0.23 ± 0.06
B02SL-718-01	—	0
B02SL-719-01	—	0
B02SL-720-01	—	1.06 ± 0.19
B02SL-721-01	2.43 ± 0.17	1.8 ± 0.3
B02SL-722-01	—	0
B02SL-723-01	—	0
B02SL-724-01	—	0.32 ± 0.09
B02SL-725-01	—	0
B02SL-726-01	—	0
B02SL-727-01	—	0.39 ± 0.10
B02SL-728-01	—	0.29 ± 0.09
B02SL-729-01	—	0.63 ± 0.12
B02SL-730-01	—	0.42 ± 0.10
B02SL-732-01	—	0.47 ± 0.12
B02SL-733-01	—	0.33 ± 0.10
B02SL-736-01	—	0.9 ± 0.4
B02SL-737-01	—	0.67 ± 0.19
B02SL-738-01	—	0.83 ± 0.19
B02SL-739-01	3.6 ± 0.7	2.8 ± 0.5
B02SL-742-01	—	0.34 ± 0.11
B02SL-743-01	—	0
B02SL-745-01	—	0.9 ± 0.4
B02SL-746-01	—	0.36 ± 0.13
B02SL-748-01	—	0.83 ± 0.13
B02SL-749-01	—	0.23 ± 0.10
B02SL-750-01	—	0.38 ± 0.12
B02SL-751-01	—	0
B02SL-752-01	—	0.3 ± 0.4
B02SL-753-01	—	0
B02SL-754-01	—	0.37 ± 0.08
B02SL-755-01	—	0.31 ± 0.11
B02SL-756-01	—	0
B02SL-757-01	—	0
B02SL-758-01	—	0.7 ± 0.4

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 ⇒ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-17
COPC CONCENTRATIONS IN BUILDING 2 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B02SL-001-01	—	—	—	—	—	—	—	—	0.86 ± 0.16	—	—	—	—	1.1 ± 0.6
B02SL-002-03	—	—	—	—	—	—	—	—	0.23 ± 0.13	—	—	—	—	0.7 ± 0.4
B02SL-003-01	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	4.2 ± 1.1
B02SL-003-03	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	0.4 ± 0.9
B02SL-004-01	—	—	—	—	—	—	—	—	0.67 ± 0.19	—	—	—	—	1.5 ± 0.6
B02SL-004-02	—	—	—	—	—	—	—	—	1.16 ± 0.20	—	—	—	—	1.3 ± 0.6
B02SL-005-01	1.31 ± 0.17	—	1.7 ± 0.2	—	2.8 ± 0.4	1.4 ± 0.3	2.7 ± 0.4	—	2.1 ± 0.2	8.3 ± 0.7	0.37 ± 0.10	—	8.9 ± 0.7	7.0 ± 1.3
B02SL-006-01	—	—	—	—	—	—	—	—	0.38 ± 0.12	—	—	—	—	8.2 ± 1.1
B02SL-006-02	—	—	—	—	—	—	—	—	0.70 ± 0.19	—	—	—	—	3.3 ± 0.8
B02SL-007-01	—	—	—	—	—	—	—	—	0.51 ± 0.16	—	—	—	—	2.7 ± 0.6
B02SL-007-02	—	—	—	—	—	—	—	—	0.93 ± 0.17	—	—	—	—	3.1 ± 0.7
B02SL-008-01	—	—	—	—	0.27 ± 0.17	0.40 ± 0.19	0.44 ± 0.19	—	0.35 ± 0.12	26 ± 3	1.5 ± 0.3	—	27 ± 3	14.7 ± 1.5
B02SL-008-02	—	—	—	—	—	—	—	—	1.4 ± 0.2	—	—	—	—	3.5 ± 1.6
B02SL-008-03	—	—	—	—	—	—	—	—	1.5 ± 0.2	—	—	—	—	1.5 ± 0.7
B02SL-009-01	0.45 ± 0.15	—	0.4 ± 0.2	—	0.6 ± 0.3	0.7 ± 0.3	0.5 ± 0.2	—	0.34 ± 0.15	15.1 ± 1.5	0.8 ± 0.2	—	15.1 ± 1.5	9.3 ± 1.4
B02SL-009-02	1.6 ± 0.3	—	1.2 ± 0.3	—	1.3 ± 0.3	1.3 ± 0.4	1.0 ± 0.3	—	2.5 ± 0.4	10.0 ± 1.1	0.54 ± 0.18	—	9.5 ± 1.0	8.8 ± 1.6
B02SL-010-01	—	—	—	—	—	—	—	—	0.63 ± 0.18	—	—	—	—	3.0 ± 1.2
B02SL-010-02	—	—	—	—	—	—	—	—	1.05 ± 0.18	—	—	—	—	2.1 ± 0.7
B02SL-011-01	—	—	—	—	—	—	—	—	0.96 ± 0.19	—	—	—	—	2.6 ± 0.6
B02SL-012-01	—	—	—	—	0.8 ± 0.3	0.8 ± 0.3	0.7 ± 0.3	—	0.7 ± 0.2	11.1 ± 1.2	0.58 ± 0.18	—	12.1 ± 1.2	9.4 ± 1.4
B02SL-012-02	—	0.78 ± 0.16	—	1.0 ± 0.2	0.73 ± 0.19	0.80 ± 0.20	0.78 ± 0.20	1.0 ± 0.2	1.2 ± 0.2	3.3 ± 0.5	0.12 ± 0.08	0.1 ± 0.4	3.6 ± 0.5	4.3 ± 0.8
B02SL-013-01	—	—	—	—	—	—	—	—	0.74 ± 0.17	—	—	—	—	2.6 ± 0.7
B02SL-014-01	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	2.7 ± 0.8
B02SL-014-02	—	—	—	—	—	—	—	—	0.33 ± 0.20	—	—	—	—	1.9 ± 0.7
B02SL-015-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	0.8 ± 0.7
B02SL-016-01	—	—	—	—	—	—	—	—	1.2 ± 0.3	—	—	—	—	2.7 ± 0.8
B02SL-017-01	—	—	—	—	—	—	—	—	0.54 ± 0.15	—	—	—	—	5.0 ± 0.8
B02SL-017-05	—	—	—	—	0.8 ± 0.3	0.7 ± 0.3	0.5 ± 0.2	—	0.89 ± 0.15	25 ± 2	1.4 ± 0.3	—	26 ± 3	22.9 ± 1.8
B02SL-018-01	2.6 ± 0.4	—	2.0 ± 0.4	—	3.0 ± 0.6	2.5 ± 0.5	2.2 ± 0.5	—	3.4 ± 0.4	6.8 ± 0.9	0.4 ± 0.2	—	7.0 ± 0.9	9.1 ± 1.2
B02SL-018-02	3.1 ± 0.4	—	2.1 ± 0.4	—	2.6 ± 0.6	2.5 ± 0.6	2.4 ± 0.6	—	2.8 ± 0.3	4.7 ± 0.6	0.23 ± 0.12	—	4.7 ± 0.6	6.0 ± 1.5
B02SL-018-03	2.7 ± 0.4	—	1.7 ± 0.4	—	2.4 ± 0.5	1.9 ± 0.5	2.4 ± 0.5	—	4.0 ± 0.4	2.9 ± 0.5	0.16 ± 0.10	—	3.0 ± 0.4	3.4 ± 1.3
B02SL-019-01	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	1.8 ± 0.8
B02SL-019-02	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	2.3 ± 1.1
B02SL-020-03	—	—	—	—	—	—	—	—	0.68 ± 0.19	—	—	—	—	1.5 ± 0.5
B02SL-022-03	1.5 ± 0.3	—	1.0 ± 0.3	—	1.5 ± 0.4	1.1 ± 0.3	1.3 ± 0.3	—	2.0 ± 0.3	2.3 ± 0.4	0.10 ± 0.07	—	2.2 ± 0.4	2.1 ± 0.8
B02SL-022-04	—	—	—	—	—	—	—	—	1.5 ± 0.3	—	—	—	—	4.3 ± 1.1

TABLE 4-17
COPC CONCENTRATIONS IN BUILDING 2 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B02SL-023-01	—	—	—	—	—	—	—	—	0.81 ± 0.17	—	—	—	—	1.8 ± 0.6
B02SL-023-02	—	—	—	—	—	—	—	—	0.88 ± 0.17	—	—	—	—	1.5 ± 0.5
B02SL-023-03	—	—	—	—	—	—	—	—	0.91 ± 0.20	—	—	—	—	1.2 ± 1.0
B02SL-024-01	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	1.8 ± 0.8
B02SL-024-02	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	1.6 ± 0.7
B02SL-025-01	—	—	—	—	—	—	—	—	0.61 ± 0.19	—	—	—	—	2.1 ± 0.8
B02SL-025-02	—	—	—	—	1.1 ± 0.3	1.2 ± 0.3	1.0 ± 0.3	—	2.4 ± 0.4	1.5 ± 0.3	0.02 ± 0.04	—	1.5 ± 0.3	2.8 ± 0.7
B02SL-026-01	—	—	—	—	—	—	—	—	0.79 ± 0.17	—	—	—	—	3.0 ± 0.7
B02SL-026-02	—	—	—	—	—	—	—	—	0.77 ± 0.18	—	—	—	—	1.0 ± 0.4
B02SL-027-03	—	—	—	—	—	—	—	—	0.58 ± 0.15	—	—	—	—	0.7 ± 0.5
B02SL-029-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	2.4 ± 0.8
B02SL-029-02	—	—	—	—	—	—	—	—	0.88 ± 0.19	—	—	—	—	1.8 ± 0.6
B02SL-031-01	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	1.4 ± 0.7
B02SL-031-02	—	—	—	—	—	—	—	—	1.3 ± 0.3	—	—	—	—	1.9 ± 0.7
B02SL-032-01	—	—	—	—	—	—	—	—	0.84 ± 0.17	—	—	—	—	1.5 ± 0.6
B02SL-033-01	—	—	—	—	—	—	—	—	1.3 ± 0.3	—	—	—	—	1.2 ± 0.7
B02SL-033-02	—	—	—	—	—	—	—	—	1.43 ± 0.19	—	—	—	—	2.0 ± 0.5
B02SL-034-01	—	—	—	—	—	—	—	—	0.98 ± 0.19	—	—	—	—	1.7 ± 0.7
B02SL-035-01	—	—	—	—	—	—	—	—	0.66 ± 0.18	—	—	—	—	1.0 ± 0.5
B02SL-035-02	—	—	—	—	—	—	—	—	1.03 ± 0.17	—	—	—	—	0.8 ± 0.5
B02SL-036-02	—	—	—	—	—	—	—	—	0.73 ± 0.17	—	—	—	—	0.9 ± 0.4
B02SL-037-02	—	—	—	—	—	—	—	—	1.8 ± 0.4	—	—	—	—	2.0 ± 0.7
B02SL-037-05	1.4 ± 0.2	—	1.1 ± 0.3	—	1.2 ± 0.4	1.1 ± 0.3	1.0 ± 0.3	—	1.8 ± 0.2	1.7 ± 0.3	0.15 ± 0.09	—	1.6 ± 0.3	3.2 ± 0.7
B02SL-037-06	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	1.1 ± 0.8
B02SL-038-01	—	—	—	—	—	—	—	—	0.86 ± 0.17	—	—	—	—	0.9 ± 0.5
B02SL-040-01	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	1.8 ± 1.0
B02SL-040-03	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	1.5 ± 0.9
B02SL-041-01	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	1.8 ± 0.9
B02SL-041-02	—	—	—	—	—	—	—	—	0.97 ± 0.17	—	—	—	—	1.2 ± 0.6
B02SL-042-01	—	—	—	—	—	—	—	—	0.90 ± 0.20	—	—	—	—	7.0 ± 1.0
B02SL-043-02	—	—	—	—	—	—	—	—	1.01 ± 0.18	—	—	—	—	2.0 ± 0.6
B02SL-044-01	—	—	—	—	—	—	—	—	0.38 ± 0.16	—	—	—	—	0.4 ± 0.5
B02SL-045-01	2.3 ± 0.3	—	1.8 ± 0.4	—	2.2 ± 0.5	3.0 ± 0.6	2.0 ± 0.5	—	2.1 ± 0.3	2.4 ± 0.4	0.15 ± 0.09	—	2.5 ± 0.4	3.1 ± 0.9
B02SL-046-02	—	—	—	—	—	—	—	—	0.87 ± 0.18	—	—	—	—	1.5 ± 0.6
B02SL-047-01	—	—	—	—	—	—	—	—	0.94 ± 0.20	—	—	—	—	1.0 ± 0.5
B02SL-048-01	—	—	—	—	—	—	—	—	0.9 ± 0.3	—	—	—	—	3.7 ± 1.1

TABLE 4-17
COPC CONCENTRATIONS IN BUILDING 2 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B02SL-048-02	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	2.0 ± 0.8
B02SL-049-01	2.4 ± 0.4	—	1.7 ± 0.4	—	1.3 ± 0.4	1.5 ± 0.4	1.5 ± 0.4	—	2.6 ± 0.3	1.7 ± 0.3	0.07 ± 0.06	—	2.0 ± 0.4	2.4 ± 0.8
B02SL-049-02	2.1 ± 0.3	—	1.7 ± 0.4	—	1.8 ± 0.4	1.6 ± 0.4	1.5 ± 0.4	—	3.0 ± 0.4	2.4 ± 0.4	0.05 ± 0.05	—	2.4 ± 0.4	3.7 ± 1.4
B02SL-050-01	—	—	—	—	—	—	—	—	0.68 ± 0.17	—	—	—	—	0.9 ± 0.7
B02SL-050-02	—	—	—	—	—	—	—	—	0.39 ± 0.13	—	—	—	—	0.6 ± 0.5
B02SL-051-01	—	—	—	—	—	—	—	—	1.11 ± 0.18	—	—	—	—	1.7 ± 0.6
B02SL-051-02	—	—	—	—	—	—	—	—	1.7 ± 0.2	—	—	—	—	2.3 ± 0.7
B02SL-051-05	—	—	—	—	—	—	—	—	1.8 ± 0.2	—	—	—	—	1.5 ± 0.7
B02SL-052-03	2.7 ± 0.3	—	2.0 ± 0.3	—	2.0 ± 0.4	2.0 ± 0.4	1.3 ± 0.3	—	2.8 ± 0.3	1.6 ± 0.3	0.04 ± 0.05	—	1.3 ± 0.4	2.1 ± 1.3
B02SL-052-05	—	—	—	—	1.4 ± 0.4	1.6 ± 0.4	1.2 ± 0.3	—	1.7 ± 0.3	1.5 ± 0.3	0.05 ± 0.06	—	1.4 ± 0.3	3.6 ± 0.6
B02SL-052-06	—	—	—	—	—	—	—	—	2.3 ± 0.3	—	—	—	—	3.5 ± 0.8
B02SL-053-01	—	—	—	—	—	—	—	—	0.53 ± 0.17	—	—	—	—	0.9 ± 0.4
B02SL-053-02	—	0.51 ± 0.19	—	0.3 ± 0.3	—	—	—	0.3 ± 0.3	0.30 ± 0.14	—	—	0.0 ± 0.2	—	0.05 ± 0.05
B02SL-054-01	—	—	—	—	—	—	—	—	1.9 ± 0.3	—	—	—	—	1.1 ± 0.7
B02SL-054-02	—	—	—	—	—	—	—	—	1.33 ± 0.19	—	—	—	—	1.8 ± 0.7
B02SL-055-01	—	—	—	—	—	—	—	—	0.36 ± 0.14	—	—	—	—	0.9 ± 0.5
B02SL-055-02	—	1.2 ± 0.3	—	1.6 ± 0.4	—	—	—	1.6 ± 0.4	1.5 ± 0.2	—	—	0.1 ± 0.4	—	1.8 ± 0.7
B02SL-055-03	—	—	—	—	1.4 ± 0.42	1.29 ± 0.20	1.21 ± 0.19	—	2.0 ± 0.3	1.0 ± 0.2	0.06 ± 0.06	—	1.0 ± 0.2	1.9 ± 1.0
B02SL-055-05	—	—	—	—	—	—	—	—	0.85 ± 0.20	—	—	—	—	1.1 ± 1.0
B02SL-057-05	—	—	—	—	—	—	—	—	0.85 ± 0.18	—	—	—	—	0.5 ± 0.2
B02SL-058-01	—	—	—	—	—	—	—	—	0.87 ± 0.18	—	—	—	—	1.1 ± 0.6
B02SL-059-01	—	—	—	—	0.9 ± 0.2	0.9 ± 0.2	1.1 ± 0.2	—	1.04 ± 0.18	16.2 ± 1.2	0.82 ± 0.16	—	16.6 ± 1.2	13.8 ± 1.6
B02SL-059-02	—	1.0 ± 0.2	—	1.0 ± 0.3	—	—	—	1.0 ± 0.3	1.0 ± 0.2	—	—	0.1 ± 0.3	—	4.8 ± 0.8
B02SL-301-01	—	—	—	—	—	—	—	—	1.1 ± 0.3	—	—	—	—	3.8 ± 1.0
B02SL-301-02	—	—	—	—	—	—	—	—	0.48 ± 0.18	—	—	—	—	1.0 ± 0.6
B02SL-302-01	—	—	—	—	0.7 ± 0.2	1.1 ± 0.3	0.61 ± 0.20	—	0.7 ± 0.3	24 ± 2	1.2 ± 0.3	—	23 ± 2	12.9 ± 1.7
B02SL-302-05	—	—	—	—	1.0 ± 0.2	0.9 ± 0.2	1.0 ± 0.2	—	0.49 ± 0.20	29 ± 3	1.3 ± 0.3	—	28 ± 3	18.9 ± 2.0
B02SL-303-01	—	—	—	—	—	—	—	—	1.7 ± 0.2	—	—	—	—	2.6 ± 0.7
B02SL-303-06	—	—	—	—	—	—	—	—	0.44 ± 0.16	—	—	—	—	0.7 ± 0.5

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] Sample IDs ending with "-01" represent a soil sample collected immediately below a covering substance (for example, concrete or asphalt).

[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-18
SOR FOR BUILDING 2 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
B02SL-001-01	—	0.5 ± 0.3
B02SL-002-03	—	0
B02SL-003-01	—	1.2 ± 0.5
B02SL-003-03	—	1.0 ± 0.5
B02SL-004-01	—	0
B02SL-004-02	—	1.1 ± 0.4
B02SL-005-01	3.6 ± 0.4	4.0 ± 0.5
B02SL-006-01	—	1.13 ± 0.17
B02SL-006-02	—	0.38 ± 0.12
B02SL-007-01	—	0.30 ± 0.09
B02SL-007-02	—	1.0 ± 0.4
B02SL-008-01	4.0 ± 0.3	2.1 ± 0.2
B02SL-008-02	—	2.0 ± 0.5
B02SL-008-03	—	1.7 ± 0.5
B02SL-009-01	2.15 ± 0.16	1.3 ± 0.2
B02SL-009-02	1.8 ± 0.4	5.0 ± 0.8
B02SL-010-01	—	0.34 ± 0.18
B02SL-010-02	—	0.9 ± 0.4
B02SL-011-01	—	1.0 ± 0.4
B02SL-012-01	1.63 ± 0.13	1.3 ± 0.2
B02SL-012-02	0.42 ± 0.05	1.8 ± 0.5
B02SL-013-01	—	0.5 ± 0.4
B02SL-014-01	—	0.30 ± 0.12
B02SL-014-02	—	0
B02SL-015-01	—	0
B02SL-016-01	—	1.4 ± 0.6
B02SL-017-01	—	0.66 ± 0.13
B02SL-017-05	3.9 ± 0.3	4.0 ± 0.4
B02SL-018-01	3.5 ± 0.5	6.9 ± 0.8
B02SL-018-02	3.4 ± 0.6	5.2 ± 0.7
B02SL-018-03	2.7 ± 0.5	7.2 ± 0.8
B02SL-019-01	—	0.7 ± 0.4
B02SL-019-02	—	1.3 ± 0.5
B02SL-020-03	—	0
B02SL-022-03	0.9 ± 0.4	2.7 ± 0.6
B02SL-022-04	—	2.3 ± 0.5
B02SL-023-01	—	0.4 ± 0.3
B02SL-023-02	—	0.5 ± 0.3
B02SL-023-03	—	0.6 ± 0.4
B02SL-024-01	—	0.6 ± 0.5
B02SL-024-02	—	0.7 ± 0.5
B02SL-025-01	—	0
B02SL-025-02	0.3 ± 0.3	3.9 ± 0.8
B02SL-026-01	—	0.7 ± 0.4
B02SL-026-02	—	0.3 ± 0.4
B02SL-027-03	—	0
B02SL-029-01	—	0.5 ± 0.4
B02SL-029-02	—	0.5 ± 0.4
B02SL-031-01	—	0.9 ± 0.5
B02SL-031-02	—	1.3 ± 0.6
B02SL-032-01	—	0.4 ± 0.3
B02SL-033-01	—	1.5 ± 0.6
B02SL-033-02	—	1.6 ± 0.4
B02SL-034-01	—	0.7 ± 0.4
B02SL-035-01	—	0
B02SL-035-02	—	0.8 ± 0.4
B02SL-036-02	—	0
B02SL-037-02	—	2.4 ± 0.7
B02SL-037-05	0.3 ± 0.3	2.7 ± 0.5
B02SL-037-06	—	0
B02SL-038-01	—	0.5 ± 0.3
B02SL-040-01	—	0.7 ± 0.5
B02SL-040-03	—	1.4 ± 0.5
B02SL-041-01	—	1.3 ± 0.5
B02SL-041-02	—	0.7 ± 0.4
B02SL-042-01	—	1.5 ± 0.4
B02SL-043-02	—	0.8 ± 0.4
B02SL-044-01	—	0
B02SL-045-01	2.8 ± 0.6	3.3 ± 0.6
B02SL-046-02	—	0.5 ± 0.4
B02SL-047-01	—	0.7 ± 0.4
B02SL-048-01	—	1.0 ± 0.7
B02SL-048-02	—	1.3 ± 0.5
B02SL-049-01	1.1 ± 0.4	4.3 ± 0.7
B02SL-049-02	1.5 ± 0.4	5.3 ± 0.8
B02SL-050-01	—	0
B02SL-050-02	—	0
B02SL-051-01	—	1.0 ± 0.4
B02SL-051-02	—	2.5 ± 0.5
B02SL-051-05	—	2.3 ± 0.5
B02SL-052-03	1.3 ± 0.4	4.4 ± 0.6
B02SL-052-05	0.9 ± 0.4	2.5 ± 0.6
B02SL-052-06	—	3.8 ± 0.6
B02SL-053-01	—	0
B02SL-053-02	—	0
B02SL-054-01	—	2.5 ± 0.6
B02SL-054-02	—	1.4 ± 0.4
B02SL-055-01	—	0
B02SL-055-02	—	1.7 ± 0.4
B02SL-055-03	0.7 ± 0.2	2.8 ± 0.6
B02SL-055-05	—	0.5 ± 0.4
B02SL-057-05	—	0.5 ± 0.4
B02SL-058-01	—	0.5 ± 0.4
B02SL-059-01	2.6 ± 0.3	2.9 ± 0.4
B02SL-059-02	—	1.4 ± 0.4
B02SL-301-01	—	1.4 ± 0.6
B02SL-301-02	—	0
B02SL-302-01	3.7 ± 0.3	1.9 ± 0.3
B02SL-302-05	4.4 ± 0.4	2.8 ± 0.3
B02SL-303-01	—	2.4 ± 0.5
B02SL-303-06	—	0

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-19
COPC CONCENTRATIONS IN BUILDING 2 SURFACE WATER
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)[b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A08-B2-SW-001	0.01 ± 0.08	0.4 ± 0.5	0.13 ± 0.06	0.26 ± 0.08	—	4.2 ± 0.8	0.22 ± 0.15	4.7 ± 0.8
A08-B2-SW-003	0.44 ± 0.19	0.5 ± 0.7	1.2 ± 0.3	0.7 ± 0.2	0.61 ± 0.19	105 ± 14	4.5 ± 1.0	105 ± 14

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-20
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS
IN BUILDING 2 SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b]	
	Combined Ra (pCi/L) [c]	U (µg/L) [d]
A08-B2-SW-001	0.4 ± 0.8	14 ± 2
A08-B2-SW-003	1.0 ± 0.9	315 ± 42

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-21
COPC CONCENTRATIONS IN BUILDING 2 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A08-B2-SD-001	0.7 ± 0.2	0.65 ± 0.09	1.1 ± 0.4	1.77 ± 0.17	1.5 ± 0.3	0.84 ± 0.19	1.4 ± 0.3	1.77 ± 0.17	—	1.18 ± 0.19	0.04 ± 0.04	0.07 ± 0.18	1.33 ± 0.20	—
A08-B2-SD-002	0.66 ± 0.19	0.25 ± 0.09	0.3 ± 0.4	0.27 ± 0.14	0.5 ± 0.2	0.6 ± 0.2	0.37 ± 0.19	0.27 ± 0.14	—	5.6 ± 0.8	0.24 ± 0.12	0.24 ± 0.17	5.6 ± 0.8	—
A08-B2-SD-003	1.0 ± 0.2	1.09 ± 0.17	0.6 ± 0.4	1.0 ± 0.2	0.54 ± 0.18	0.69 ± 0.20	0.70 ± 0.20	1.0 ± 0.2	—	5.5 ± 0.8	0.22 ± 0.11	0.3 ± 0.3	5.7 ± 0.8	—

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy

TABLE 4-22
SOR FOR BUILDING 2 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-B2-SD-001	1.2 ± 0.5
A08-B2-SD-002	0.73 ± 0.09
A08-B2-SD-003	0.73 ± 0.09

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha spectroscopy laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-23
COPC CONCENTRATIONS IN BUILDING 3 BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Matrix	Concentration[b] (pCi/g)											
		^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th		^{234}U	^{235}U		^{238}U
		GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Alpha	Alpha	Gamma	Alpha
B03-BM-001	Concrete	0.33 ± 0.16	0.15 ± 0.09	0.0 ± 0.3	0.13 ± 0.13	0.27 ± 0.11	0.43 ± 0.14	0.13 ± 0.07	0.13 ± 0.13	3.9 ± 0.6	0.12 ± 0.08	0.20 ± 0.17	3.9 ± 0.6
B03-BM-002	Concrete	0.7 ± 0.2	0.48 ± 0.13	0.1 ± 0.3	0.23 ± 0.13	0.51 ± 0.16	0.66 ± 0.19	0.35 ± 0.13	0.23 ± 0.13	3.0 ± 0.5	0.16 ± 0.09	0.1 ± 0.2	3.4 ± 0.6
B03-BM-003	Wood	0.12 ± 0.08	-0.1 ± 0.6	0.1 ± 0.4	0 ± 27	0.10 ± 0.09	0.05 ± 0.06	0.02 ± 0.04	0 ± 27	1.3 ± 0.3	0.10 ± 0.08	0 ± 73	1.2 ± 0.3
B03-BM-004	Brick	1.4 ± 0.3	1.3 ± 0.2	0.6 ± 0.3	1.6 ± 0.3	1.4 ± 0.3	1.0 ± 0.3	1.6 ± 0.4	1.6 ± 0.3	1.2 ± 0.3	0.06 ± 0.06	0.0 ± 0.4	1.3 ± 0.3
B03-BM-005	Concrete	0.38 ± 0.16	0.27 ± 0.15	-1.2 ± 0.4	0.2 ± 0.3	0.38 ± 0.15	0.57 ± 0.18	0.30 ± 0.13	0.2 ± 0.3	0.62 ± 0.17	0.06 ± 0.06	0.1 ± 0.2	0.9 ± 0.2
B03-BM-006	Metal	0.17 ± 0.13	0.07 ± 0.06	-0.1 ± 0.3	0.06 ± 0.07	0.14 ± 0.12	0.24 ± 0.14	0.11 ± 0.10	0.06 ± 0.07	1.9 ± 0.4	0.20 ± 0.10	0.01 ± 0.07	2.0 ± 0.4
B03-BM-007	Ceramic Tile	1.4 ± 0.3	1.6 ± 0.2	0.6 ± 0.4	2.2 ± 0.3	1.5 ± 0.4	1.4 ± 0.3	1.6 ± 0.4	2.2 ± 0.3	1.3 ± 0.3	0.07 ± 0.08	0.0 ± 0.7	1.4 ± 0.3

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-24
COPC CONCENTRATIONS IN BUILDING 3 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B03SL-001-01	—	—	—	—	—	—	—	—	0.55 ± 0.15	—	—	—	—	1.8 ± 0.6
B03SL-010-01	—	—	—	—	—	—	—	—	0.44 ± 0.18	—	—	—	—	2.4 ± 1.0
B03SL-014-01	0.29 ± 0.14	—	0.2 ± 0.3	—	0.58 ± 0.17	0.51 ± 0.16	0.42 ± 0.14	—	0.22 ± 0.12	31 ± 3	1.6 ± 0.4	—	33 ± 3	12.4 ± 1.3
B03SL-016-01	1.5 ± 0.3	—	0.8 ± 0.3	—	1.2 ± 0.3	1.4 ± 0.3	1.1 ± 0.2	—	0.8 ± 0.3	33 ± 3	1.7 ± 0.4	—	36 ± 3	18.9 ± 1.7
B03SL-017-01	—	—	—	—	—	—	—	—	0.42 ± 0.19	—	—	—	—	5.2 ± 0.8
B03SL-020-01	—	—	—	—	1.3 ± 0.3	1.3 ± 0.3	0.9 ± 0.2	—	0.54 ± 0.19	15.7 ± 1.6	0.9 ± 0.2	—	18.0 ± 1.8	13.9 ± 1.3
B03SL-024-01	—	—	—	—	—	—	—	—	0.77 ± 0.19	—	—	—	—	3.2 ± 1.0
B03SL-025-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	2.5 ± 0.7
B03SL-026-01	—	—	—	—	—	—	—	—	0.68 ± 0.14	—	—	—	—	2.2 ± 0.7
B03SL-027-01	—	—	—	—	—	—	—	—	0.57 ± 0.17	—	—	—	—	2.6 ± 0.7
B03SL-028-01	—	—	—	—	—	—	—	—	0.42 ± 0.18	—	—	—	—	0.7 ± 0.6
B03SL-029-01	—	—	—	—	—	—	—	—	0.64 ± 0.20	—	—	—	—	2.8 ± 0.7
B03SL-030-01	—	—	—	—	0.26 ± 0.11	0.42 ± 0.14	0.31 ± 0.11	—	0.27 ± 0.12	13.4 ± 1.3	0.57 ± 0.18	—	13.0 ± 1.3	10.3 ± 1.4
B03SL-031-01	—	—	—	—	—	—	—	—	0.29 ± 0.11	—	—	—	—	1.3 ± 0.5
B03SL-033-01	—	1.3 ± 0.3	—	0.8 ± 0.3	—	—	—	0.8 ± 0.3	1.0 ± 0.3	—	—	0.2 ± 0.4	—	4.2 ± 1.3
B03SL-037-01	0.9 ± 0.2	0.53 ± 0.13	0.9 ± 0.3	0.32 ± 0.16	0.82 ± 0.15	0.88 ± 0.15	0.80 ± 0.14	0.32 ± 0.16	0.35 ± 0.19	2.1 ± 0.2	0 ± 5	0.2 ± 0.2	2.2 ± 0.2	31 ± 3

TABLE 4-24
COPC CONCENTRATIONS IN BUILDING 3 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B03SL-302-01	—	—	—	—	—	—	—	—	0.58 ± 0.20	—	—	—	—	2.8 ± 0.8
B03SL-303-01	—	—	—	—	—	—	—	—	0.9 ± 0.3	—	—	—	—	2.0 ± 1.1
B03SL-306-01	—	—	—	—	—	—	—	—	0.28 ± 0.18	—	—	—	—	3.0 ± 0.6
B03SL-307-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	3.8 ± 1.0
B03SL-701-01	—	—	—	—	—	—	—	—	0.44 ± 0.13	—	—	—	—	4.1 ± 0.7
B03SL-702-01	—	—	—	—	—	—	—	—	0.36 ± 0.11	—	—	—	—	2.7 ± 0.7
B03SL-704-01	—	—	—	—	—	—	—	—	0.29 ± 0.13	—	—	—	—	1.5 ± 0.4
B03SL-705-01	—	—	—	—	—	—	—	—	0.40 ± 0.12	—	—	—	—	3.7 ± 0.8
B03SL-706-01	—	—	—	—	—	—	—	—	0.08 ± 0.10	—	—	—	—	2.8 ± 0.6
B03SL-707-01	—	—	—	—	—	—	—	—	0.65 ± 0.14	—	—	—	—	21.3 ± 1.6
B03SL-708-01	—	—	—	—	—	—	—	—	0.26 ± 0.13	—	—	—	—	5.0 ± 1.0
B03SL-709-01	—	—	—	—	—	—	—	—	0.60 ± 0.15	—	—	—	—	6.4 ± 0.9
B03SL-710-01	—	—	—	—	—	—	—	—	0.41 ± 0.14	—	—	—	—	10.2 ± 1.2
B03SL-711-01	—	—	—	—	—	—	—	—	0.50 ± 0.19	—	—	—	—	5.7 ± 1.1
B03SL-712-01	—	—	—	—	—	—	—	—	1.22 ± 0.19	—	—	—	—	49 ± 3
B03SL-713-01	—	—	—	—	—	—	—	—	0.47 ± 0.14	—	—	—	—	21.6 ± 1.6

TABLE 4-24
COPC CONCENTRATIONS IN BUILDING 3 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B03SL-715-01	—	—	—	—	—	—	—	—	0.21 ± 0.11	—	—	—	—	8.3 ± 0.8
B03SL-717-01	—	—	—	—	—	—	—	—	0.56 ± 0.16	—	—	—	—	35 ± 2
B03SL-718-01	—	—	—	—	—	—	—	—	0.63 ± 0.10	—	—	—	—	6.3 ± 0.5
B03SL-719-01	—	—	—	—	—	—	—	—	0.48 ± 0.18	—	—	—	—	33 ± 3
B03SL-720-01	—	—	—	—	—	—	—	—	1.4 ± 0.3	—	—	—	—	32 ± 3
B03SL-721-01	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	59 ± 3
B03SL-722-01	—	—	—	—	—	—	—	—	0.69 ± 0.19	—	—	—	—	9.1 ± 1.6
B03SL-723-01	—	—	—	—	—	—	—	—	0.38 ± 0.13	—	—	—	—	44.0 ± 1.9
B03SL-724-01	—	—	—	—	—	—	—	—	0.17 ± 0.12	—	—	—	—	5.6 ± 1.1
B03SL-725-01	—	—	—	—	—	—	—	—	0.31 ± 0.15	—	—	—	—	18.3 ± 1.7
B03SL-726-01	—	—	—	—	—	—	—	—	0.32 ± 0.13	—	—	—	—	3.6 ± 1.0
B03SL-727-01	—	—	—	—	—	—	—	—	0.15 ± 0.12	—	—	—	—	3.1 ± 0.8
B03SL-728-01	—	—	—	—	—	—	—	—	0.44 ± 0.19	—	—	—	—	4.2 ± 0.8

TABLE 4-24
COPC CONCENTRATIONS IN BUILDING 3 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a] [b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B03SL-729-01	—	—	—	—	—	—	—	—	0.39 ± 0.10	—	—	—	—	3.4 ± 0.8
B03SL-730-01	—	—	—	—	—	—	—	—	0.08 ± 0.12	—	—	—	—	3.2 ± 0.8
B03SL-731-01	—	—	—	—	—	—	—	—	0.14 ± 0.13	—	—	—	—	11.8 ± 1.6
B03SL-732-01	—	—	—	—	—	—	—	—	0.18 ± 0.10	—	—	—	—	3.3 ± 1.0
B03SL-733-01	—	—	—	—	—	—	—	—	0.20 ± 0.13	—	—	—	—	5.8 ± 1.1
B03SL-734-01	—	—	—	—	—	—	—	—	0.46 ± 0.16	—	—	—	—	3.3 ± 0.9
B03SL-735-01	—	—	—	—	—	—	—	—	0.22 ± 0.10	—	—	—	—	4.2 ± 0.9
B03SL-736-01	—	—	—	—	—	—	—	—	0.35 ± 0.13	—	—	—	—	3.8 ± 0.7
B03SL-737-01	—	—	—	—	—	—	—	—	0.27 ± 0.13	—	—	—	—	7.7 ± 0.9
B03SL-738-01	—	—	—	—	—	—	—	—	0.29 ± 0.09	—	—	—	—	8.4 ± 1.0
B03SL-739-01	—	—	—	—	—	—	—	—	0.42 ± 0.11	—	—	—	—	2.3 ± 0.7

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] "-700-" series sample IDs are "detritus" samples.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-25
SOR FOR BUILDING 3 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
B03SL-001-01	—	0
B03SL-010-01	—	0.24 ± 0.15
B03SL-014-01	4.8 ± 0.3	1.79 ± 0.19
B03SL-016-01	6.0 ± 0.6	3.1 ± 0.6
B03SL-017-01	—	0.68 ± 0.13
B03SL-020-01	2.9 ± 0.5	2.02 ± 0.20
B03SL-024-01	—	0.6 ± 0.4
B03SL-025-01	—	0.26 ± 0.11
B03SL-026-01	—	0
B03SL-027-01	—	0.28 ± 0.11
B03SL-028-01	—	0
B03SL-029-01	—	0.30 ± 0.10
B03SL-030-01	1.84 ± 0.14	1.5 ± 0.2
B03SL-031-01	—	0
B03SL-033-01	—	1.2 ± 0.7
B03SL-037-01	0.105 ± 0.018	4.7 ± 0.5
B03SL-302-01	—	0.30 ± 0.12
B03SL-303-01	—	0.6 ± 0.7
B03SL-306-01	—	0.33 ± 0.09
B03SL-307-01	—	0.46 ± 0.15
B03SL-701-01	—	0.51 ± 0.11
B03SL-702-01	—	0.29 ± 0.11
B03SL-704-01	—	0
B03SL-705-01	—	0.44 ± 0.12
B03SL-706-01	—	0.30 ± 0.10
B03SL-707-01	—	3.2 ± 0.2
B03SL-708-01	—	0.64 ± 0.15
B03SL-709-01	—	0.87 ± 0.15
B03SL-710-01	—	1.45 ± 0.19
B03SL-711-01	—	0.75 ± 0.17
B03SL-712-01	—	8.6 ± 0.6
B03SL-713-01	—	3.2 ± 0.2
B03SL-715-01	—	1.15 ± 0.13
B03SL-717-01	—	5.3 ± 0.4
B03SL-718-01	—	0.85 ± 0.08
B03SL-719-01	—	4.9 ± 0.4
B03SL-720-01	—	6.4 ± 0.7
B03SL-721-01	—	9.9 ± 0.6
B03SL-722-01	—	1.3 ± 0.2
B03SL-723-01	—	6.6 ± 0.3
B03SL-724-01	—	0.74 ± 0.18
B03SL-725-01	—	2.7 ± 0.3
B03SL-726-01	—	0.43 ± 0.16
B03SL-727-01	—	0.35 ± 0.13
B03SL-728-01	—	0.53 ± 0.13
B03SL-729-01	—	0.39 ± 0.13
B03SL-730-01	—	0.37 ± 0.13
B03SL-731-01	—	1.7 ± 0.2
B03SL-732-01	—	0.38 ± 0.15
B03SL-733-01	—	0.76 ± 0.16
B03SL-734-01	—	0.38 ± 0.14
B03SL-735-01	—	0.52 ± 0.13
B03SL-736-01	—	0.45 ± 0.11
B03SL-737-01	—	1.07 ± 0.14
B03SL-738-01	—	1.17 ± 0.15
B03SL-739-01	—	0.23 ± 0.10

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 ⇒ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-26
ICP-MS RESULTS FOR URANIUM ISOTOPES IN BUILDING 3 SURFACE SOIL SAMPLE
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
Natural uranium [c]							—	0.0054%	0.7204%	—	99.2742%
Low enrichment [c]							—	0.0290%	3.4989%	—	96.4722%
Depleted uranium [c]							—	0.0010%	0.1991%	0.0003%	99.7996%
Recycled uranium [c]							—	0.0082%	0.9700%	0.0680%	98.9500%
B03SL-037-01	[0.01]	[0.01]	0.033	[0.01]	5.1	5.1	ND	ND	0.64%	ND	99.4%

Notes:
[a] Bracketed numbers are the laboratory reporting limits.
[b] Relative mass abundances were calculated using uranium isotopic data in Table 3-30. "ND" represents samples for which the isotope was not detected above the laboratory reporting limit; these values are assigned a zero value in the calculations.
[c] Traub, RJ. 2006. *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium*. Battelle-TBD-6001 rev. F0, Battelle, Richland, Washington.

TABLE 4-27
COPC CONCENTRATIONS IN BUILDING 3 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B03SL-001-02	—	—	—	—	—	—	—	—	1.12 ± 0.20	—	—	—	—	1.7 ± 0.5
B03SL-002-01	—	—	—	—	—	—	—	—	1.4 ± 0.2	—	—	—	—	1.8 ± 0.7
B03SL-002-02	—	—	—	—	—	—	—	—	1.5 ± 0.3	—	—	—	—	1.0 ± 0.4
B03SL-003-01	—	—	—	—	—	—	—	—	1.2 ± 0.3	—	—	—	—	2.2 ± 0.6
B03SL-003-02	—	—	—	—	—	—	—	—	1.4 ± 0.3	—	—	—	—	1.8 ± 0.6
B03SL-004-01	—	—	—	—	—	—	—	—	0.27 ± 0.13	—	—	—	—	1.6 ± 0.7
B03SL-004-02	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	1.2 ± 0.6
B03SL-005-01	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	1.1 ± 0.4
B03SL-006-01	—	—	—	—	—	—	—	—	0.57 ± 0.16	—	—	—	—	1.5 ± 0.6
B03SL-006-03	—	—	—	—	—	—	—	—	0.59 ± 0.16	—	—	—	—	1.3 ± 0.5
B03SL-007-01	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	1.3 ± 0.6
B03SL-008-01	—	—	—	—	—	—	—	—	1.5 ± 0.2	—	—	—	—	2.2 ± 0.7
B03SL-009-01	0.72 ± 0.14	—	0.7 ± 0.2	—	0.84 ± 0.15	0.79 ± 0.14	0.66 ± 0.12	—	0.70 ± 0.17	13.6 ± 1.0	0.75 ± 0.15	—	13.4 ± 1.0	11.0 ± 1.3
B03SL-010-02	—	—	—	—	—	—	—	—	0.63 ± 0.14	—	—	—	—	1.6 ± 0.5
B03SL-011-01	—	—	—	—	—	—	—	—	1.01 ± 0.18	—	—	—	—	1.7 ± 0.6
B03SL-011-02	—	—	—	—	—	—	—	—	1.05 ± 0.20	—	—	—	—	1.2 ± 0.5

TABLE 4-27
COPC CONCENTRATIONS IN BUILDING 3 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B03SL-013-01	—	—	—	—	0.77 ± 0.19	1.2 ± 0.2	0.81 ± 0.19	—	0.8 ± 0.2	8.0 ± 0.9	0.52 ± 0.18	—	9.2 ± 1.0	12.4 ± 1.4
B03SL-013-02	—	—	—	—	—	—	—	—	0.75 ± 0.16	—	—	—	—	1.5 ± 0.6
B03SL-014-05	0.42 ± 0.15	0.04 ± 0.17	0.9 ± 0.3	0.6 ± 0.2	0.52 ± 0.11	0.53 ± 0.11	0.42 ± 0.14	0.6 ± 0.2	0.8 ± 0.3	399 ± 43	19 ± 8	14.9 ± 1.5	396 ± 43	180 ± 5
B03SL-014-08	—	—	—	—	—	—	—	—	0.37 ± 0.13	—	—	—	—	1.3 ± 0.5
B03SL-015-01	—	—	—	—	—	—	—	—	0.95 ± 0.18	—	—	—	—	0.6 ± 0.4
B03SL-015-02	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	0.9 ± 0.7
B03SL-016-05	2.0 ± 0.4	1.16 ± 0.19	1.4 ± 0.4	0.95 ± 0.19	1.2 ± 0.2	1.3 ± 0.2	1.15 ± 0.20	0.95 ± 0.19	0.92 ± 0.20	61 ± 5	3.3 ± 0.3	2.1 ± 0.5	64 ± 5	41 ± 3
B03SL-016-07	—	—	—	—	—	—	—	—	0.42 ± 0.15	—	—	—	—	1.4 ± 0.6
B03SL-017-02	—	—	—	—	—	—	—	—	0.69 ± 0.16	—	—	—	—	1.4 ± 0.6
B03SL-017-03	—	—	—	—	—	—	—	—	1.3 ± 0.3	—	—	—	—	1.4 ± 0.6
B03SL-018-01	—	—	—	—	—	—	—	—	1.10 ± 0.19	—	—	—	—	1.6 ± 0.6
B03SL-018-02	1.27 ± 0.20	—	1.27 ± 0.20	—	1.0 ± 0.2	1.4 ± 0.3	1.1 ± 0.2	—	1.5 ± 0.3	0.82 ± 0.19	0.07 ± 0.06	—	0.79 ± 0.19	1.4 ± 0.7
B03SL-019-01	—	—	—	—	—	—	—	—	0.35 ± 0.18	—	—	—	—	1.0 ± 0.6
B03SL-020-02	—	—	—	—	—	—	—	—	0.79 ± 0.15	—	—	—	—	1.5 ± 0.7
B03SL-021-01	—	—	—	—	—	—	—	—	0.41 ± 0.16	—	—	—	—	3.5 ± 0.8
B03SL-021-02	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	3.0 ± 1.1

TABLE 4-27
COPC CONCENTRATIONS IN BUILDING 3 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B03SL-022-01	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	8.1 ± 1.1
B03SL-022-02	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	1.5 ± 0.5
B03SL-023-01	—	—	—	—	1.7 ± 0.3	1.5 ± 0.3	1.4 ± 0.3	—	2.8 ± 0.3	2.6 ± 0.4	0.08 ± 0.07	—	2.6 ± 0.4	4.1 ± 1.0
B03SL-024-03	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	1.5 ± 0.8
B03SL-024-04	—	—	—	—	—	—	—	—	0.76 ± 0.17	—	—	—	—	1.1 ± 0.7
B03SL-025-02	—	—	—	—	—	—	—	—	1.0 ± 0.3	—	—	—	—	1.6 ± 0.6
B03SL-025-03	—	—	—	—	1.8 ± 0.3	2.0 ± 0.3	1.5 ± 0.3	—	1.53 ± 0.20	1.7 ± 0.3	0.12 ± 0.08	—	1.7 ± 0.3	2.4 ± 0.7
B03SL-026-02	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	2.8 ± 0.7
B03SL-027-02	—	—	—	—	—	—	—	—	1.5 ± 0.2	—	—	—	—	1.9 ± 0.6
B03SL-027-03	1.3 ± 0.6	1.5 ± 0.5	0.9 ± 0.3	1.2 ± 0.2	1.4 ± 0.3	1.6 ± 0.3	1.1 ± 0.2	1.2 ± 0.2	1.7 ± 0.3	1.0 ± 0.2	0.06 ± 0.06	0.2 ± 0.3	1.1 ± 0.2	2.4 ± 0.6
B03SL-028-02	—	—	—	—	—	—	—	—	0.45 ± 0.18	—	—	—	—	1.1 ± 0.6
B03SL-029-06	—	—	—	—	—	—	—	—	0.99 ± 0.17	—	—	—	—	1.7 ± 0.7
B03SL-030-02	—	—	—	—	0.69 ± 0.18	0.68 ± 0.18	0.47 ± 0.15	—	0.33 ± 0.18	30 ± 3	1.1 ± 0.3	—	31 ± 3	22 ± 2
B03SL-031-05	—	—	—	—	—	—	—	—	0.53 ± 0.16	—	—	—	—	1.7 ± 0.6
B03SL-032-01	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	1.2 ± 0.7
B03SL-032-02	—	—	—	—	—	—	—	—	0.7 ± 0.4	—	—	—	—	1.4 ± 1.2

TABLE 4-27
COPC CONCENTRATIONS IN BUILDING 3 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B03SL-033-03	—	—	—	—	—	—	—	—	0.9 ± 0.4	—	—	—	—	2.8 ± 1.0
B03SL-033-05	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	3.2 ± 0.8
B03SL-034-01	—	0.21 ± 0.07	—	0.15 ± 0.09	—	—	—	0.15 ± 0.09	0.07 ± 0.10	—	—	0.03 ± 0.12	—	0.6 ± 0.4
B03SL-035-01	—	—	—	—	1.0 ± 0.2	1.1 ± 0.3	0.9 ± 0.2	—	1.4 ± 0.3	13.9 ± 1.4	0.68 ± 0.20	—	14.4 ± 1.4	13.6 ± 1.7
B03SL-036-01	—	1.8 ± 0.3	—	0.8 ± 0.3	—	—	—	0.8 ± 0.3	1.0 ± 0.3	—	—	0.3 ± 0.4	—	5.3 ± 1.3
B03SL-036-02	—	1.6 ± 0.3	—	1.4 ± 0.3	1.6 ± 0.3	1.6 ± 0.3	1.4 ± 0.3	1.4 ± 0.3	1.3 ± 0.3	2.4 ± 0.4	0.14 ± 0.09	0.1 ± 0.3	2.7 ± 0.4	3.3 ± 1.3
B03SL-301-01	—	—	—	—	—	—	—	—	0.03 ± 0.04	—	—	—	—	1.6 ± 0.8
B03SL-301-06	—	—	—	—	—	—	—	—	0.6 ± 0.3	—	—	—	—	1.0 ± 0.9
B03SL-303-06	—	—	—	—	—	—	—	—	0.4 ± 0.3	—	—	—	—	0.6 ± 0.6
B03SL-304-01	—	—	—	—	—	—	—	—	0.6 ± 0.3	—	—	—	—	1.1 ± 1.1
B03SL-304-02	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	1.4 ± 0.8
B03SL-305-01	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	1.8 ± 0.9
B03SL-305-02	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	1.6 ± 0.8
B03SL-306-10	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	2.7 ± 1.3
B03SL-306-11	—	—	—	—	—	—	—	—	0.41 ± 0.19	—	—	—	—	1.7 ± 1.2

TABLE 4-27
COPC CONCENTRATIONS IN BUILDING 3 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] "-700-" series sample IDs are "detritus" samples.

TABLE 4-28
SOR FOR BUILDING 3 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
B03SL-001-02	—	1.0 ± 0.4
B03SL-002-01	—	1.7 ± 0.5
B03SL-002-02	—	1.8 ± 0.5
B03SL-003-01	—	1.3 ± 0.6
B03SL-003-02	—	1.6 ± 0.5
B03SL-004-01	—	0
B03SL-004-02	—	0.8 ± 0.5
B03SL-005-01	—	1.1 ± 0.5
B03SL-006-01	—	0
B03SL-006-03	—	0
B03SL-007-01	—	0.6 ± 0.5
B03SL-008-01	—	1.9 ± 0.5
B03SL-009-01	1.91 ± 0.10	1.57 ± 0.20
B03SL-010-02	—	0
B03SL-011-01	—	0.8 ± 0.4
B03SL-011-02	—	0.9 ± 0.4
B03SL-013-01	1.35 ± 0.17	2.2 ± 0.5
B03SL-013-02	—	0.3 ± 0.3
B03SL-014-05	61 ± 5	28.0 ± 1.0
B03SL-014-08	—	0
B03SL-015-01	—	0.7 ± 0.4
B03SL-015-02	—	0.9 ± 0.4
B03SL-016-05	10.1 ± 0.6	6.8 ± 0.6
B03SL-016-07	—	0
B03SL-017-02	—	0
B03SL-017-03	—	1.4 ± 0.6
B03SL-018-01	—	1.0 ± 0.4
B03SL-018-02	0.6 ± 0.3	1.8 ± 0.6
B03SL-019-01	—	0
B03SL-020-02	—	0.3 ± 0.3
B03SL-021-01	—	0.42 ± 0.12
B03SL-021-02	—	0.34 ± 0.18
B03SL-022-01	—	1.4 ± 0.5
B03SL-022-02	—	1.0 ± 0.5
B03SL-023-01	1.4 ± 0.6	4.9 ± 0.7
B03SL-024-03	—	1.1 ± 0.5
B03SL-024-04	—	0.3 ± 0.3
B03SL-025-02	—	0.8 ± 0.5
B03SL-025-03	1.4 ± 0.3	2.1 ± 0.4
B03SL-026-02	—	1.8 ± 0.5
B03SL-027-02	—	1.8 ± 0.5
B03SL-027-03	0.8 ± 0.3	2.3 ± 0.6
B03SL-028-02	—	0
B03SL-029-06	—	0.8 ± 0.4
B03SL-030-02	4.5 ± 0.3	3.3 ± 0.3
B03SL-031-05	—	0
B03SL-032-01	—	0
B03SL-032-02	—	0.2 ± 0.9
B03SL-033-03	—	0.9 ± 0.8
B03SL-033-05	—	0.37 ± 0.12
B03SL-034-01	—	0
B03SL-035-01	2.3 ± 0.3	3.6 ± 0.6
B03SL-036-01	—	1.6 ± 0.6
B03SL-036-02	1.4 ± 0.3	1.7 ± 0.7
B03SL-301-01	—	0
B03SL-301-06	—	0
B03SL-303-06	—	0
B03SL-304-01	—	0
B03SL-304-02	—	0
B03SL-305-01	—	0
B03SL-305-02	—	0
B03SL-306-10	—	0.6 ± 0.5
B03SL-306-11	—	0

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-29
ICP-MS RESULTS FOR URANIUM ISOTOPES IN BUILDING 3 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
Natural uranium [c]							—	0.0054%	0.7204%	—	99.2742%
Low enrichment [c]							—	0.0290%	3.4989%	—	96.4722%
Depleted uranium [c]							—	0.0010%	0.1991%	0.0003%	99.7996%
Recycled uranium [c]							—	0.0082%	0.9700%	0.0680%	98.9500%
B03SL-014-05	[0.01]	0.063	7.1	[0.01]	1120	1127	ND	0.0056%	0.63%	ND	99.4%
B03SL-016-05	[0.01]	0.009	0.94	[0.01]	97	98	ND	0.0092%	0.96%	ND	99.0%

Notes:
[a] Bracketed numbers are the laboratory reporting limits.
[b] Relative mass abundances were calculated using uranium isotopic data in Table 3-30. "ND" represents samples for which the isotope was not detected above the laboratory reporting limit; these values are assigned a zero value in the calculations.
[c] Traub, RJ. 2006. *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium*. Battelle-TBD-6001 rev. F0, Battelle, Richland, Washington.

TABLE 4-30
COPC CONCENTRATIONS BUILDING 3 IN SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)[b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A08-B3-SW-003	0.03 ± 0.13	0.2 ± 0.3	0.03 ± 0.10	0.16 ± 0.15	0.02 ± 0.07	6.6 ± 1.1	0.29 ± 0.18	7.5 ± 1.2
A08-B3-SW-004	0.17 ± 0.15	0.0 ± 0.3	0.05 ± 0.12	0.09 ± 0.14	-0.02 ± 0.09	6.1 ± 1.0	0.26 ± 0.17	6.2 ± 1.1
A08-B3-SW-005	0.02 ± 0.11	0.3 ± 0.4	0.00 ± 0.14	0.13 ± 0.15	0.07 ± 0.12	13.5 ± 2.0	0.5 ± 0.2	13.0 ± 1.9
A08-B3-SW-006	0.17 ± 0.12	0.6 ± 0.3	0.01 ± 0.08	0.43 ± 0.20	0.01 ± 0.06	18.7 ± 1.8	0.9 ± 0.2	20 ± 2
A08-B3-SW-007	0.03 ± 0.17	0.0 ± 0.3	0.04 ± 0.14	0.3 ± 0.3	0.05 ± 0.13	0.7 ± 0.3	0.07 ± 0.11	0.6 ± 0.3
A08-B3-SW-008	0.14 ± 0.15	0.4 ± 0.4	0.04 ± 0.11	0.06 ± 0.10	-0.01 ± 0.08	1.9 ± 0.5	0.05 ± 0.09	2.0 ± 0.5
A08-B3-SW-009	0.07 ± 0.09	0.07 ± 0.19	0.0 ± 0.2	0.04 ± 0.12	0.12 ± 0.15	2.8 ± 0.6	0.14 ± 0.14	3.2 ± 0.7
A08-B3-SW-011	0.09 ± 0.15	0.2 ± 0.5	0.11 ± 0.14	0.28 ± 0.19	-0.03 ± 0.07	2.2 ± 0.5	0.21 ± 0.16	2.9 ± 0.6
A08-B3-SW-012	0.09 ± 0.11	-0.9 ± 0.6	0.1 ± 0.2	0.06 ± 0.11	-0.01 ± 0.08	3.1 ± 0.6	0.07 ± 0.09	2.8 ± 0.6
A08-B3-SW-013	0.27 ± 0.13	0.8 ± 0.5	0.18 ± 0.14	0.18 ± 0.13	0.05 ± 0.08	24 ± 3	1.3 ± 0.4	26 ± 4
A08-B3-SW-014	0.06 ± 0.12	0.4 ± 0.3	0.13 ± 0.15	0.10 ± 0.11	0.03 ± 0.07	21 ± 3	1.0 ± 0.4	25 ± 3
A08-B3-SW-015	0.22 ± 0.17	0.5 ± 0.3	0.12 ± 0.14	0.32 ± 0.18	0.10 ± 0.11	30 ± 4	1.8 ± 0.5	33 ± 4

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-31
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS
IN BUILDING 3 SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A08-B3-SW-003	0.2 ± 0.3	20 ± 3
A08-B3-SW-004	0.1 ± 0.3	18 ± 3
A08-B3-SW-005	0.3 ± 0.4	40 ± 6
A08-B3-SW-006	0.7 ± 0.3	56 ± 5
A08-B3-SW-007	0.0 ± 0.4	2.2 ± 0.8
A08-B3-SW-008	0.5 ± 0.4	5.5 ± 1.4
A08-B3-SW-009	0.1 ± 0.2	8.4 ± 1.8
A08-B3-SW-011	0.3 ± 0.5	6.6 ± 1.5
A08-B3-SW-012	-0.8 ± 0.6	9.2 ± 1.8
A08-B3-SW-013	1.1 ± 0.6	72 ± 10
A08-B3-SW-014	0.4 ± 0.3	64 ± 9
A08-B3-SW-015	0.7 ± 0.4	88 ± 12

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-32
COPC CONCENTRATIONS IN BUILDING 3 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A08-B3-SD-002	0.13 ± 0.11	0.04 ± 0.06	0.2 ± 0.4	0.17 ± 0.12	0.28 ± 0.13	0.31 ± 0.13	0.21 ± 0.11	0.17 ± 0.12	—	1.9 ± 0.4	0.14 ± 0.09	0.06 ± 0.11	1.9 ± 0.4	—
A08-B3-SD-003	0.6 ± 0.2	0.36 ± 0.09	0.0 ± 0.4	0.29 ± 0.13	0.7 ± 0.2	0.59 ± 0.19	0.53 ± 0.18	0.29 ± 0.13	—	20 ± 3	1.1 ± 0.3	0.8 ± 0.3	24 ± 3	—
A08-B3-SD-004	0.50 ± 0.19	0.08 ± 0.10	0.4 ± 0.4	0.50 ± 0.17	0.9 ± 0.2	0.52 ± 0.16	0.8 ± 0.2	0.50 ± 0.17	—	30 ± 4	1.3 ± 0.3	0.9 ± 0.3	33 ± 4	—
A08-B3-SD-005	0.25 ± 0.14	0.06 ± 0.10	0.2 ± 0.3	0.13 ± 0.19	0.25 ± 0.12	0.46 ± 0.15	0.20 ± 0.10	0.13 ± 0.19	—	19 ± 2	1.2 ± 0.3	0.8 ± 0.3	20 ± 3	—
A08-B3-SD-006	0.21 ± 0.09	0.15 ± 0.08	0.13 ± 0.15	0.23 ± 0.12	0.29 ± 0.13	0.28 ± 0.12	0.17 ± 0.09	0.23 ± 0.12	—	18 ± 2	1.0 ± 0.3	0.6 ± 0.2	19 ± 3	—
A08-B3-SD-007	0.25 ± 0.13	0.15 ± 0.11	0.1 ± 0.2	0.17 ± 0.17	0.20 ± 0.11	0.33 ± 0.14	0.14 ± 0.09	0.17 ± 0.17	—	5.4 ± 0.8	0.35 ± 0.14	0.3 ± 0.3	6.6 ± 0.9	—
A08-B3-SD-008	0.25 ± 0.09	0.16 ± 0.10	0.39 ± 0.18	0.13 ± 0.14	0.19 ± 0.12	0.46 ± 0.15	0.18 ± 0.09	0.13 ± 0.14	—	278 ± 26	14 ± 3	5.6 ± 0.7	289 ± 27	—
A08-B3-SD-009	0.52 ± 0.13	0.40 ± 0.08	0.3 ± 0.3	0.28 ± 0.09	0.59 ± 0.12	0.62 ± 0.13	0.51 ± 0.11	0.28 ± 0.09	—	9.9 ± 1.0	0.57 ± 0.13	0.38 ± 0.18	10.3 ± 1.0	—
A08-B3-SD-010	1.9 ± 0.4	2.1 ± 0.5	0.7 ± 0.4	0.7 ± 0.6	0.67 ± 0.20	2.4 ± 0.5	0.59 ± 0.18	0.7 ± 0.6	—	10.2 ± 1.4	0.53 ± 0.17	0.8 ± 0.7	10.5 ± 1.4	—
A08-B3-SD-011	0.56 ± 0.13	0.31 ± 0.09	0.7 ± 0.3	0.36 ± 0.13	0.35 ± 0.15	0.23 ± 0.12	0.25 ± 0.12	0.36 ± 0.13	—	3.5 ± 0.6	0.12 ± 0.08	0.24 ± 0.16	3.5 ± 0.6	—
A08-B3-SD-012	0.20 ± 0.09	0.09 ± 0.07	0.4 ± 0.3	0.06 ± 0.11	0.17 ± 0.07	0.15 ± 0.06	0.10 ± 0.05	0.06 ± 0.11	—	8.1 ± 0.8	0.40 ± 0.11	0.44 ± 0.16	7.9 ± 0.8	—
A08-B3-SD-013	2.8 ± 0.5	1.6 ± 0.2	2.0 ± 0.5	2.6 ± 0.4	1.8 ± 0.4	1.1 ± 0.3	1.7 ± 0.4	2.6 ± 0.4	—	3.6 ± 0.6	0.17 ± 0.10	0.0 ± 0.9	4.0 ± 0.6	—
A08-B3-SD-014	2.6 ± 0.5	2.3 ± 0.3	-1.3 ± 1.2	1.5 ± 0.4	2.2 ± 0.4	2.1 ± 0.4	2.2 ± 0.4	1.5 ± 0.4	—	5.6 ± 0.8	0.25 ± 0.12	0.4 ± 0.4	6.1 ± 0.9	—
A08-B3-SD-015	2.6 ± 0.5	2.0 ± 0.3	1.7 ± 0.6	3.0 ± 0.4	1.8 ± 0.4	1.8 ± 0.4	2.0 ± 0.4	3.0 ± 0.4	—	8.6 ± 1.2	0.54 ± 0.18	0.4 ± 0.4	9.0 ± 1.2	—

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-33
SOR FOR BUILDING 3 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-B3-SD-002	0
A08-B3-SD-003	3.3 ± 0.3
A08-B3-SD-004	4.7 ± 0.5
A08-B3-SD-005	2.9 ± 0.3
A08-B3-SD-006	2.8 ± 0.3
A08-B3-SD-007	0.78 ± 0.09
A08-B3-SD-008	44 ± 3
A08-B3-SD-009	1.39 ± 0.10
A08-B3-SD-010	2.3 ± 0.3
A08-B3-SD-011	0.42 ± 0.06
A08-B3-SD-012	1.08 ± 0.08
A08-B3-SD-013	2.4 ±0.7
A08-B3-SD-014	4.2 ± 0.8
A08-B3-SD-015	4.1 ± 0.8

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha spectroscopy laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-34
COPC CONCENTRATIONS IN BUILDING 4 AND 9 BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Matrix	Concentration (pCi/g)[b]											
		^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th		^{234}U		^{235}U	^{238}U
		GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Alpha	Alpha	Gamma	Alpha
B04&B09-BM-001	Brick	1.3 ± 0.2	1.29 ± 0.18	1.1 ± 0.4	1.4 ± 0.2	1.1 ± 0.2	0.93 ± 0.20	1.0 ± 0.2	1.4 ± 0.2	1.9 ± 0.3	0.07 ± 0.05	0.2 ± 0.3	1.8 ± 0.3
B04&B09-BM-002	Cinder block	0.51 ± 0.18	0.40 ± 0.11	0.3 ± 0.4	0.27 ± 0.12	0.51 ± 0.16	0.62 ± 0.18	0.38 ± 0.14	0.27 ± 0.12	1.3 ± 0.3	0.05 ± 0.05	0.1 ± 0.2	1.3 ± 0.3
B04&B09-BM-003	Concrete	0.33 ± 0.18	0.26 ± 0.11	-0.2 ± 0.5	0.16 ± 0.15	0.22 ± 0.11	0.45 ± 0.15	0.39 ± 0.14	0.16 ± 0.15	0.44 ± 0.13	0.01 ± 0.02	0.1 ± 0.2	0.40 ± 0.12
B04&B09-BM-004	Cinder block	1.0 ± 0.2	0.82 ± 0.19	0.4 ± 0.4	0.5 ± 0.2	0.67 ± 0.20	1.1 ± 0.3	0.57 ± 0.18	0.5 ± 0.2	1.0 ± 0.2	0.03 ± 0.04	0.0 ± 0.4	1.0 ± 0.2

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-35
COPC CONCENTRATIONS IN BUILDING 4 AND 9 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration [c] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
B04&B09SL-008-01	—	—	—	—	—	—	—	—	0.14 ± 0.10	—	—	—	—	1.0 ± 0.5
B04&B09SL-015-01	0.59 ± 0.18	—	1.0 ± 0.3	—	1.2 ± 0.2	0.43 ± 0.14	1.0 ± 0.2	—	0.7 ± 0.2	16.5 ± 1.6	0.72 ± 0.20	—	19.9 ± 1.9	10.4 ± 1.5
B04&B09SL-017-01	—	—	—	—	1.1 ± 0.2	1.4 ± 0.3	1.4 ± 0.2	—	1.43 ± 0.20	2.5 ± 0.4	0.14 ± 0.08	—	2.5 ± 0.4	3.5 ± 0.9
B04&B09SL-018-01	1.9 ± 0.3	—	0.5 ± 0.3	—	1.1 ± 0.2	0.83 ± 0.20	1.0 ± 0.2	—	1.3 ± 0.3	3.1 ± 0.4	0.16 ± 0.09	—	3.1 ± 0.4	5.3 ± 1.0
B04&B09SL-019-01	—	—	—	—	—	—	—	—	0.14 ± 0.10	—	—	—	—	1.1 ± 0.5
B04&B09SL-026-01	0.36 ± 0.14	—	0.1 ± 0.3	—	0.47 ± 0.16	0.37 ± 0.14	0.29 ± 0.13	—	0.27 ± 0.15	9.1 ± 1.0	0.30 ± 0.12	—	9.2 ± 1.0	7.4 ± 1.3
B04&B09SL-305-01	—	—	—	—	—	—	—	—	1.3 ± 0.3	—	—	—	—	3.6 ± 1.3
B04&B09SL-702-01	—	—	—	—	—	—	—	—	0.15 ± 0.12	—	—	—	—	8.5 ± 1.0
B04&B09SL-703-01	—	—	—	—	—	—	—	—	0.36 ± 0.13	—	—	—	—	15.7 ± 1.6
B04&B09SL-704-01	—	—	—	—	—	—	—	—	0.19 ± 0.13	—	—	—	—	7.8 ± 0.8
B04&B09SL-705-01	—	—	—	—	—	—	—	—	0.16 ± 0.11	—	—	—	—	1.1 ± 0.4
B04&B09SL-707-01	—	—	—	—	—	—	—	—	0.32 ± 0.15	—	—	—	—	24.2 ± 1.5
B04&B09SL-708-01	—	—	—	—	—	—	—	—	0.16 ± 0.11	—	—	—	—	1.7 ± 0.4
B04&B09SL-710-01	—	—	—	—	—	—	—	—	0.17 ± 0.15	—	—	—	—	4.3 ± 0.9
B04&B09SL-711-01	—	—	—	—	—	—	—	—	0.53 ± 0.12	—	—	—	—	28.2 ± 1.8
B04&B09SL-712-01	—	—	—	—	—	—	—	—	0.11 ± 0.07	—	—	—	—	2.9 ± 0.5
B04&B09SL-713-01	—	—	—	—	—	—	—	—	0.11 ± 0.13	—	—	—	—	3.1 ± 0.6
B04&B09SL-714-01	—	—	—	—	—	—	—	—	0.09 ± 0.13	—	—	—	—	5.7 ± 0.8
B04&B09SL-715-01	—	—	—	—	—	—	—	—	1.08 ± 0.19	—	—	—	—	8.3 ± 1.2
B04&B09SL-716-01	—	—	—	—	—	—	—	—	0.29 ± 0.13	—	—	—	—	10.0 ± 1.3
B04&B09SL-717-01	—	—	—	—	—	—	—	—	1.13 ± 0.16	—	—	—	—	4.6 ± 0.7
B04&B09SL-719-01	—	—	—	—	—	—	—	—	0.12 ± 0.10	—	—	—	—	0.7 ± 0.4
B04&B09SL-720-01	—	—	—	—	—	—	—	—	0.08 ± 0.12	—	—	—	—	2.3 ± 0.7

TABLE 4-35
COPC CONCENTRATIONS IN BUILDING 4 AND 9 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration [c] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
B04&B09SL-721-01	—	—	—	—	—	—	—	—	0.25 ± 0.12	—	—	—	—	3.5 ± 0.9
B04&B09SL-722-01	—	—	—	—	—	—	—	—	0.40 ± 0.12	—	—	—	—	9.2 ± 1.3
B04&B09SL-723-01	—	—	—	—	—	—	—	—	0.34 ± 0.12	—	—	—	—	16.0 ± 1.0
B04&B09SL-724-01	—	—	—	—	—	—	—	—	0.38 ± 0.13	—	—	—	—	12.3 ± 1.4
B04&B09SL-725-01	—	—	—	—	—	—	—	—	0.24 ± 0.11	—	—	—	—	9.1 ± 1.0
B04&B09SL-727-01	—	—	—	—	—	—	—	—	0.05 ± 0.05	—	—	—	—	2.0 ± 0.6
B04&B09SL-728-01	—	—	—	—	—	—	—	—	0.16 ± 0.10	—	—	—	—	2.2 ± 0.5
B04&B09SL-729-01	—	—	—	—	—	—	—	—	0.15 ± 0.11	—	—	—	—	17.4 ± 1.7
B04&B09SL-730-01	—	—	—	—	—	—	—	—	0.37 ± 0.15	—	—	—	—	48 ± 3
B04&B09SL-731-01	—	—	—	—	—	—	—	—	0.15 ± 0.11	—	—	—	—	10.9 ± 1.2
B04&B09SL-732-01	—	—	—	—	—	—	—	—	0.01 ± 0.01	—	—	—	—	2.8 ± 0.6
B04&B09SL-733-01	—	—	—	—	—	—	—	—	0.11 ± 0.15	—	—	—	—	3.6 ± 0.7
B04&B09SL-734-01	—	—	—	—	—	—	—	—	0.15 ± 0.11	—	—	—	—	10.9 ± 1.2
B04&B09SL-736-01	—	—	—	—	—	—	—	—	0.22 ± 0.12	—	—	—	—	5.7 ± 0.9
B04&B09SL-738-01	—	—	—	—	—	—	—	—	0.06 ± 0.05	—	—	—	—	0.7 ± 0.4
B04&B09SL-739-01	—	—	—	—	—	—	—	—	0.09 ± 0.10	—	—	—	—	2.2 ± 0.6
B04&B09SL-740-01	—	—	—	—	—	—	—	—	0.07 ± 0.13	—	—	—	—	2.7 ± 0.5
B04&B09SL-741-01	—	—	—	—	—	—	—	—	0.25 ± 0.12	—	—	—	—	12.4 ± 1.2

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] "-700-" series sample IDs are "detritus" samples.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes onsite gamma spectroscopy.

TABLE 4-36
SOR FOR BUILDING 4 AND 9 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
B04&B09SL-008-01	—	0
B04&B09SL-015-01	2.9 ± 0.4	1.5 ± 0.2
B04&B09SL-017-01	1.7 ± 0.5	2.0 ± 0.4
B04&B09SL-018-01	0.8 ± 0.4	2.0 ± 0.7
B04&B09SL-019-01	—	0
B04&B09SL-026-01	1.24 ± 0.10	1.02 ± 0.19
B04&B09SL-305-01	—	1.8 ± 0.7
B04&B09SL-702-01	—	1.19 ± 0.16
B04&B09SL-703-01	—	2.3 ± 0.2
B04&B09SL-704-01	—	1.08 ± 0.13
B04&B09SL-705-01	—	0
B04&B09SL-707-01	—	3.6 ± 0.2
B04&B09SL-708-01	—	0
B04&B09SL-710-01	—	0.54 ± 0.14
B04&B09SL-711-01	—	4.2 ± 0.3
B04&B09SL-712-01	—	0.33 ± 0.07
B04&B09SL-713-01	—	0.35 ± 0.09
B04&B09SL-714-01	—	0.75 ± 0.12
B04&B09SL-715-01	—	2.0 ± 0.4
B04&B09SL-716-01	—	1.4 ± 0.2
B04&B09SL-717-01	—	1.6 ± 0.4
B04&B09SL-719-01	—	0
B04&B09SL-720-01	—	0.22 ± 0.11
B04&B09SL-721-01	—	0.41 ± 0.14
B04&B09SL-722-01	—	1.29 ± 0.19
B04&B09SL-723-01	—	2.33 ± 0.15
B04&B09SL-724-01	—	1.8 ± 0.2
B04&B09SL-725-01	—	1.28 ± 0.16
B04&B09SL-727-01	—	0
B04&B09SL-728-01	—	0.22 ± 0.07
B04&B09SL-729-01	—	2.6 ± 0.3
B04&B09SL-730-01	—	7.2 ± 0.4
B04&B09SL-731-01	—	1.55 ± 0.19
B04&B09SL-732-01	—	0.30 ± 0.09
B04&B09SL-733-01	—	0.43 ± 0.10
B04&B09SL-734-01	—	1.55 ± 0.19
B04&B09SL-736-01	—	0.75 ± 0.15
B04&B09SL-738-01	—	0
B04&B09SL-739-01	—	0.22 ± 0.09
B04&B09SL-740-01	—	0.29 ± 0.08
B04&B09SL-741-01	—	1.78 ± 0.18

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-37
COPC CONCENTRATIONS IN BUILDING 4 AND 9 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B04&B09SL-001-01	—	—	—	—	—	—	—	—	1.16 ± 0.19	—	—	—	—	1.2 ± 0.6
B04&B09SL-002-01	—	—	—	—	—	—	—	—	0.91 ± 0.18	—	—	—	—	1.7 ± 0.7
B04&B09SL-002-02	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	0.7 ± 0.5
B04&B09SL-003-01	—	—	—	—	—	—	—	—	0.32 ± 0.14	—	—	—	—	1.8 ± 0.6
B04&B09SL-004-01	—	—	—	—	—	—	—	—	0.33 ± 0.13	—	—	—	—	1.6 ± 0.5
B04&B09SL-005-01	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	2.1 ± 1.0
B04&B09SL-006-01	—	—	—	—	—	—	—	—	1.28 ± 0.17	—	—	—	—	1.9 ± 0.6
B04&B09SL-006-02	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	1.8 ± 0.7
B04&B09SL-007-01	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	2.6 ± 0.8
B04&B09SL-007-05	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	2.2 ± 0.8
B04&B09SL-008-03	—	—	—	—	—	—	—	—	0.19 ± 0.20	—	—	—	—	1.0 ± 0.7
B04&B09SL-009-01	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	2.2 ± 0.7
B04&B09SL-009-02	1.3 ± 0.3	—	1.1 ± 0.4	—	1.08 ± 0.17	1.26 ± 0.18	1.22 ± 0.18	—	1.4 ± 0.3	0.91 ± 0.14	0.03 ± 0.03	—	0.90 ± 0.14	1.8 ± 0.6
B04&B09SL-009-06	—	—	—	—	—	—	—	—	0.85 ± 0.17	—	—	—	—	1.1 ± 0.6
B04&B09SL-010-01	—	—	—	—	—	—	—	—	0.85 ± 0.19	—	—	—	—	3.1 ± 0.7
B04&B09SL-010-05	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	0.9 ± 0.7

TABLE 4-37
COPC CONCENTRATIONS IN BUILDING 4 AND 9 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B04&B09SL-011-01	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	2.0 ± 0.7
B04&B09SL-012-01	—	—	—	—	—	—	—	—	0.95 ± 0.19	—	—	—	—	1.5 ± 0.6
B04&B09SL-012-02	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	0.7 ± 0.7
B04&B09SL-013-01	—	—	—	—	—	—	—	—	0.82 ± 0.16	—	—	—	—	3.9 ± 0.8
B04&B09SL-014-01	—	—	—	—	—	—	—	—	1.17 ± 0.19	—	—	—	—	2.9 ± 0.7
B04&B09SL-015-02	—	—	—	—	1.0 ± 0.2	1.1 ± 0.2	0.9 ± 0.2	—	0.84 ± 0.19	5.3 ± 0.7	0.21 ± 0.10	—	6.0 ± 0.7	7.0 ± 1.5
B04&B09SL-016-01	—	—	—	—	—	—	—	—	0.20 ± 0.12	—	—	—	—	0.31 ± 0.18
B04&B09SL-017-02	—	—	—	—	0.40 ± 0.14	0.51 ± 0.16	0.37 ± 0.14	—	0.40 ± 0.14	7.7 ± 0.9	0.28 ± 0.12	—	9.2 ± 1.0	7.7 ± 1.2
B04&B09SL-018-02	1.2 ± 0.3	—	0.8 ± 0.3	—	1.2 ± 0.3	1.3 ± 0.3	1.2 ± 0.3	—	1.8 ± 0.3	2.1 ± 0.3	0.05 ± 0.05	—	2.2 ± 0.4	3.2 ± 0.9
B04&B09SL-019-07	—	—	—	—	—	—	—	—	0.41 ± 0.10	—	—	—	—	0.8 ± 0.6
B04&B09SL-020-01	1.7 ± 0.3	—	0.7 ± 0.4	—	1.1 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	—	1.4 ± 0.3	2.5 ± 0.4	0.12 ± 0.07	—	2.5 ± 0.4	3.6 ± 0.8
B04&B09SL-020-02	—	—	—	—	—	—	—	—	1.03 ± 0.18	—	—	—	—	2.1 ± 0.7
B04&B09SL-021-01	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	1.4 ± 0.5
B04&B09SL-021-05	—	—	—	—	—	—	—	—	0.84 ± 0.19	—	—	—	—	1.4 ± 0.6
B04&B09SL-022-01	—	—	—	—	—	—	—	—	0.90 ± 0.18	—	—	—	—	1.5 ± 0.6

TABLE 4-37
COPC CONCENTRATIONS IN BUILDING 4 AND 9 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B04&B09SL-022-05	—	—	—	—	—	—	—	—	0.94 ± 0.18	—	—	—	—	1.3 ± 0.7
B04&B09SL-023-01	—	—	—	—	—	—	—	—	0.37 ± 0.16	—	—	—	—	0.7 ± 0.5
B04&B09SL-024-01	—	0.74 ± 0.17	—	1.1 ± 0.2	—	—	—	1.1 ± 0.2	1.4 ± 0.3	—	—	0.2 ± 0.3	—	3.3 ± 0.8
B04&B09SL-025-01	—	—	—	—	—	—	—	—	0.66 ± 0.20	—	—	—	—	0.6 ± 0.5
B04&B09SL-025-02	1.9 ± 0.3	1.4 ± 0.3	1.2 ± 0.4	1.3 ± 0.4	1.5 ± 0.3	2.0 ± 0.3	1.3 ± 0.3	1.3 ± 0.4	1.2 ± 0.3	1.8 ± 0.3	0.10 ± 0.07	0.4 ± 0.5	1.6 ± 0.3	3.2 ± 0.9
B04&B09SL-026-02	—	—	—	—	—	—	—	—	0.06 ± 0.09	—	—	—	—	2.4 ± 0.7
B04&B09SL-026-05	—	—	—	—	—	—	—	—	0.46 ± 0.13	—	—	—	—	3.1 ± 0.9
B04&B09SL-026-06	—	—	—	—	—	—	—	—	0.02 ± 0.01	—	—	—	—	0.9 ± 0.3
B04&B09SL-027-01	—	—	—	—	1.4 ± 0.3	1.4 ± 0.3	1.2 ± 0.3	—	1.42 ± 0.18	2.7 ± 0.4	0.16 ± 0.09	—	2.6 ± 0.4	3.5 ± 0.8
B04&B09SL-027-02	—	—	—	—	—	—	—	—	0.85 ± 0.17	—	—	—	—	1.3 ± 0.5
B04&B09SL-028-01	—	—	—	—	—	—	—	—	0.72 ± 0.16	—	—	—	—	3.3 ± 0.8
B04&B09SL-029-01	—	—	—	—	—	—	—	—	0.85 ± 0.16	—	—	—	—	3.1 ± 0.7
B04&B09SL-029-05	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	1.3 ± 0.6
B04&B09SL-030-01	—	—	—	—	0.62 ± 0.17	0.61 ± 0.16	0.49 ± 0.14	—	0.48 ± 0.14	3.6 ± 0.5	0.37 ± 0.14	—	15.1 ± 1.5	12.2 ± 1.6
B04&B09SL-030-02	—	—	—	—	—	—	—	—	0.42 ± 0.13	—	—	—	—	1.0 ± 0.6

TABLE 4-37
COPC CONCENTRATIONS IN BUILDING 4 AND 9 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B04&B09SL-031-01	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	2.2 ± 0.8
B04&B09SL-031-05	—	—	—	—	—	—	—	—	0.60 ± 0.20	—	—	—	—	0.9 ± 0.6
B04&B09SL-032-01	1.0 ± 0.3	1.50 ± 0.18	0.7 ± 0.4	1.1 ± 0.2	1.3 ± 0.3	1.3 ± 0.3	1.1 ± 0.2	1.1 ± 0.2	1.5 ± 0.3	1.6 ± 0.3	0.06 ± 0.05	0.2 ± 0.2	1.7 ± 0.3	2.4 ± 1.0
B04&B09SL-032-02	—	0.30 ± 0.14	—	0.17 ± 0.13	—	—	—	0.17 ± 0.13	0.28 ± 0.14	—	—	0.08 ± 0.17	—	0.7 ± 0.4
B04&B09SL-033-01	—	—	—	—	—	—	—	—	0.57 ± 0.17	—	—	—	—	0.8 ± 0.5
B04&B09SL-033-02	1.4 ± 0.3	—	1.0 ± 0.3	—	1.23 ± 0.18	1.26 ± 0.19	1.18 ± 0.18	—	1.3 ± 0.2	0.74 ± 0.14	0.03 ± 0.03	—	0.98 ± 0.16	1.7 ± 0.7
B04&B09SL-034-01	—	—	—	—	1.1 ± 0.2	0.81 ± 0.20	0.9 ± 0.2	—	1.3 ± 0.2	4.0 ± 0.5	0.11 ± 0.07	—	4.4 ± 0.6	4.4 ± 0.9
B04&B09SL-035-01	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	1.1 ± 0.8
B04&B09SL-035-02	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	1.4 ± 0.6
B04&B09SL-036-01	—	—	—	—	—	—	—	—	0.48 ± 0.16	—	—	—	—	1.0 ± 0.5
B04&B09SL-036-02	1.8 ± 0.3	1.29 ± 0.18	1.0 ± 0.4	1.4 ± 0.2	1.2 ± 0.3	1.4 ± 0.3	1.2 ± 0.2	1.4 ± 0.2	1.42 ± 0.20	1.5 ± 0.3	0.03 ± 0.04	0.14 ± 0.18	1.5 ± 0.3	3.1 ± 0.8
B04&B09SL-037-01	—	1.3 ± 0.2	—	0.9 ± 0.3	—	—	—	0.9 ± 0.3	1.4 ± 0.3	—	—	0.2 ± 0.3	—	1.9 ± 0.7
B04&B09SL-037-02	—	—	—	—	—	—	—	—	0.91 ± 0.19	—	—	—	—	1.2 ± 0.6
B04&B09SL-038-01	—	—	—	—	—	—	—	—	0.91 ± 0.19	—	—	—	—	1.2 ± 0.6
B04&B09SL-038-02	—	—	—	—	1.2 ± 0.3	1.6 ± 0.3	1.2 ± 0.3	—	1.4 ± 0.2	1.0 ± 0.2	0.000 ± 0.010	—	0.9 ± 0.2	1.5 ± 0.7

TABLE 4-37
COPC CONCENTRATIONS IN BUILDING 4 AND 9 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B04&B09SL-038-03	—	0.9 ± 0.2	—	0.9 ± 0.3	1.2 ± 0.3	1.5 ± 0.3	1.2 ± 0.3	0.9 ± 0.3	1.5 ± 0.2	0.81 ± 0.19	0.02 ± 0.03	0.3 ± 0.3	0.9 ± 0.2	2.6 ± 0.7
B04&B09SL-039-01	—	—	—	—	—	—	—	—	0.92 ± 0.18	—	—	—	—	2.7 ± 0.8
B04&B09SL-039-06	—	—	—	—	—	—	—	—	1.06 ± 0.19	—	—	—	—	1.3 ± 0.7
B04&B09SL-040-01	—	2.1 ± 0.3	—	0.7 ± 0.3	—	—	—	0.7 ± 0.3	1.3 ± 0.2	—	—	0.0 ± 1.2	—	2.9 ± 0.8
B04&B09SL-040-02	—	—	—	—	—	—	—	—	0.94 ± 0.19	—	—	—	—	1.6 ± 0.8
B04&B09SL-041-01	—	—	—	—	—	—	—	—	1.10 ± 0.20	—	—	—	—	2.0 ± 1.0
B04&B09SL-041-02	—	—	—	—	—	—	—	—	0.91 ± 0.17	—	—	—	—	1.4 ± 0.6
B04&B09SL-041-03	—	—	—	—	—	—	—	—	0.89 ± 0.18	—	—	—	—	1.0 ± 0.6
B04&B09SL-041-04	—	—	—	—	—	—	—	—	0.82 ± 0.20	—	—	—	—	1.3 ± 0.6
B04&B09SL-301-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	2.9 ± 0.6
B04&B09SL-301-02	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	2.4 ± 0.7
B04&B09SL-302-01	—	—	—	—	—	—	—	—	0.6 ± 0.3	—	—	—	—	2.5 ± 1.1
B04&B09SL-302-02	—	—	—	—	—	—	—	—	1.2 ± 0.3	—	—	—	—	3.2 ± 1.3
B04&B09SL-302-05	—	—	—	—	—	—	—	—	0.35 ± 0.16	—	—	—	—	0.8 ± 0.5
B04&B09SL-303-01	—	—	—	—	—	—	—	—	0.7 ± 0.3	—	—	—	—	1.3 ± 0.8
B04&B09SL-303-02	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	0.8 ± 0.7

TABLE 4-37
COPC CONCENTRATIONS IN BUILDING 4 AND 9 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B04&B09SL-304-01	—	—	—	—	—	—	—	—	0.8 ± 0.3	—	—	—	—	3.7 ± 0.9
B04&B09SL-304-02	—	—	—	—	—	—	—	—	1.2 ± 0.3	—	—	—	—	3.0 ± 1.2
B04&B09SL-304-06	—	—	—	—	—	—	—	—	1.1 ± 0.3	—	—	—	—	2.6 ± 1.0
B04&B09SL-305-02	—	—	—	—	—	—	—	—	1.6 ± 0.3	—	—	—	—	3.1 ± 1.3
B04&B09SL-305-03	—	—	—	—	—	—	—	—	0.51 ± 0.20	—	—	—	—	2.0 ± 0.9

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-38
SOR FOR BUILDING 4 AND 9 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
B04&B09SL-001-01	—	1.1 ± 0.4
B04&B09SL-001-02	—	1.0 ± 0.4
B04&B09SL-002-01	—	0.6 ± 0.4
B04&B09SL-002-02	—	0.6 ± 0.4
B04&B09SL-003-01	—	0
B04&B09SL-004-01	—	0
B04&B09SL-005-01	—	1.1 ± 0.5
B04&B09SL-006-01	—	1.3 ± 0.4
B04&B09SL-006-02	—	1.0 ± 0.4
B04&B09SL-007-01	—	0.7 ± 0.5
B04&B09SL-007-05	—	0.9 ± 0.5
B04&B09SL-008-03	—	0
B04&B09SL-009-01	—	1.4 ± 0.5
B04&B09SL-009-02	0.59 ± 0.20	1.5 ± 0.5
B04&B09SL-009-06	—	0.5 ± 0.4
B04&B09SL-010-01	—	0.8 ± 0.4
B04&B09SL-010-05	—	1.2 ± 0.4
B04&B09SL-011-01	—	1.3 ± 0.5
B04&B09SL-012-01	—	0.7 ± 0.4
B04&B09SL-012-02	—	0.6 ± 0.5
B04&B09SL-013-01	—	0.9 ± 0.4
B04&B09SL-014-01	—	1.4 ± 0.4
B04&B09SL-015-02	0.86 ± 0.15	1.4 ± 0.4
B04&B09SL-016-01	—	0
B04&B09SL-017-02	1.16 ± 0.10	1.06 ± 0.18
B04&B09SL-018-02	0.8 ± 0.3	2.7 ± 0.6
B04&B09SL-019-07	—	0
B04&B09SL-020-01	0.7 ± 0.3	2.0 ± 0.6
B04&B09SL-020-02	—	0.8 ± 0.4
B04&B09SL-021-01	—	0.4 ± 0.5
B04&B09SL-021-05	—	0.4 ± 0.4
B04&B09SL-022-01	—	0.6 ± 0.4
B04&B09SL-022-05	—	0.6 ± 0.4
B04&B09SL-023-01	—	0
B04&B09SL-024-01	—	1.9 ± 0.5
B04&B09SL-025-01	—	0
B04&B09SL-025-02	1.2 ± 0.3	1.6 ± 0.7
B04&B09SL-026-02	—	0.25 ± 0.10
B04&B09SL-026-05	—	0.35 ± 0.15
B04&B09SL-026-06	—	0
B04&B09SL-027-01	1.1 ± 0.3	2.1 ± 0.4
B04&B09SL-027-02	—	0.5 ± 0.4
B04&B09SL-028-01	—	0.39 ± 0.12
B04&B09SL-029-01	—	0.8 ± 0.3
B04&B09SL-029-05	—	0.8 ± 0.4
B04&B09SL-030-01	1.27 ± 0.11	1.8 ± 0.3
B04&B09SL-030-02	—	0
B04&B09SL-031-01	—	1.6 ± 0.5
B04&B09SL-031-05	—	0
B04&B09SL-032-01	0.5 ± 0.3	2.0 ± 0.7
B04&B09SL-032-02	—	0
B04&B09SL-033-01	—	0
B04&B09SL-033-02	0.55 ± 0.20	1.3 ± 0.4
B04&B09SL-034-01	0.53 ± 0.06	2.0 ± 0.5
B04&B09SL-035-01	—	0.3 ± 0.4
B04&B09SL-035-02	—	1.2 ± 0.4
B04&B09SL-036-01	—	0
B04&B09SL-036-02	0.7 ± 0.3	2.0 ± 0.4
B04&B09SL-037-01	—	1.7 ± 0.5
B04&B09SL-037-02	—	0.6 ± 0.4
B04&B09SL-038-01	—	0.6 ± 0.4
B04&B09SL-038-02	0.7 ± 0.3	1.5 ± 0.5
B04&B09SL-038-03	0.6 ± 0.3	2.1 ± 0.5
B04&B09SL-039-01	—	0.9 ± 0.4
B04&B09SL-039-06	—	0.9 ± 0.4
B04&B09SL-040-01	—	1.8 ± 0.5
B04&B09SL-040-02	—	0.6 ± 0.4
B04&B09SL-041-01	—	1.0 ± 0.4
B04&B09SL-041-02	—	0.6 ± 0.3
B04&B09SL-041-03	—	0.6 ± 0.4
B04&B09SL-041-04	—	0.4 ± 0.4
B04&B09SL-301-01	—	0.32 ± 0.09
B04&B09SL-301-02	—	0.8 ± 0.5
B04&B09SL-302-01	—	0.26 ± 0.17
B04&B09SL-302-02	—	1.6 ± 0.6
B04&B09SL-302-05	—	0
B04&B09SL-303-01	—	0
B04&B09SL-303-02	—	0.4 ± 0.4
B04&B09SL-304-01	—	0.9 ± 0.5
B04&B09SL-304-02	—	1.4 ± 0.7
B04&B09SL-304-06	—	1.3 ± 0.6
B04&B09SL-305-02	—	2.4 ± 0.7
B04&B09SL-305-03	—	0

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha spectroscopy and gamma spectroscopy SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-39
COPC CONCENTRATIONS IN BUILDING 4 AND 9 SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)[b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A08-B04&B09-SW-001	0.17 ± 0.13	0.3 ± 0.6	0.04 ± 0.06	0.06 ± 0.06	0.02 ± 0.03	0.6 ± 0.2	0.10 ± 0.11	0.43 ± 0.19
A08-B04&B09-SW-002	0.12 ± 0.12	0.6 ± 0.5	0.10 ± 0.06	0.09 ± 0.05	0.05 ± 0.04	2.5 ± 0.5	0.10 ± 0.11	2.7 ± 0.6
A08-B04&B09-SW-003	0.09 ± 0.11	0.2 ± 0.4	0.07 ± 0.08	0.30 ± 0.12	-0.02 ± 0.05	4.8 ± 0.9	0.23 ± 0.16	8.9 ± 1.4
A08-B04&B09-SW-004	0.04 ± 0.14	-0.3 ± 0.9	0.11 ± 0.07	0.05 ± 0.06	-0.01 ± 0.03	0.4 ± 0.2	0.02 ± 0.06	0.6 ± 0.2
A08-B04&B09-SW-005	-0.04 ± 0.09	0.6 ± 0.5	0.09 ± 0.06	0.07 ± 0.05	-0.02 ± 0.04	1.7 ± 0.4	0.12 ± 0.12	1.4 ± 0.4

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-40
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS
IN BUILDINGS 4 AND 9 SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration[b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A08-B04&B09-SW-001	0.4 ± 0.6	1.3 ± 0.6
A08-B04&B09-SW-002	0.7 ± 0.5	8.1 ± 1.7
A08-B04&B09-SW-003	0.3 ± 0.4	27 ± 4
A08-B04&B09-SW-004	-0.3 ± 0.9	1.7 ± 0.7
A08-B04&B09-SW-005	0.6 ± 0.5	4.3 ± 1.1

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-41
COPC CONCENTRATIONS IN BUILDING 4 AND 9 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A08-B04&B09-SD-001	0.43 ± 0.16	0.26 ± 0.11	0.5 ± 0.4	0.22 ± 0.14	0.35 ± 0.09	0.31 ± 0.09	0.25 ± 0.08	0.22 ± 0.14	—	6.9 ± 0.7	0.28 ± 0.09	0.4 ± 0.2	7.3 ± 0.7	—
A08-B04&B09-SD-002	0.56 ± 0.17	0.34 ± 0.12	0.4 ± 0.3	0.11 ± 0.17	0.29 ± 0.09	0.36 ± 0.09	0.23 ± 0.07	0.11 ± 0.17	—	5.7 ± 0.6	0.31 ± 0.09	0.7 ± 0.3	6.5 ± 0.7	—
A08-B04&B09-SD-003	0.47 ± 0.16	0.10 ± 0.16	0.6 ± 0.4	0.2 ± 0.2	0.28 ± 0.13	0.45 ± 0.16	0.19 ± 0.10	0.2 ± 0.2	—	18 ± 2	0.8 ± 0.2	1.2 ± 0.5	21 ± 3	—
A08-B04&B09-SD-004	0.26 ± 0.13	0.11 ± 0.10	0.2 ± 0.4	0.09 ± 0.18	0.22 ± 0.10	0.23 ± 0.10	0.13 ± 0.08	0.09 ± 0.18	—	4.0 ± 0.6	0.22 ± 0.11	0.3 ± 0.2	4.5 ± 0.7	—
A08-B04&B09-SD-005	0.46 ± 0.17	0.05 ± 0.17	0.2 ± 0.4	0.3 ± 0.4	0.16 ± 0.10	0.32 ± 0.13	0.15 ± 0.09	0.3 ± 0.4	—	14.8 ± 1.9	0.8 ± 0.2	1.0 ± 0.4	17 ± 2	—

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-42
SOR FOR BUILDING 4 AND 9 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-B04&B09-SD-001	0.95 ± 0.08
A08-B04&B09-SD-002	0.80 ± 0.07
A08-B04&B09-SD-003	2.9 ± 0.3
A08-B04&B09-SD-004	0.53 ± 0.07
A08-B04&B09-SD-005	2.3 ± 0.2

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha spectroscopy laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-43
COPC CONCENTRATIONS IN BUILDING 5 BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Matrix	Concentration (pCi/g)[b]												
		^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U
		GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha
B05-BM-001	Concrete	0.40 ± 0.16	0.46 ± 0.12	0.1 ± 0.4	0.41 ± 0.17	0.35 ± 0.13	0.67 ± 0.19	0.34 ± 0.13	0.41 ± 0.17	—	0.47 ± 0.15	0.04 ± 0.05	0.07 ± 0.13	0.40 ± 0.14
B05-BM-002	Brick	1.2 ± 0.3	1.0 ± 0.2	0.8 ± 0.4	1.0 ± 0.3	1.1 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	1.0 ± 0.3	—	0.78 ± 0.20	0.04 ± 0.05	-0.1 ± 1.2	0.80 ± 0.20

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, On-site denotes On Site Gamma Spectroscopy

TABLE 4-44
RADIONUCLIDE CONCENTRATIONS IN BUILDING 6 BUILDING MATERIALS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]											
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th		^{234}U	^{235}U		^{238}U
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Alpha	Alpha	Gamma	Alpha
Brick												
B06-BM-001	1.18 ± 0.19	1.27 ± 0.16	0.9 ± 0.3	1.8 ± 0.2	1.5 ± 0.4	1.4 ± 0.3	1.4 ± 0.3	1.8 ± 0.2	1.4 ± 0.3	0.08 ± 0.07	0.1 ± 0.3	1.4 ± 0.3
B06-BM-002	1.34 ± 0.20	1.40 ± 0.18	1.1 ± 0.3	1.3 ± 0.2	1.3 ± 0.4	1.0 ± 0.3	1.3 ± 0.3	1.3 ± 0.2	1.4 ± 0.3	0.08 ± 0.07	0.1 ± 0.4	1.1 ± 0.3
B06-BM-003	-0.03 ± 0.11	0.2 ± 0.4	-0.3 ± 0.4	-0.3 ± 1.0	0.13 ± 0.08	0.15 ± 0.08	0.12 ± 0.08	-0.3 ± 1.0	4.9 ± 0.7	0.20 ± 0.10	0.6 ± 0.7	5.0 ± 0.7
B06-BM-005	2.2 ± 0.4	2.5 ± 0.3	1.3 ± 0.5	1.5 ± 0.4	1.7 ± 0.4	2.2 ± 0.5	1.7 ± 0.4	1.5 ± 0.4	3.8 ± 0.7	0.19 ± 0.12	0.2 ± 0.4	4.0 ± 0.7
Metal												
B06-BM-004	-0.02 ± 0.09	0.0 ± 2.0	-0.1 ± 0.3	0.00 ± 0.14	0.08 ± 0.07	0.18 ± 0.10	0.01 ± 0.03	0.00 ± 0.14	1.0 ± 0.2	0.06 ± 0.06	0.03 ± 0.11	0.9 ± 0.2
Wood												
B06-BM-006	-0.2 ± 0.2	-0.1 ± 0.9	-0.7 ± 0.8	-1 ± 18	0.07 ± 0.07	0.12 ± 0.09	0.04 ± 0.06	-1 ± 18	4.0 ± 0.7	0.21 ± 0.13	0.2 ± 1.5	4.5 ± 0.8

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy

TABLE 4-45
COPC CONCENTRATIONS IN BUILDING 6 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a] [b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
B06SL-003-01	0.52 ± 0.18	—	0.9 ± 0.3	—	0.52 ± 0.17	0.45 ± 0.15	0.31 ± 0.12	—	0.31 ± 0.15	8.7 ± 0.9	0.48 ± 0.16	—	10.4 ± 1.1	8.8 ± 1.4
B06SL-004-01	—	—	—	—	—	—	—	—	0.15 ± 0.12	—	—	—	—	4.4 ± 0.9
B06SL-005-01	0.7 ± 0.2	—	0.5 ± 0.3	—	0.8 ± 0.2	0.62 ± 0.19	0.54 ± 0.18	—	0.43 ± 0.16	66 ± 6	3.1 ± 0.6	—	68 ± 6	43 ± 2
B06SL-010-01	—	—	—	—	—	—	—	—	0.48 ± 0.20	—	—	—	—	1.1 ± 0.5
B06SL-011-01	—	—	—	—	—	—	—	—	0.94 ± 0.18	—	—	—	—	2.0 ± 0.6
B06SL-021-01	3.6 ± 0.5	0.4 ± 0.3	16.3 ± 1.5	22.9 ± 1.6	23 ± 2	2.0 ± 0.3	22 ± 2	22.9 ± 1.6	22.3 ± 0.9	12.3 ± 1.3	0.57 ± 0.18	0.6 ± 0.9	13.1 ± 1.3	11 ± 2
B06SL-023-01	—	—	—	—	—	—	—	—	0.44 ± 0.14	—	—	—	—	1.1 ± 0.6
B06SL-301-01	—	—	—	—	—	—	—	—	0.38 ± 0.15	—	—	—	—	0.8 ± 0.7
B06SL-702-01	—	—	—	—	—	—	—	—	0.5 ± 0.3	—	—	—	—	46 ± 4
B06SL-707-01	—	—	—	—	—	—	—	—	0.41 ± 0.19	—	—	—	—	36 ± 3
B06SL-708-01	—	—	—	—	—	—	—	—	1.5 ± 0.2	—	—	—	—	45 ± 3
B06SL-709-01	—	—	—	—	—	—	—	—	0.23 ± 0.19	—	—	—	—	17 ± 3
B06SL-717-01	—	—	—	—	—	—	—	—	0.9 ± 0.3	—	—	—	—	19 ± 2

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] "-700-" series sample IDs are "detritus" samples.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-46
SOR FOR BUILDING 6 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
B06SL-003-01	1.30 ± 0.11	1.2 ± 0.2
B06SL-004-01	—	0.55 ± 0.15
B06SL-005-01	10.2 ± 0.6	6.5 ± 0.4
B06SL-010-01	—	0
B06SL-011-01	—	0.6 ± 0.4
B06SL-021-01	46 ± 4	45.6 ± 1.8
B06SL-023-01	—	0
B06SL-301-01	—	0
B06SL-702-01	—	7.0 ± 0.7
B06SL-707-01	—	5.4 ± 0.5
B06SL-708-01	—	8.5 ± 0.6
B06SL-709-01	—	2.5 ± 0.4
B06SL-717-01	—	3.4 ± 0.6

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha spectroscopy and gamma spectroscopy SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-47
COPC CONCENTRATIONS IN BUILDING 6 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B06SL-001-01	—	—	—	—	—	—	—	—	0.46 ± 0.20	—	—	—	—	1.8 ± 0.6
B06SL-001-02	—	—	—	—	—	—	—	—	0.82 ± 0.16	—	—	—	—	0.6 ± 0.4
B06SL-002-01	—	—	—	—	—	—	—	—	0.74 ± 0.16	—	—	—	—	2.1 ± 0.8
B06SL-002-02	—	—	—	—	—	—	—	—	1.04 ± 0.19	—	—	—	—	1.8 ± 0.6
B06SL-003-03	—	—	—	—	—	—	—	—	0.71 ± 0.20	—	—	—	—	1.6 ± 0.5
B06SL-004-05	—	—	—	—	0.58 ± 0.17	0.62 ± 0.19	0.67 ± 0.18	—	0.50 ± 0.15	31 ± 3	1.7 ± 0.4	—	33 ± 3	27.8 ± 1.7
B06SL-005-03	—	—	—	—	—	—	—	—	0.63 ± 0.14	—	—	—	—	1.2 ± 0.5
B06SL-006-01	—	—	—	—	0.73 ± 0.20	0.77 ± 0.20	0.70 ± 0.19	—	0.57 ± 0.16	10.3 ± 1.1	0.57 ± 0.18	—	13.8 ± 1.4	14.4 ± 1.7
B06SL-006-02	0.85 ± 0.20	—	1.5 ± 0.4	—	1.4 ± 0.3	0.9 ± 0.2	1.4 ± 0.3	—	1.43 ± 0.19	82 ± 7	4.4 ± 0.8	—	107 ± 9	67 ± 3
B06SL-007-01	—	—	—	—	—	—	—	—	0.41 ± 0.16	—	—	—	—	2.0 ± 0.7
B06SL-007-02	—	—	—	—	—	—	—	—	1.26 ± 0.18	—	—	—	—	2.3 ± 0.7
B06SL-008-01	—	—	—	—	—	—	—	—	0.19 ± 0.15	—	—	—	—	1.6 ± 0.4
B06SL-008-14	—	—	—	—	—	—	—	—	0.93 ± 0.17	—	—	—	—	1.6 ± 0.5
B06SL-009-01	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	2.1 ± 0.8
B06SL-009-06	—	—	—	—	—	—	—	—	0.99 ± 0.18	—	—	—	—	1.3 ± 0.6
B06SL-010-02	—	—	—	—	—	—	—	—	0.31 ± 0.20	—	—	—	—	0 ± 186
B06SL-011-02	—	—	—	—	—	—	—	—	0.95 ± 0.20	—	—	—	—	2.3 ± 0.7
B06SL-011-05	1.0 ± 0.3	—	1.2 ± 0.3	—	1.9 ± 0.4	1.0 ± 0.3	1.7 ± 0.3	—	1.7 ± 0.3	55 ± 5	3.4 ± 0.6	—	34 ± 3	28 ± 2
B06SL-012-01	—	—	—	—	—	—	—	—	0.69 ± 0.14	—	—	—	—	1.6 ± 0.6

TABLE 4-47
COPC CONCENTRATIONS IN BUILDING 6 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B06SL-012-06	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	2.0 ± 0.6
B06SL-013-01	—	—	—	—	—	—	—	—	0.36 ± 0.13	—	—	—	—	1.4 ± 0.5
B06SL-013-02	—	0.33 ± 0.14	—	0.27 ± 0.15	—	—	—	0.27 ± 0.15	0.32 ± 0.12	—	—	0.1 ± 0.2	—	0.6 ± 0.4
B06SL-014-01	—	—	—	—	—	—	—	—	0.46 ± 0.16	—	—	—	—	0.9 ± 0.5
B06SL-014-05	—	—	—	—	—	—	—	—	0.83 ± 0.16	—	—	—	—	1.0 ± 0.7
B06SL-015-01	—	—	—	—	—	—	—	—	0.28 ± 0.11	—	—	—	—	0.06 ± 0.06
B06SL-015-06	—	—	—	—	—	—	—	—	0.94 ± 0.19	—	—	—	—	1.2 ± 0.6
B06SL-016-01	—	—	—	—	—	—	—	—	0.49 ± 0.16	—	—	—	—	4.1 ± 0.9
B06SL-016-05	—	—	—	—	—	—	—	—	0.48 ± 0.18	—	—	—	—	4.9 ± 1.5
B06SL-017-01	—	—	—	—	—	—	—	—	0.47 ± 0.13	—	—	—	—	2.4 ± 0.6
B06SL-017-02	—	—	—	—	—	—	—	—	0.38 ± 0.15	—	—	—	—	0.6 ± 0.8
B06SL-018-01	—	—	—	—	—	—	—	—	0.55 ± 0.16	—	—	—	—	2.2 ± 0.6
B06SL-019-01	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	1.5 ± 0.4
B06SL-020-01	—	—	—	—	—	—	—	—	0.34 ± 0.13	—	—	—	—	1.5 ± 0.6
B06SL-020-02	—	—	—	—	—	—	—	—	0.39 ± 0.16	—	—	—	—	2.2 ± 0.6
B06SL-021-05	3.4 ± 0.3	0.4 ± 0.4	13.5 ± 0.9	17.6 ± 1.7	21.5 ± 2.0	2.5 ± 0.6	19.5 ± 1.9	17.6 ± 1.7	18.5 ± 0.8	9.5 ± 0.7	0.49 ± 0.12	0.5 ± 1.0	10.7 ± 0.8	8.6 ± 1.8
B06SL-021-06	—	—	—	—	3.3 ± 0.5	1.0 ± 0.2	3.6 ± 0.5	—	3.1 ± 0.3	1.7 ± 0.3	0.11 ± 0.08	—	1.9 ± 0.3	2.2 ± 1.3
B06SL-021-07	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	0.9 ± 0.8
B06SL-022-01	—	—	—	—	—	—	—	—	0.52 ± 0.15	—	—	—	—	3.2 ± 0.9

TABLE 4-47
COPC CONCENTRATIONS IN BUILDING 6 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B06SL-022-06	—	—	—	—	—	—	—	—	1.17 ± 0.17	—	—	—	—	3.5 ± 0.7
B06SL-023-03	—	—	—	—	—	—	—	—	0.65 ± 0.15	—	—	—	—	1.7 ± 0.6
B06SL-024-01	—	—	—	—	1.6 ± 0.3	0.71 ± 0.19	1.5 ± 0.3	—	1.6 ± 0.3	11.7 ± 1.2	0.53 ± 0.18	—	12.8 ± 1.3	10.1 ± 1.9
B06SL-024-04	—	—	—	—	—	—	—	—	0.79 ± 0.18	—	—	—	—	1.2 ± 1.0
B06SL-301-02	—	—	—	—	—	—	—	—	0.4 ± 0.2	—	—	—	—	0.4 ± 0.5
B06SL-302-01	—	—	—	—	—	—	—	—	0.30 ± 0.17	—	—	—	—	1.5 ± 0.6

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] "-700-" series sample IDs are "detritus" samples.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-48
SOR FOR BUILDING 6 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
B06SL-001-01	—	0
B06SL-001-02	—	0.4 ± 0.3
B06SL-002-01	—	0.2 ± 0.3
B06SL-002-02	—	0.9 ± 0.4
B06SL-003-03	—	0
B06SL-004-05	4.8 ± 0.3	4.2 ± 0.3
B06SL-005-03	—	0
B06SL-006-01	1.69 ± 0.13	2.1 ± 0.3
B06SL-006-02	15.1 ± 0.9	11.8 ± 0.5
B06SL-007-01	—	0
B06SL-007-02	—	1.5 ± 0.4
B06SL-008-01	—	0
B06SL-008-14	—	0.6 ± 0.3
B06SL-009-01	—	0.6 ± 0.5
B06SL-009-06	—	0.7 ± 0.4
B06SL-010-02	—	0
B06SL-011-02	—	0.9 ± 0.4
B06SL-011-05	8.0 ± 0.6	6.3 ± 0.6
B06SL-012-01	—	0
B06SL-012-06	—	0.5 ± 0.5
B06SL-013-01	—	0
B06SL-013-02	—	0
B06SL-014-01	—	0
B06SL-014-05	—	0.4 ± 0.3
B06SL-015-01	—	0
B06SL-015-06	—	0.6 ± 0.4
B06SL-016-01	—	0.51 ± 0.15
B06SL-016-05	—	0.6 ± 0.2
B06SL-017-01	—	0.25 ± 0.09
B06SL-017-02	—	0
B06SL-018-01	—	0.22 ± 0.09
B06SL-019-01	—	0
B06SL-020-01	—	0
B06SL-020-02	—	0.22 ± 0.10
B06SL-021-05	24 ± 2	37.4 ± 1.7
B06SL-021-06	3.1 ± 0.5	5.3 ± 0.6
B06SL-021-07	—	1.4 ± 0.4
B06SL-022-01	—	0.37 ± 0.15
B06SL-022-06	—	1.5 ± 0.4
B06SL-023-03	—	0
B06SL-024-01	2.5 ± 0.3	3.5 ± 0.7
B06SL-024-04	—	0.3 ± 0.4
B06SL-301-02	—	0
B06SL-302-01	—	0

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-49
COPC CONCENTRATIONS IN BUILDING 6 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A08-B6-SD-001	0.68 ± 0.14	0.41 ± 0.13	1.3 ± 0.3	1.7 ± 0.3	2.1 ± 0.3	0.72 ± 0.15	2.0 ± 0.3	1.7 ± 0.3	—	49 ± 5	2.6 ± 0.9	3.0 ± 0.5	51 ± 5	—
A08-B6-SD-002	0.55 ± 0.10	0.21 ± 0.07	0.42 ± 0.16	0.31 ± 0.11	1.1 ± 0.3	0.67 ± 0.20	0.9 ± 0.2	0.31 ± 0.11	—	42 ± 7	2.2 ± 1.1	0.63 ± 0.18	42 ± 6	—

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-50
SOR FOR BUILDING 6 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-B6-SD-001	10.0 ± 0.8
A08-B6-SD-002	2.4 ± 0.2

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha spectroscopy laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-51
COPC CONCENTRATIONS IN BUILDING 8 BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Matrix	Concentration (pCi/g)[c]											
		^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th		^{234}U	^{235}U		^{238}U
		GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Alpha	Alpha	Gamma	Alpha
B08-BM-001	Concrete	0.49 ± 0.19	0.54 ± 0.16	0.1 ± 0.3	0.07 ± 0.20	0.37 ± 0.13	0.46 ± 0.15	0.23 ± 0.10	0.07 ± 0.20	5.9 ± 0.9	0.31 ± 0.14	0.3 ± 0.3	6.4 ± 0.9
B08-BM-002	Brick	1.0 ± 0.3	1.3 ± 0.3	1.1 ± 0.5	1.5 ± 0.3	1.3 ± 0.4	1.2 ± 0.3	1.3 ± 0.4	1.5 ± 0.3	3.1 ± 0.6	0.17 ± 0.11	0.2 ± 0.4	3.4 ± 0.6

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-52
COPC CONCENTRATIONS IN BUILDING 8 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B08SL-002-01	—	—	—	—	—	—	—	—	0.24 ± 0.13	—	—	—	—	17.9 ± 1.7
B08SL-003-01	1.0 ± 0.2	0.7 ± 0.3	2.8 ± 0.5	1.1 ± 0.5	1.5 ± 0.2	2.3 ± 0.3	1.5 ± 0.5	1.1 ± 0.5	1.2 ± 0.6	3226 ± 228	168 ± 31	98 ± 14	3232 ± 230	1944 ± 19
B08SL-004-01	—	—	—	—	—	—	—	—	1.06 ± 0.19	—	—	—	—	8.8 ± 1.0
B08SL-005-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	3.9 ± 1.1
B08SL-010-01	—	—	—	—	—	—	—	—	0.41 ± 0.14	—	—	—	—	15.4 ± 1.6
B08SL-011-01	—	—	—	—	—	—	—	—	0.42 ± 0.15	—	—	—	—	3.0 ± 0.7
B08SL-023-01	—	0.9 ± 0.4	—	5.3 ± 0.6	5.1 ± 0.5	1.27 ± 0.19	4.5 ± 0.8	5.3 ± 0.6	5.2 ± 0.4	166 ± 22	13 ± 5	8 ± 2	281 ± 32	232 ± 6
B08SL-026-01	—	—	—	—	—	—	—	—	3.2 ± 0.3	—	—	—	—	81 ± 3
B08SL-028-01	—	—	—	—	—	—	—	—	0.63 ± 0.20	—	—	—	—	13.2 ± 2.0
B08SL-301-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	28.5 ± 2.0
B08SL-725-01	—	—	—	—	—	—	—	—	0.6 ± 0.3	—	—	—	—	18 ± 2

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] "-700-" series sample IDs are "detritus" samples.

TABLE 4-53
SOR FOR BUILDING 8 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
B08SL-002-01	—	2.6 ± 0.3
B08SL-003-01	502 ± 24	300 ± 3
B08SL-004-01	—	2.1 ± 0.4
B08SL-005-01	—	0.48 ± 0.17
B08SL-010-01	—	2.2 ± 0.2
B08SL-011-01	—	0.34 ± 0.11
B08SL-023-01	42 ± 3	44.9 ± 1.2
B08SL-026-01	—	17.5 ± 0.8
B08SL-028-01	—	1.9 ± 0.3
B08SL-301-01	—	4.3 ± 0.3
B08SL-725-01	—	2.6 ± 0.3

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-54
ICP-MS RESULTS FOR URANIUM ISOTOPES FOR BUILDING 8 SURFACE SOIL SAMPLE
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
						Natural uranium [c]	—	0.0054%	0.7204%	—	99.2742%
						Low enrichment [c]	—	0.0290%	3.4989%	—	96.4722%
						Depleted uranium [c]	—	0.0010%	0.1991%	0.0003%	99.7996%
						Recycled uranium [c]	—	0.0082%	0.9700%	0.0680%	98.9500%
B08SL-003-01	[0.01]	0.55	59	[0.01]	8700	8759	ND	0.0063%	0.67%	ND	99.3%

Notes:
[a] Bracketed numbers are the laboratory reporting limits.
[b] Relative mass abundances were calculated using uranium isotopic data in Table 3-30. "ND" represents samples for which the isotope was not detected above the laboratory reporting limit; these values are assigned a zero value in the calculations.
[c] Traub, RJ. 2006. *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium*. Battelle-TBD-6001 rev. F0, Battelle, Richland, Washington.

TABLE 4-55
COPC CONCENTRATIONS IN BUILDING 8 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B08SL-001-01	—	—	—	—	—	—	—	—	1.5 ± 0.3	—	—	—	—	15.9 ± 1.8
B08SL-001-02	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	1.5 ± 0.7
B08SL-002-02	—	—	—	—	—	—	—	—	0.80 ± 0.18	—	—	—	—	28 ± 2
B08SL-003-05	1.3 ± 0.3	1.0 ± 0.3	1.1 ± 0.3	0.4 ± 0.3	1.2 ± 0.3	1.5 ± 0.3	1.1 ± 0.3	0.4 ± 0.3	0.6 ± 0.3	926 ± 65	44 ± 8	23 ± 2	944 ± 66	530 ± 10
B08SL-004-02	—	—	—	—	—	—	—	—	0.59 ± 0.17	—	—	—	—	2.0 ± 0.6
B08SL-005-02	—	—	—	—	—	—	—	—	1.05 ± 0.19	—	—	—	—	1.4 ± 0.7
B08SL-006-01	—	—	—	—	—	—	—	—	0.36 ± 0.16	—	—	—	—	4.5 ± 1.2
B08SL-006-02	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	4.4 ± 1.0
B08SL-007-01	—	—	—	—	—	—	—	—	0.73 ± 0.17	—	—	—	—	9.8 ± 1.2
B08SL-007-02	—	—	—	—	—	—	—	—	0.92 ± 0.19	—	—	—	—	4.6 ± 1.5
B08SL-008-01	—	—	—	—	—	—	—	—	0.36 ± 0.16	—	—	—	—	11.7 ± 1.5
B08SL-008-02	—	—	—	—	—	—	—	—	0.77 ± 0.20	—	—	—	—	5.6 ± 1.2
B08SL-009-01	—	—	—	—	—	—	—	—	0.50 ± 0.17	—	—	—	—	11.0 ± 1.5
B08SL-009-02	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	7.6 ± 1.3
B08SL-010-02	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	2.7 ± 1.0
B08SL-011-03	—	—	—	—	—	—	—	—	1.1 ± 0.3	—	—	—	—	1.9 ± 0.9
B08SL-012-02	—	0.80 ± 0.20	—	1.0 ± 0.3	—	—	—	1.0 ± 0.3	1.3 ± 0.3	—	—	0.4 ± 0.4	—	4.0 ± 1.0
B08SL-013-01	—	—	—	—	—	—	—	—	1.00 ± 0.19	—	—	—	—	2.6 ± 1.1

TABLE 4-55
COPC CONCENTRATIONS IN BUILDING 8 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B08SL-013-02	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	2.4 ± 0.8
B08SL-014-01	0.57 ± 0.20	0.22 ± 0.16	1.6 ± 0.4	1.2 ± 0.3	1.6 ± 0.3	0.9 ± 0.2	1.7 ± 0.3	1.2 ± 0.3	1.1 ± 0.3	421 ± 45	22 ± 7	12 .3± 1.1	471 ± 49	225 ± 6
B08SL-014-05	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	90 ± 4
B08SL-015-01	—	–0.03 ± 0.16	—	0.62 ± 0.18	0.8 ± 0.2	0.8 ± 0.2	0.74 ± 0.20	0.62 ± 0.18	0.5 ± 0.3	524 ± 57	35 ± 11	22.7 ± 1.3	601 ± 64	369 ± 8
B08SL-015-09	0.59 ± 0.18	0.3 ± 0.2	2.5 ± 0.4	1.3 ± 0.5	2.3 ± 0.4	1.3 ± 0.3	2.2 ± 0.3	1.3 ± 0.5	1.3 ± 0.5	1488 ± 113	64 ± 16	47 ± 4	1586 ± 118	1001 ± 12
B08SL-015-10	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	11.3 ± 1.9
B08SL-016-01	—	—	—	—	—	—	—	—	0.15 ± 0.14	—	—	—	—	21.1 ± 1.8
B08SL-016-06	—	—	—	—	—	—	—	—	0.89 ± 0.20	—	—	—	—	4.1 ± 0.7
B08SL-017-01	2.1 ± 0.4	1.3 ± 0.3	11.0 ± 1.1	0.6 ± 0.9	0.61 ± 0.14	8.5 ± 0.7	0.48 ± 0.12	0.6 ± 0.9	1.2 ± 1.2	18514 ± 1236	1022 ± 148	273 ± 17	17919 ± 1196	5417 ± 31
B08SL-017-05	1.5 ± 0.3	0.7 ± 0.4	2.9 ± 0.5	0.6 ± 0.6	1.0 ± 0.3	3.2 ± 0.5	1.0 ± 0.2	0.6 ± 0.6	0.6 ± 0.8	3440 ± 330	191 ± 44	130 ± 9	3330 ± 320	2311 ± 26
B08SL-018-01	—	—	—	—	—	—	—	—	0.43 ± 0.16	—	—	—	—	8.3 ± 1.6
B08SL-018-02	—	—	—	—	—	—	—	—	0.6 ± 0.3	—	—	—	—	2.9 ± 0.8
B08SL-019-01	—	—	—	—	—	—	—	—	0.46 ± 0.15	—	—	—	—	3.1 ± 1.0
B08SL-019-03	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.5 ± 0.8
B08SL-020-01	—	—	—	—	—	—	—	—	1.0 ± 0.3	—	—	—	—	95 ± 4
B08SL-021-01	—	—	—	—	—	—	—	—	0.84 ± 0.18	—	—	—	—	74 ± 4
B08SL-021-06	—	0.24 ± 018	—	0.4 ± 0.3	0.70 ± 0.14	0.90 ± 0.15	0.56 ± 0.12	0.4 ± 0.3	0.6 ± 0.3	310 ± 20	15 ± 3	12.0 ± 1.3	303 ± 20	306 ± 6
B08SL-022-02	—	—	—	—	—	—	—	—	1.4 ± 0.2	—	—	—	—	17.6 ± 1.9

TABLE 4-55
COPC CONCENTRATIONS IN BUILDING 8 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B08SL-023-03	—	1.1 ± 0.3	—	6.6 ± 0.6	7.6 ± 0.9	2.0 ± 0.4	7.1 ± 0.9	6.6 ± 0.6	8.1 ± 0.6	282 ± 32	20 ± 7	10.3 ± 1.0	525 ± 53	338 ± 8
B08SL-023-07	—	—	—	—	—	—	—	—	1.2 ± 0.3	—	—	—	—	57 ± 3
B08SL-023-08	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	17.1 ± 1.8
B08SL-024-01	—	—	—	—	—	—	—	—	0.58 ± 0.20	—	—	—	—	2.7 ± 0.7
B08SL-024-03	—	—	—	—	—	—	—	—	0.89 ± 0.20	—	—	—	—	1.0 ± 0.6
B08SL-025-01	—	—	—	—	—	—	—	—	0.85 ± 0.16	—	—	—	—	1.9 ± 0.7
B08SL-026-02	—	0.12 ± 0.14	—	3.3 ± 0.4	2.2 ± 0.4	0.50 ± 0.17	2.2 ± 0.4	3.3 ± 0.4	3.5 ± 0.4	121 ± 13	4.8 ± 1.9	8.3 ± 1.2	142 ± 15	126 ± 4
B08SL-027-01	—	—	—	—	—	—	—	—	0.77 ± 0.19	—	—	—	—	97 ± 4
B08SL-027-02	—	—	—	—	—	—	—	—	1.07 ± 0.19	—	—	—	—	68 ± 3
B08SL-028-05	—	—	—	—	—	—	—	—	1.6 ± 0.2	—	—	—	—	6.5 ± 1.2
B08SL-028-06	—	—	—	—	—	—	—	—	0.62 ± 0.17	—	—	—	—	1.7 ± 0.5
B08SL-301-02	—	—	—	—	—	—	—	—	0.69 ± 0.19	—	—	—	—	1.6 ± 0.8
B08SL-302-01	—	—	—	—	—	—	—	—	0.6 ± 0.3	—	—	—	—	1.4 ± 0.8
B08SL-302-03	—	—	—	—	—	—	—	—	0.28 ± 0.13	—	—	—	—	4.9 ± 0.9
B08SL-304-01	—	—	—	—	—	—	—	—	23.3 ± 1.2	—	—	—	—	19 ± 4
B08SL-304-06	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	2.2 ± 0.8
B08SL-305-01	—	—	—	—	—	—	—	—	0.29 ± 0.17	—	—	—	—	42 ± 3

TABLE 4-55
COPC CONCENTRATIONS IN BUILDING 8 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-56
SOR FOR BUILDING 8 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
B08SL-001-01	—	4.2 ± 0.6
B08SL-001-02	—	1.5 ± 0.5
B08SL-002-02	—	4.6 ± 0.5
B08SL-003-05	145 ± 7	81.5 ± 1.5
B08SL-004-02	—	0
B08SL-005-02	—	0.9 ± 0.4
B08SL-006-01	—	0.58 ± 0.19
B08SL-006-02	—	1.2 ± 0.5
B08SL-007-01	—	1.6 ± 0.4
B08SL-007-02	—	1.2 ± 0.5
B08SL-008-01	—	1.7 ± 0.2
B08SL-008-02	—	1.0 ± 0.4
B08SL-009-01	—	1.6 ± 0.2
B08SL-009-02	—	2.3 ± 0.5
B08SL-010-02	—	1.0 ± 0.5
B08SL-011-03	—	0.9 ± 0.6
B08SL-012-01	—	2.3 ± 0.3
B08SL-012-02	—	1.9 ± 0.5
B08SL-013-01	—	1.1 ± 0.4
B08SL-013-02	—	0.9 ± 0.5
B08SL-014-01	70 ± 5	35.5 ± 1.1
B08SL-014-05	—	14.0 ± 0.7
B08SL-015-01	88 ± 6	56.6 ± 1.3
B08SL-015-09	237 ± 12	156 ± 2
B08SL-015-10	—	2.1 ± 0.5
B08SL-016-01	—	3.1 ± 0.3
B08SL-016-06	—	1.1 ± 0.4
B08SL-017-01	2836 ± 128	835 ± 5
B08SL-017-05	528 ± 35	356 ± 4
B08SL-018-01	—	1.2 ± 0.2
B08SL-018-02	—	0.32 ± 0.13
B08SL-019-01	—	0.36 ± 0.16
B08SL-019-03	—	0
B08SL-020-01	—	15.3 ± 0.8
B08SL-021-01	—	11.7 ± 0.7
B08SL-021-06	47 ± 2	46.9 ± 0.9
B08SL-022-01	37 ± 3	21.9 ± 0.9
B08SL-022-02	—	4.1 ± 0.5
B08SL-023-03	69 ± 5	67.2 ± 1.6
B08SL-023-07	—	9.8 ± 0.8
B08SL-023-08	—	2.8 ± 0.5
B08SL-024-01	—	0.30 ± 0.11
B08SL-024-03	—	0.5 ± 0.4
B08SL-025-01	—	0.5 ± 0.3
B08SL-026-02	21 ± 2	25.1 ± 1.0
B08SL-027-01	—	15.2 ± 0.7
B08SL-027-02	—	11.3 ± 0.7
B08SL-028-05	—	2.9 ± 0.5
B08SL-028-06	—	0
B08SL-301-02	—	0
B08SL-302-01	—	0
B08SL-302-03	—	0.63 ± 0.13
B08SL-304-01	—	49 ± 3
B08SL-304-06	—	0.22 ± 0.12
B08SL-305-01	—	6.3 ± 0.5

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-57
ICP-MS RESULTS FOR URANIUM ISOTOPES FOR BUILDING 8 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
Natural uranium [c]							—	0.0054%	0.7204%	—	99.2742%
Low enrichment [c]							—	0.0290%	3.4989%	—	96.4722%
Depleted uranium [c]							—	0.0010%	0.1991%	0.0003%	99.7996%
Recycled uranium [c]							—	0.0082%	0.9700%	0.0680%	98.9500%
B08SL-015-09	[0.01]	0.27	32	0.015	5190	5223	ND	0.0052%	0.62%	0.0003%	99.4%
B08SL-017-01	[0.01]	3	336	0.006[d]	50000	50339	ND	0.0060%	0.67%	0.00001%	99.3%

Notes:

[a] Bracketed numbers are the laboratory reporting limits.

[b] Relative mass abundances were calculated using uranium isotopic data in Table 3-30. "ND" represents samples for which the isotope was not detected above the laboratory reporting limit; these values are assigned a zero value in the calculations.

[c] Traub, RJ. 2006. *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium*. Battelle-TBD-6001 rev. F0, Battelle, Richland, Washington.

[d] This laboratory-reported value is greater than the laboratory detection limit but less than the laboratory reporting limit.

TABLE 4-58
COPC CONCENTRATIONS IN BUILDING 8 SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)[b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A08-B8-SW-001	0.09 ± 0.12	0.7 ± 0.4	0.10 ± 0.15	0.17 ± 0.15	-0.01 ± 0.06	12.9 ± 1.9	0.5 ± 0.2	13.2 ± 1.9
A08-B8-SW-002	0.10 ± 0.12	0.3 ± 0.3	0.07 ± 0.13	0.00 ± 0.07	-0.01 ± 0.06	11.1 ± 1.6	0.6 ± 0.3	11.1 ± 1.6

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-59
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS IN BUILDING 8 SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration[b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A08-B8-SW-001	0.8 ± 0.4	39 ± 6
A08-B8-SW-002	0.4 ± 0.3	33 ± 5

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-60
COPC CONCENTRATIONS IN BUILDING 8 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A08-B8-SD-001	0.71 ± 0.14	0.14 ± 0.11	1.1 ± 0.3	1.43 ± 0.19	1.8 ± 0.4	0.64 ± 0.19	1.7 ± 0.4	1.43 ± 0.19	—	92 ± 10	4.2 ± 1.4	5.1 ± 0.6	92 ± 10	—
A08-B8-SD-002	0.57 ± 0.18	0.1 ± 0.2	1.1 ± 0.3	1.5 ± 0.4	2.6 ± 0.5	1.1 ± 0.3	2.6 ± 0.5	1.5 ± 0.4	—	199 ± 29	11 ± 5	11.4 ± 1.8	224 ± 32	—

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-61
SOR FOR BUILDING 8 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-B8-SD-001	15.9 ± 1.3
A08-B8-SD-002	36 ± 3

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. Only alpha spectroscopy laboratory data are available to calculate SORs for sediments.
[b] 0 ⇒ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-62
COPC CONCENTRATIONS IN BUILDING 24 BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g) [b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
Cinder Block														
B24-BM-004	0.27 ± 0.15	0.37 ± 0.11	-1.0 ± 0.3	0.08 ± 0.13	0.21 ± 0.12	0.38 ± 0.14	0.19 ± 0.10	0.08 ± 0.13	—	0.30 ± 0.12	0.03 ± 0.05	0.07 ± 0.16	0.29 ± 0.12	—
Concrete														
B24-BM-001	0.28 ± 0.17	0.26 ± 0.11	-0.3 ± 0.3	0.19 ± 0.19	0.36 ± 0.14	0.42 ± 0.15	0.34 ± 0.13	0.19 ± 0.19	—	0.73 ± 0.19	0.06 ± 0.06	-0.1 ± 1.1	0.79 ± 0.20	—
B24-BM-002	0.51 ± 0.20	0.61 ± 0.14	0.0 ± 0.3	0.24 ± 0.18	0.36 ± 0.14	0.8 ± 0.2	0.32 ± 0.13	0.24 ± 0.18	—	3.0 ± 0.5	0.15 ± 0.09	0.3 ± 0.3	2.8 ± 0.5	—
B24-BM-003	0.5 ± 0.2	0.20 ± 0.11	0.6 ± 0.3	0.0 ± 0.6	0.26 ± 0.11	0.45 ± 0.15	0.26 ± 0.11	0.0 ± 0.6	—	0.26 ± 0.11	—	0.05 ± 0.16	0.33 ± 0.12	—
Roof Truss Dust														
B24SL-601-01	—	—	—	—	14.4 ± 1.9	3.8 ± 0.6	14.4 ± 1.9	—	14.8 ± 0.8	1715 ± 159	85 ± 16	—	1743 ± 159	1697 ± 12
B24SL-602-01	—	—	—	—	16.8 ± 1.6	4.1 ± 0.5	16.4 ± 1.6	—	17.8 ± 1.1	2110 ± 198	94 ± 17	—	2169 ± 205	1795 ± 12
B24SL-603-01	1.6 ± 0.4	1.1 ± 0.6	3.8 ± 0.8	3.3 ± 0.6	3.4 ± 0.6	1.5 ± 0.3	3.8 ± 0.6	3.3 ± 0.6	3.6 ± 0.7	416 ± 58	24 ± 8	24 ± 2	474 ± 65	470 ± 8

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-63
SOR FOR BUILDING 24 ROOF TRUSS DUST SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
B24SL-601-01	296 ± 17	290 ± 2
B24SL-602-01	362 ± 21	311 ± 3
B24SL-603-01	75 ± 7	78.2 ± 2.0

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-64
COPC CONCENTRATIONS IN BUILDING 24 DETRITUS SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]				
	^{232}Th			^{238}U	
	Alpha	Gamma	On-site	Alpha	On-site
B24SL-701-01	—	—	0.04 ± 0.07	—	0.8 ± 0.4
B24SL-704-01	—	—	0.27 ± 0.13	—	1.0 ± 0.4
B24SL-715-01	—	—	0.18 ± 0.10	—	1.3 ± 0.4
B24SL-716-01	—	—	0.07 ± 0.05	—	0.20 ± 0.14
B24SL-718-01	—	—	0.6 ± 0.2	—	8.3 ± 1.2
B24SL-720-01	—	—	0.11 ± 0.11	—	0.8 ± 0.3
B24SL-722-01	—	—	0.31 ± 0.13	—	2.6 ± 0.6
B24SL-723-01	—	—	0.37 ± 0.18	—	25.9 ± 2.0
B24SL-731-01	—	—	0.92 ± 0.19	—	58 ± 3
B24SL-732-01	—	—	1.0 ± 0.2	—	39 ± 2

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] "-700-" series sample IDs are "detritus" samples.
[c] Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-65
SOR FOR BUILDING 24 DETRITUS SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	On-site Gamma[e]
B24SL-701-01	—	0
B24SL-704-01	—	0
B24SL-715-01	—	0
B24SL-716-01	—	0
B24SL-718-01	—	1.15 ± 0.19
B24SL-720-01	—	0
B24SL-722-01	—	0.27 ± 0.09
B24SL-723-01	—	3.9 ± 0.3
B24SL-731-01	—	9.3 ± 0.6
B24SL-732-01	—	6.6 ± 0.5

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-66
COPC CONCENTRATIONS IN BUILDING 24 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a] [b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B24SL-001-01	—	—	—	—	—	—	—	—	0.16 ± 0.11	—	—	—	—	0.7 ± 0.4
B24SL-001-03	—	—	—	—	—	—	—	—	0.42 ± 0.18	—	—	—	—	0.7 ± 0.5
B24SL-002-01	—	—	—	—	—	—	—	—	0.42 ± 0.13	—	—	—	—	0.9 ± 0.4
B24SL-003-01	—	—	—	—	—	—	—	—	0.45 ± 0.16	—	—	—	—	0.8 ± 0.4
B24SL-003-02	—	—	—	—	—	—	—	—	0.48 ± 0.16	—	—	—	—	0.8 ± 0.5
B24SL-004-01	—	—	—	—	—	—	—	—	0.46 ± 0.16	—	—	—	—	0.9 ± 0.6
B24SL-005-01	—	—	—	—	—	—	—	—	0.38 ± 0.14	—	—	—	—	0.7 ± 0.4
B24SL-005-02	—	—	—	—	—	—	—	—	0.43 ± 0.15	—	—	—	—	0.7 ± 0.5
B24SL-006-01	—	—	—	—	—	—	—	—	0.58 ± 0.14	—	—	—	—	3.1 ± 0.7
B24SL-007-01	—	—	—	—	—	—	—	—	0.56 ± 0.19	—	—	—	—	0.7 ± 0.5
B24SL-008-01	—	—	—	—	—	—	—	—	0.43 ± 0.20	—	—	—	—	0.3 ± 0.8
B24SL-008-02	—	—	—	—	—	—	—	—	0.52 ± 0.14	—	—	—	—	1.1 ± 0.4
B24SL-009-01	—	—	—	—	—	—	—	—	0.57 ± 0.18	—	—	—	—	0.8 ± 0.4
B24SL-009-02	—	—	—	—	—	—	—	—	0.63 ± 0.15	—	—	—	—	0.5 ± 0.4
B24SL-010-01	—	—	—	—	—	—	—	—	0.47 ± 0.14	—	—	—	—	0.6 ± 0.5
B24SL-010-02	—	—	—	—	—	—	—	—	0.53 ± 0.13	—	—	—	—	0.9 ± 0.5
B24SL-011-01	—	—	—	—	—	—	—	—	0.54 ± 0.19	—	—	—	—	0.7 ± 0.8
B24SL-011-02	—	—	—	—	—	—	—	—	0.47 ± 0.14	—	—	—	—	0.4 ± 0.4

TABLE 4-66
COPC CONCENTRATIONS IN BUILDING 24 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a] [b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B24SL-012-01	—	0.64 ± 0.17	—	0.3 ± 0.3	—	—	—	0.3 ± 0.3	0.50 ± 0.15	—	—	0.1 ± 0.2	—	0.5 ± 0.4
B24SL-013-01	—	—	—	—	—	—	—	—	0.51 ± 0.20	—	—	—	—	0.9 ± 0.7
B24SL-014-01	—	—	—	—	—	—	—	—	0.42 ± 0.15	—	—	—	—	0.6 ± 0.5
B24SL-014-02	—	—	—	—	—	—	—	—	0.66 ± 0.16	—	—	—	—	1.2 ± 0.4
B24SL-015-01	—	—	—	—	—	—	—	—	0.70 ± 0.18	—	—	—	—	0.7 ± 0.6
B24SL-016-01	—	—	—	—	—	—	—	—	0.56 ± 0.15	—	—	—	—	0.9 ± 0.5
B24SL-017-01	—	—	—	—	—	—	—	—	0.43 ± 0.17	—	—	—	—	1.9 ± 0.7
B24SL-018-01	—	—	—	—	—	—	—	—	0.84 ± 0.19	—	—	—	—	2.3 ± 0.7
B24SL-018-02	—	—	—	—	1.5 ± 0.3	1.1 ± 0.2	1.1 ± 0.2	—	1.3 ± 0.2	0.79 ± 0.19	0.06 ± 0.05	—	0.92 ± 0.20	1.5 ± 0.6
B24SL-018-03	1.1 ± 0.3	—	1.1 ± 0.4	—	1.2 ± 0.3	1.2 ± 0.2	1.1 ± 0.2	—	1.4 ± 0.3	0.89 ± 0.20	0.07 ± 0.06	—	0.70 ± 0.18	1.0 ± 0.6
B24SL-019-01	—	0.78 ± 0.14	—	0.76 ± 0.13	1.1 ± 0.3	1.0 ± 0.2	1.2 ± 0.3	0.76 ± 0.16	1.4 ± 0.3	3.1 ± 0.4	0.12 ± 0.08	0.35 ± 0.19	3.0 ± 0.4	3.1 ± 0.7
B24SL-019-02	1.6 ± 0.3	—	1.4 ± 0.4	—	2.2 ± 0.3	1.7 ± 0.3	2.1 ± 0.3	—	2.0 ± 0.2	1.5 ± 0.3	0.10 ± 0.07	—	1.5 ± 0.3	3.0 ± 0.8
B24SL-021-01	0.63 ± 0.18	—	0.7 ± 0.4	—	0.67 ± 0.13	0.49 ± 0.12	0.56 ± 0.12	—	0.68 ± 0.16	17.3 ± 1.2	0.65 ± 0.13	—	17.0 ± 1.2	20.5 ± 1.7
B24SL-021-02	1.4 ± 0.3	—	1.0 ± 0.4	—	1.0 ± 0.3	1.0 ± 0.3	0.8 ± 0.2	—	1.1 ± 0.2	3.3 ± 0.5	0.15 ± 0.08	—	3.0 ± 0.4	3.4 ± 1.2
B24SL-022-01	—	—	—	—	1.1 ± 0.6	1.1 ± 0.3	0.9 ± 0.3	—	1.2 ± 0.2	5.2 ± 0.7	0.34 ± 0.13	—	4.8 ± 0.6	4.9 ± 1.3
B24SL-023-01	—	—	—	—	—	—	—	—	0.72 ± 0.17	—	—	—	—	1.8 ± 0.7
B24SL-023-02	—	1.2 ± 0.3	—	1.0 ± 0.4	1.3 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	1.0 ± 0.4	1.4 ± 0.3	0.87 ± 0.20	0.03 ± 0.04	0.0 ± 0.3	1.1 ± 0.2	2.6 ± 0.9
B24SL-025-01	—	—	—	—	—	—	—	—	1.10 ± 0.20	—	—	—	—	1.7 ± 0.9

TABLE 4-66
COPC CONCENTRATIONS IN BUILDING 24 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a] [b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B24SL-025-02	1.1 ± 0.3	1.4 ± 0.3	0.9 ± 0.4	0.9 ± 0.3	1.5 ± 0.3	1.6 ± 0.3	1.3 ± 0.3	0.9 ± 0.3	1.6 ± 0.3	0.83 ± 0.20	0.06 ± 0.05	0.0 ± 0.5	1.0 ± 0.2	1.9 ± 0.8
B24SL-026-01	1.1 ± 0.3	0.8 ± 0.2	1.0 ± 0.4	1.0 ± 0.3	1.2 ± 0.3	1.2 ± 0.2	0.9 ± 0.2	1.0 ± 0.3	0.90 ± 0.19	5.5 ± 0.7	0.24 ± 0.10	0.5 ± 0.4	5.5 ± 0.7	5.6 ± 1.4
B24SL-026-02	—	—	—	—	1.2 ± 0.3	1.2 ± 0.3	1.1 ± 0.2	—	1.16 ± 0.18	1.9 ± 0.3	0.08 ± 0.07	—	2.0 ± 0.4	2.8 ± 0.6
B24SL-027-01	—	—	—	—	—	—	—	—	1.2 ± 0.3	—	—	—	—	1.4 ± 1.0
B24SL-027-02	—	—	—	—	—	—	—	—	0.95 ± 0.19	—	—	—	—	1.0 ± 0.6
B24SL-028-01	1.04 ± 0.17	1.3 ± 0.3	1.04 ± 0.17	0.9 ± 0.3	1.2 ± 0.3	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.3	1.2 ± 0.2	2.2 ± 0.4	0.16 ± 0.10	0.2 ± 0.4	2.7 ± 0.4	3.6 ± 1.3
B24SL-028-02	—	—	—	—	—	—	—	—	0.72 ± 0.17	—	—	—	—	1.6 ± 0.5
B24SL-029-01	—	—	—	—	—	—	—	—	0.18 ± 0.09	—	—	—	—	3.7 ± 0.8
B24SL-029-02	—	—	—	—	—	—	—	—	0.59 ± 0.17	—	—	—	—	3.5 ± 0.9
B24SL-030-01	—	—	—	—	—	—	—	—	0.95 ± 0.19	—	—	—	—	4.9 ± 1.0
B24SL-030-02	—	—	—	—	—	—	—	—	0.66 ± 0.17	—	—	—	—	1.7 ± 0.6
B24SL-031-01	—	—	—	—	—	—	—	—	0.71 ± 0.17	—	—	—	—	2.2 ± 0.8
B24SL-031-02	—	—	—	—	—	—	—	—	0.83 ± 0.17	—	—	—	—	1.4 ± 0.6
B24SL-032-01	—	1.0 ± 0.2	—	1.0 ± 0.3	—	—	—	0.74 ± 0.15	1.02 ± 0.20	—	—	0.6 ± 0.3	—	4.7 ± 0.7
B24SL-033-01	1.1 ± 0.2	0.73 ± 0.16	0.3 ± 0.3	0.61 ± 0.18	0.9 ± 0.2	0.86 ± 0.20	0.9 ± 0.2	—	0.56 ± 0.17	13.6 ± 1.4	0.60 ± 0.17	—	13.7 ± 1.4	13.4 ± 1.4
B24SL-034-01	—	—	—	—	1.0 ± 0.3	1.0 ± 0.3	1.0 ± 0.3	—	0.83 ± 0.20	9.2 ± 1.0	0.40 ± 0.14	—	8.6 ± 0.9	7.9 ± 1.6
B24SL-034-02	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	2.9 ± 0.7
B24SL-301-01	—	—	—	—	—	—	—	—	0.66 ± 0.15	—	—	—	—	8.0 ± 1.3

TABLE 4-66
COPC CONCENTRATIONS IN BUILDING 24 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a] [b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B24SL-301-02	—	—	—	—	—	—	—	—	1.7 ± 0.2	—	—	—	—	35 ± 2
B24SL-302-01	—	—	—	—	—	—	—	—	0.5 ± 0.3	—	—	—	—	5.1 ± 1.5
B24SL-302-05	—	—	—	—	—	—	—	—	0.6 ± 0.3	—	—	—	—	1.9 ± 0.9
B24SL-303-01	—	—	—	—	—	—	—	—	0.72 ± 0.20	—	—	—	—	12.9 ± 1.8
B24SL-303-02	—	—	—	—	—	—	—	—	0.7 ± 0.3	—	—	—	—	1.0 ± 1.1
B24SL-304-01	—	—	—	—	—	—	—	—	0.64 ± 0.18	—	—	—	—	2.9 ± 0.5
B24SL-305-01	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	1.6 ± 0.9
B24SL-305-03	—	—	—	—	—	—	—	—	0.40 ± 0.16	—	—	—	—	1.0 ± 0.6

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-67
SOR FOR BUILDING 24 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
B24SL-001-01	—	0
B24SL-001-03	—	0
B24SL-002-01	—	0
B24SL-003-01	—	0
B24SL-003-02	—	0
B24SL-004-01	—	0
B24SL-005-01	—	0
B24SL-005-02	—	0
B24SL-006-01	—	0.35 ± 0.11
B24SL-007-01	—	0
B24SL-008-01	—	0
B24SL-008-02	—	0
B24SL-009-01	—	0
B24SL-009-02	—	0
B24SL-010-01	—	0
B24SL-010-02	—	0
B24SL-011-01	—	0
B24SL-011-02	—	0
B24SL-012-01	—	0
B24SL-013-01	—	0
B24SL-014-01	—	0
B24SL-014-02	—	0
B24SL-015-01	—	0
B24SL-016-01	—	0
B24SL-017-01	—	0
B24SL-018-01	—	0.7 ± 0.4
B24SL-018-02	0.5 ± 0.3	1.4 ± 0.5
B24SL-018-03	0.4 ± 0.2	1.6 ± 0.5
B24SL-019-01	0.7 ± 0.2	1.9 ± 0.6
B24SL-019-02	1.9 ± 0.4	3.2 ± 0.5
B24SL-021-01	2.45 ± 0.13	3.0 ± 0.3
B24SL-021-02	0.38 ± 0.05	1.3 ± 0.5
B24SL-022-01	0.77 ± 0.17	1.9 ± 0.5
B24SL-023-01	—	0
B24SL-023-02	0.5 ± 0.3	1.8 ± 0.6
B24SL-025-01	—	1.0 ± 0.4
B24SL-025-02	1.0 ± 0.3	2.0 ± 0.6
B24SL-026-01	0.88 ± 0.15	1.3 ± 0.4
B24SL-026-02	0.5 ± 0.3	1.4 ± 0.4
B24SL-027-01	—	1.2 ± 0.5
B24SL-027-02	—	0.7 ± 0.4
B24SL-028-01	0.4 ± 0.2	1.6 ± 0.5
B24SL-028-02	—	0
B24SL-029-01	—	0.45 ± 0.13
B24SL-029-02	—	0.42 ± 0.13
B24SL-030-01	—	1.3 ± 0.4
B24SL-030-02	—	0
B24SL-031-01	—	0.22 ± 0.13
B24SL-031-02	—	0.4 ± 0.4
B24SL-032-01	—	1.4 ± 0.4
B24SL-033-01	1.93 ± 0.15	1.9 ± 0.2
B24SL-034-01	1.4 ± 0.3	1.5 ± 0.5
B24SL-034-02	—	0.7 ± 0.5
B24SL-301-01	—	1.11 ± 0.20
B24SL-301-02	—	7.5 ± 0.5
B24SL-302-01	—	0.7 ± 0.2
B24SL-302-05	—	0
B24SL-303-01	—	1.9 ± 0.3
B24SL-303-02	—	0
B24SL-304-01	—	0.33 ± 0.07
B24SL-305-01	—	0
B24SL-305-03	—	0

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-68
COPC CONCENTRATIONS IN BUILDING 24 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A08-B24-SD-001	0.46 ± 0.13	0.19 ± 0.07	0.7 ± 0.3	0.25 ± 0.09	0.46 ± 0.11	0.44 ± 0.11	0.44 ± 0.11	0.25 ± 0.09	—	21.5 ± 1.9	1.18 ± 0.20	0.73 ± 0.16	22.5 ± 2.0	—
A08-B24-SD-002	0.4 ± 0.2	0.32 ± 0.13	0.7 ± 0.5	0.40 ± 0.15	0.31 ± 0.10	0.39 ± 0.11	0.28 ± 0.09	0.40 ± 0.15	—	20 ± 3	0.8 ± 0.2	0.9 ± 0.3	20 ± 3	—
A08-B24-SD-003	0.48 ± 0.16	0.23 ± 0.13	1.0 ± 0.5	0.43 ± 0.15	0.53 ± 0.17	0.61 ± 0.18	0.60 ± 0.18	0.43 ± 0.15	—	17 ± 2	0.8 ± 0.2	0.9 ± 0.3	17 ± 2	—
A08-B24-SD-004	0.50 ± 0.16	0.33 ± 0.13	0.5 ± 0.5	0.08 ± 0.17	0.36 ± 0.15	0.51 ± 0.17	0.38 ± 0.14	0.08 ± 0.17	—	3.1 ± 0.5	0.17 ± 0.10	0.1 ± 0.2	3.2 ± 0.5	—
A08-B24-SD-005	0.14 ± 0.11	0.12 ± 0.06	0.3 ± 0.4	0.04 ± 0.09	0.09 ± 0.09	0.35 ± 0.15	0.03 ± 0.04	0.04 ± 0.09	—	1.6 ± 0.3	0.02 ± 0.04	0.12 ± 0.12	1.8 ± 0.3	—
A08-B24-SD-006	1.4 ± 0.3	1.9 ± 0.3	1.9 ± 0.5	1.8 ± 0.3	2.1 ± 0.5	1.3 ± 0.4	2.1 ± 0.5	1.8 ± 0.3	—	2.1 ± 0.4	0.06 ± 0.06	0.0 ± 0.4	2.8 ± 0.5	—
A08-B24-SD-007	0.51 ± 0.17	0.35 ± 0.12	0.7 ± 0.5	0.52 ± 0.17	0.8 ± 0.2	0.57 ± 0.18	0.8 ± 0.2	0.52 ± 0.17	—	30 ± 4	1.4 ± 0.3	1.9 ± 0.5	31 ± 4	—

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-69
SOR FOR BUILDING 24 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-B24-SD-001	3.3 ± 0.3
A08-B24-SD-002	2.9 ± 0.3
A08-B24-SD-003	2.4 ± 0.2
A08-B24-SD-004	0.37 ± 0.05
A08-B24-SD-005	0
A08-B24-SD-006	3.1 ± 1.1
A08-B24-SD-007	4.5 ± 0.5

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha spectroscopy laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-70
COPC CONCENTRATIONS IN BUILDING 35 BUILDING MATERIAL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Matrix	Concentration (pCi/g)[b]													
		^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
		GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B35-BM-001	Concrete	0.19 ± 0.17	0.16 ± 0.10	0.2 ± 0.4	0.19 ± 0.14	0.20 ± 0.10	0.27 ± 0.11	0.22 ± 0.10	0.19 ± 0.14	—	0.09 ± 0.06	0.03 ± 0.04	0.1 ± 0.2	0.12 ± 0.07	—
B35-BM-002	Brick	0.7 ± 0.2	0.73 ± 0.13	0.1 ± 0.4	0.66 ± 0.15	0.8 ± 0.2	1.8 ± 0.4	0.7 ± 0.2	0.66 ± 0.15	—	0.67 ± 0.18	0.06 ± 0.06	0.1 ± 0.2	1.0 ± 0.2	—

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-71
COPC CONCENTRATIONS IN BUILDING 35 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
B35SL-001-01	0.7 ± 0.2	0.36 ± 0.11	2.0 ± 0.5	0.7 ± 0.2	1.7 ± 059	0.5 ± 0.2	1.3 ± 0.4	0.7 ± 0.2	1.2 ± 0.2	6.7 ± 1.0	0.30 ± 0.13	0.2 ± 0.2	6.6 ± 1.0	4.9 ± 0.8
B35SL-001-05	—	—	—	—	—	—	—	—	3.3 ± 0.3	—	—	—	—	6.1 ± 1.0
B35SL-001-07	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.3 ± 0.5
B35SL-002-01	—	—	—	—	—	—	—	—	1.7 ± 0.2	—	—	—	—	2.2 ± 0.8
B35SL-002-06	—	—	—	—	—	—	—	—	0.83 ± 0.20	—	—	—	—	1.4 ± 0.8
B35SL-002-07	—	—	—	—	—	—	—	—	0.66 ± 0.19	—	—	—	—	0.9 ± 0.7
B35SL-003-01	—	—	—	—	—	—	—	—	1.7 ± 0.3	—	—	—	—	3.0 ± 0.8
B35SL-003-07	2.5 ± 0.4	1.9 ± 0.3	1.7 ± 0.5	1.4 ± 0.3	2.1 ± 0.5	2.5 ± 0.5	2.2 ± 0.5	1.4 ± 0.3	2.2 ± 0.3	2.1 ± 0.4	0.16 ± 0.10	0.1 ± 0.5	1.9 ± 0.4	2.0 ± 0.6
B35SL-003-09	—	—	—	—	—	—	—	—	0.53 ± 0.17	—	—	—	—	1.1 ± 0.5
B35SL-004-01	—	—	—	—	—	—	—	—	0.86 ± 0.18	—	—	—	—	1.1 ± 0.6
B35SL-004-06	—	—	—	—	—	—	—	—	3.1 ± 0.3	—	—	—	—	1.4 ± 0.8
B35SL-004-07	—	—	—	—	—	—	—	—	0.83 ± 0.17	—	—	—	—	0.9 ± 0.6
B35SL-301-01	—	—	—	—	—	—	—	—	0.37 ± 0.13	—	—	—	—	0.5 ± 0.4
B35SL-301-07	—	—	—	—	—	—	—	—	2.7 ± 0.3	—	—	—	—	0.8 ± 0.6
B35SL-302-01	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	0.6 ± 0.8
B35SL-302-06	—	—	—	—	—	—	—	—	2.2 ± 0.3	—	—	—	—	2.7 ± 0.8
B35SL-303-01	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	1.6 ± 0.7
B35SL-303-03	—	—	—	—	—	—	—	—	1.47 ± 0.20	—	—	—	—	2.0 ± 0.8
B35SL-303-05	—	—	—	—	—	—	—	—	0.96 ± 0.17	—	—	—	—	2.2 ± 0.9
B35SL-304-01	—	—	—	—	—	—	—	—	0.29 ± 0.15	—	—	—	—	5.1 ± 1.0
B35SL-304-07	—	—	—	—	—	—	—	—	1.8 ± 0.2	—	—	—	—	4.8 ± 0.8
B35SL-305-01	—	—	—	—	—	—	—	—	0.65 ± 0.17	—	—	—	—	0.8 ± 0.5
B35SL-305-03	—	—	—	—	—	—	—	—	1.6 ± 0.2	—	—	—	—	2.5 ± 1.0
B35SL-305-05	—	—	—	—	—	—	—	—	0.64 ± 0.19	—	—	—	—	1.0 ± 0.6

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-72
SOR FOR BUILDING 35 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
B35SL-001-01	1.5 ± 0.4	1.9 ± 0.5
B35SL-001-05	—	6.2 ± 0.7
B35SL-001-07	—	0.2 ± 0.4
B35SL-002-01	—	2.3 ± 0.5
B35SL-002-06	—	0.4 ± 0.4
B35SL-002-07	—	0
B35SL-003-01	—	2.5 ± 0.6
B35SL-003-07	2.5 ± 0.5	3.3 ± 0.6
B35SL-003-09	—	0
B35SL-004-01	—	0.5 ± 0.4
B35SL-004-06	—	5.0 ± 0.6
B35SL-004-07	—	0.4 ± 0.3
B35SL-301-01	—	0
B35SL-301-07	—	4.2 ± 0.5
B35SL-302-01	—	0.3 ± 0.5
B35SL-302-06	—	3.4 ± 0.6
B35SL-303-01	—	0
B35SL-303-03	—	1.7 ± 0.4
B35SL-303-05	—	0.9 ± 0.4
B35SL-304-01	—	0.67 ± 0.15
B35SL-304-07	—	2.9 ± 0.5
B35SL-305-01	—	0
B35SL-305-03	—	2.3 ± 0.5
B35SL-305-05	—	0

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-73
COPC CONCENTRATIONS IN IA02 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A02SL-001-01	—	—	—	—	0.56 ± 0.18	0.33 ± 0.13	0.53 ± 0.17	—	0.25 ± 0.12	6.6 ± 0.8	0.30 ± 0.13	—	7.1 ± 0.8	5.3 ± 1.1
A02SL-002-01	1.2 ± 0.3	—	0.7 ± 0.3	—	1.1 ± 0.3	1.0 ± 0.3	0.7 ± 0.2	—	0.6 ± 0.2	9.8 ± 1.1	0.52 ± 0.17	—	11.1 ± 1.2	9.5 ± 2.0
A02SL-003-01	—	—	—	—	0.26 ± 0.09	0.31 ± 0.10	0.31 ± 0.10	—	0.0 ± 0.9	7.5 ± 0.6	0.38 ± 0.10	—	6.8 ± 0.6	6.7 ± 1.0
A02SL-004-01	—	—	—	—	—	—	—	—	0.24 ± 0.12	—	—	—	—	0.8 ± 0.5
A02SL-005-01	0.70 ± 0.19	—	0.4 ± 0.2	—	0.61 ± 0.18	0.8 ± 0.2	0.64 ± 0.19	—	0.46 ± 0.14	5.6 ± 0.7	0.23 ± 0.11	—	5.8 ± 0.7	4.4 ± 0.9
A02SL-006-01	—	—	—	—	—	—	—	—	0.02 ± 0.11	—	—	—	—	0.2 ± 0.3
A02SL-007-01	—	—	—	—	0.33 ± 0.12	0.03 ± 0.11	0.24 ± 0.10	—	0.15 ± 0.15	22 ± 2	1.0 ± 0.3	—	22 ± 2	13.9 ± 1.4
A02SL-008-01	—	—	—	—	—	—	—	—	0.68 ± 0.19	—	—	—	—	1.9 ± 0.8
A02SL-009-01	—	—	—	—	—	—	—	—	0.65 ± 0.20	—	—	—	—	1.1 ± 0.5
A02SL-010-01	—	—	—	—	—	—	—	—	0.68 ± 0.20	—	—	—	—	2.0 ± 0.7
A02SL-011-01	1.2 ± 0.3	—	0.8 ± 0.3	—	0.8 ± 0.2	0.8 ± 0.2	0.66 ± 0.194	—	0.95 ± 0.20	1.9 ± 0.3	0.09 ± 0.07	—	2.1 ± 0.3	2.0 ± 0.6
A02SL-012-01	0.8 ± 0.2	—	1.1 ± 0.4	—	—	—	—	—	0.53 ± 0.17	—	—	—	—	3.0 ± 0.7
A02SL-013-01	—	0.29 ± 0.13	—	0.18 ± 0.13	—	—	—	0.18 ± 0.13	0.10 ± 0.12	—	—	0.03 ± 0.13	—	0.2 ± 0.3
A02SL-014-01	—	—	—	—	0.48 ± 0.17	0.71 ± 0.20	0.50 ± 0.16	—	0.50 ± 0.13	10.9 ± 1.1	0.47 ± 0.16	—	11.6 ± 1.2	8.9 ± 0.8
A02SL-015-01	1.5 ± 0.3	—	1.7 ± 0.4	—	1.2 ± 0.3	1.1 ± 0.2	1.1 ± 0.2	—	1.5 ± 0.2	3.1 ± 0.4	0.17 ± 0.09	—	3.3 ± 0.5	3.8 ± 0.5
A02SL-016-01	1.2 ± 0.3	—	1.3 ± 0.3	—	1.0 ± 0.3	1.3 ± 0.3	1.0 ± 0.3	—	1.12 ± 0.19	3.1 ± 0.5	0.06 ± 0.06	—	3.0 ± 0.4	2.7 ± 0.8
A02SL-017-01	—	—	—	—	—	—	—	—	0.44 ± 0.13	—	—	—	—	2.5 ± 0.6
A02SL-018-01	—	—	—	—	—	—	—	—	0.70 ± 0.16	—	—	—	—	2.4 ± 0.6
A02SL-019-01	—	—	—	—	—	—	—	—	0.46 ± 0.17	—	—	—	—	1.8 ± 0.5

TABLE 4-73
COPC CONCENTRATIONS IN IA02 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A02SL-020-01	—	—	—	—	1.28 ± 0.20	1.34 ± 0.20	1.18 ± 0.19	—	0.97 ± 0.18	1.52 ± 0.19	0.08 ± 0.04	—	1.47 ± 0.19	2.6 ± 0.7
A02SL-021-01	—	—	—	—	—	—	—	—	0.57 ± 0.18	—	—	—	—	2.4 ± 0.7
A02SL-022-01	1.3 ± 0.3	—	1.1 ± 0.4	—	1.0 ± 0.3	0.8 ± 0.2	0.9 ± 0.2	—	0.78 ± 0.18	6.0 ± 0.7	0.30 ± 0.13	—	6.0 ± 0.7	4.2 ± 0.8
A02SL-023-01	—	—	—	—	0.9 ± 0.2	1.3 ± 0.3	0.9 ± 0.2	—	0.78 ± 0.16	2.7 ± 0.4	0.12 ± 0.08	—	2.9 ± 0.4	2.9 ± 1.0
A02SL-024-01	—	—	—	—	0.9 ± 0.3	0.5 ± 0.2	0.5 ± 0.3	—	0.60 ± 0.17	18.4 ± 1.8	1.0 ± 0.2	—	20.4 ± 2.0	11.7 ± 1.5
A02SL-025-01	0.59 ± 0.14	—	0.9 ± 0.3	—	0.9 ± 0.3	0.43 ± 0.18	0.8 ± 0.3	—	0.5 ± 0.2	5.5 ± 0.7	0.29 ± 0.12	—	6.7 ± 0.8	3.9 ± 0.9
A02SL-026-01	0.67 ± 0.16	—	0.8 ± 0.4	—	0.6 ± 0.3	0.48 ± 0.12	0.6 ± 0.3	—	0.38 ± 0.18	5.6 ± 0.7	0.43 ± 0.15	—	6.9 ± 0.8	3.6 ± 1.0
A02SL-029-01	—	—	—	—	0.7 ± 0.2	0.7 ± 0.2	0.6 ± 0.2	—	0.45 ± 0.15	8.7 ± 0.9	0.51 ± 0.16	—	10.3 ± 1.1	7.3 ± 1.1
A02SL-030-01	—	—	—	—	0.28 ± 0.12	0.40 ± 0.14	0.45 ± 0.15	—	0.24 ± 0.10	3.9 ± 0.5	0.28 ± 0.08	—	3.8 ± 0.5	3.8 ± 0.6
A02SL-031-01	—	—	—	—	—	—	—	—	0.24 ± 0.15	—	—	—	—	3.1 ± 0.6
A02SL-032-01	—	—	—	—	0.55 ± 0.18	0.50 ± 0.16	0.38 ± 0.14	—	0.40 ± 0.14	16.6 ± 1.6	1.0 ± 0.2	—	16.7 ± 1.6	13.6 ± 1.7
A02SL-033-01	—	—	—	—	0.33 ± 0.13	0.51 ± 0.16	0.34 ± 0.13	—	0.3 ± 0.2	7.1 ± 0.8	0.28 ± 0.13	—	7.7 ± 0.9	7.6 ± 1.5
A02SL-034-01	—	—	—	—	0.46 ± 0.15	0.72 ± 0.19	0.51 ± 0.16	—	0.48 ± 0.15	3.0 ± 0.4	0.26 ± 0.11	—	3.0 ± 0.4	4.3 ± 0.7
A02SL-035-01	—	—	—	—	1.1 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	—	1.1 ± 0.2	6.0 ± 0.7	0.33 ± 0.14	—	5.8 ± 0.7	6.1 ± 1.2
A02SL-036-01	—	—	—	—	—	—	—	—	0.09 ± 0.14	—	—	—	—	0.7 ± 0.4
A02SL-037-01	—	—	—	—	—	—	—	—	0.38 ± 0.17	—	—	—	—	2.7 ± 0.8
A02SL-038-01	0.53 ± 0.17	—	0.8 ± 0.4	—	0.57 ± 0.17	0.80 ± 0.20	0.39 ± 0.14	—	1.0 ± 0.3	2.9 ± 0.4	0.14 ± 0.08	—	3.0 ± 0.4	5 ± 2
A02SL-039-01	—	—	—	—	—	—	—	—	1.00 ± 0.19	—	—	—	—	1.0 ± 0.5
A02SL-040-01	—	—	—	—	—	—	—	—	0.23 ± 0.15	—	—	—	—	1.4 ± 0.4

TABLE 4-73
COPC CONCENTRATIONS IN IA02 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A02SL-041-01	1.2 ± 0.3	—	1.2 ± 0.4	—	1.1 ± 0.3	1.0 ± 0.2	1.0 ± 0.2	—	1.11 ± 0.20	10.7 ± 1.1	0.53 ± 0.17	—	11.4 ± 1.2	12.1 ± 1.9
A02SL-042-01	—	—	—	—	0.70 ± 0.19	0.65 ± 0.18	0.70 ± 0.19	—	0.56 ± 0.15	2.7 ± 0.4	0.10 ± 0.07	—	2.8 ± 0.4	3.1 ± 0.7
A02SL-043-01	0.9 ± 0.2	—	0.7 ± 0.4	—	1.0 ± 0.2	0.75 ± 0.20	0.76 ± 0.20	—	1.0 ± 0.3	9.8 ± 1.0	0.56 ± 0.18	—	10.1 ± 1.1	5 ± 2
A02SL-208-01	—	—	—	—	—	—	—	—	0.25 ± 0.14	—	—	—	—	2.4 ± 0.7
A02SL-215-01	1.5 ± 0.3	—	1.4 ± 0.4	—	1.26 ± 0.25	1.4 ± 0.3	1.3 ± 0.3	—	1.6 ± 0.2	2.4 ± 0.4	0.09 ± 0.07	—	2.0 ± 0.3	2.8 ± 0.8
A02SL-216-01	1.1 ± 0.2	—	0.6 ± 0.4	—	1.0 ± 0.2	1.0 ± 0.2	1.1 ± 0.2	—	0.8 ± 0.3	3.9 ± 0.5	0.19 ± 0.09	—	4.0 ± 0.5	3.3 ± 1.0
A02SL-217-01	—	—	—	—	—	—	—	—	0.58 ± 0.19	—	—	—	—	2.2 ± 0.8
A02SL-223-01	—	—	—	—	—	—	—	—	0.56 ± 0.17	—	—	—	—	0.8 ± 0.6
A02SL-229-01	—	—	—	—	—	—	—	—	0.07 ± 0.09	—	—	—	—	0.0 ± 0.5
A02SL-234-01	—	—	—	—	0.8 ± 0.2	0.53 ± 0.17	0.66 ± 0.19	—	0.93 ± 0.19	29 ± 3	1.7 ± 0.4	—	44 ± 4	20.1 ± 1.6

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-74
SOR FOR IA02 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
A02SL-001-01	0.90 ± 0.08	0.70 ± 0.17
A02SL-002-01	1.43 ± 0.12	1.3 ± 0.3
A02SL-003-01	0.94 ± 0.06	0.90 ± 0.15
A02SL-004-01	—	0
A02SL-005-01	0.73 ± 0.07	0.55 ± 0.13
A02SL-006-01	—	0
A02SL-007-01	3.3 ± 0.2	2.0 ± 0.2
A02SL-008-01	—	0
A02SL-009-01	—	0
A02SL-010-01	—	0
A02SL-011-01	0	0.6 ± 0.4
A02SL-012-01	—	0.33 ± 0.11
A02SL-013-01	—	0
A02SL-014-01	1.55 ± 0.12	1.24 ± 0.12
A02SL-015-01	1.0 ± 0.5	2.2 ± 0.4
A02SL-016-01	0.9 ± 0.6	1.3 ± 0.4
A02SL-017-01	—	0.26 ± 0.09
A02SL-018-01	—	0.24 ± 0.10
A02SL-019-01	—	0
A02SL-020-01	1.0 ± 0.4	0.9 ± 0.4
A02SL-021-01	—	0.24 ± 0.10
A02SL-022-01	0.78 ± 0.07	0.8 ± 0.4
A02SL-023-01	0.8 ± 0.5	0.6 ± 0.4
A02SL-024-01	2.88 ± 0.20	1.7 ± 0.2
A02SL-025-01	0.79 ± 0.07	0.47 ± 0.14
A02SL-026-01	0.81 ± 0.08	0.43 ± 0.15
A02SL-029-01	1.29 ± 0.11	0.99 ± 0.17
A02SL-030-01	0.46 ± 0.05	0.46 ± 0.10
A02SL-031-01	—	0.36 ± 0.09
A02SL-032-01	2.47 ± 0.17	2.0 ± 0.3
A02SL-033-01	0.98 ± 0.09	1.0 ± 0.2
A02SL-034-01	0.32 ± 0.04	0.54 ± 0.11
A02SL-035-01	1.4 ± 0.5	1.7 ± 0.5
A02SL-036-01	—	0
A02SL-037-01	—	0.28 ± 0.12
A02SL-038-01	0.32 ± 0.04	1.3 ± 0.7
A02SL-039-01	—	0.7 ± 0.4
A02SL-040-01	—	0
A02SL-041-01	1.9 ± 0.5	2.7 ± 0.5
A02SL-042-01	0.29 ± 0.04	0.35 ± 0.11
A02SL-043-01	1.36 ± 0.11	1.3 ± 0.7
A02SL-208-01	—	0.24 ± 0.10
A02SL-215-01	1.3 ± 0.5	2.2 ± 0.5
A02SL-216-01	1.0 ± 0.4	0.8 ± 0.5
A02SL-217-01	—	0
A02SL-223-01	—	0
A02SL-229-01	—	0
A02SL-234-01	5.4 ± 0.4	3.6 ± 0.5

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 ⇒ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-75
COPC CONCENTRATIONS IN IA02 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [ab]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A02SL-001-03	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	1.5 ± 0.7
A02SL-002-02	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	4.0 ± 1.0
A02SL-004-06	—	—	—	—	—	—	—	—	0.79 ± 0.17	—	—	—	—	1.4 ± 0.6
A02SL-004-07	1.2 ± 0.3	—	1.5 ± 0.3	—	1.5 ± 0.3	1.3 ± 0.3	1.3 ± 0.3	—	1.4 ± 0.3	1.1 ± 0.2	0.06 ± 0.05	—	1.3 ± 0.3	1.7 ± 0.8
A02SL-005-02	—	—	—	—	0.8 ± 0.2	0.71 ± 0.20	0.64 ± 0.19	—	0.59 ± 0.16	8.0 ± 0.9	0.41 ± 0.15	—	8.7 ± 0.9	5.6 ± 1.0
A02SL-006-03	0.9 ± 0.2	—	1.0 ± 0.3	—	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	—	1.4 ± 0.2	11.6 ± 1.2	0.63 ± 0.19	—	12.6 ± 1.3	12.7 ± 1.7
A02SL-007-05	—	—	—	—	0.51 ± 0.17	0.8 ± 0.2	0.47 ± 0.16	—	0.54 ± 0.17	11.7 ± 1.2	0.65 ± 0.19	—	11.9 ± 1.2	9.2 ± 1.1
A02SL-008-02	—	—	—	—	—	—	—	—	0.65 ± 0.15	—	—	—	—	1.6 ± 0.8
A02SL-009-03	—	—	—	—	—	—	—	—	1.42 ± 0.17	—	—	—	—	1.2 ± 0.4
A02SL-009-04	1.33 ± 0.16	1.21 ± 0.19	1.33 ± 0.16	1.1 ± 0.3	1.4 ± 0.3	1.4 ± 0.3	1.1 ± 0.3	1.1 ± 0.3	1.7 ± 0.3	0.91 ± 0.20	0.04 ± 0.05	0.2 ± 0.3	1.0 ± 0.2	1.8 ± 0.7
A02SL-010-02	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	2.9 ± 0.7
A02SL-011-02	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.1 ± 0.7
A02SL-012-02	—	0.33 ± 0.12	—	0.47 ± 0.15	0.65 ± 0.20	0.48 ± 0.19	0.57 ± 0.20	0.47 ± 0.15	0.84 ± 0.19	3.5 ± 0.5	0.16 ± 0.09	0.2 ± 0.2	3.8 ± 0.5	6.4 ± 1.4
A02SL-013-03	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	1.3 ± 0.8
A02SL-014-06	—	—	—	—	—	—	—	—	1.0 ± 0.3	—	—	—	—	2.2 ± 0.7
A02SL-015-10	2.3 ± 0.4	—	1.6 ± 0.4	—	2.0 ± 0.4	1.6 ± 0.3	2.0 ± 0.4	—	1.8 ± 0.2	2.0 ± 0.3	0.19 ± 0.10	—	2.3 ± 0.4	2.5 ± 0.6
A02SL-015-11	—	—	—	—	2.2 ± 0.4	2.0 ± 0.4	1.9 ± 0.3	—	1.92 ± 0.20	1.6 ± 0.3	0.08 ± 0.06	—	1.6 ± 0.3	2.5 ± 0.7
A02SL-016-02	2.3 ± 0.4	—	1.8 ± 0.4	—	1.2 ± 0.3	1.4 ± 0.3	1.2 ± 0.3	—	1.5 ± 0.2	2.7 ± 0.4	0.07 ± 0.06	—	2.6 ± 0.4	3.3 ± 0.7
A02SL-016-03	—	—	—	—	1.8 ± 0.3	1.6 ± 0.3	1.8 ± 0.3	—	2.1 ± 0.2	4.4 ± 0.6	0.21 ± 0.10	—	4.3 ± 0.5	5.1 ± 0.7
A02SL-017-02	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	2.3 ± 0.8

TABLE 4-75
COPC CONCENTRATIONS IN IA02 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [ab]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A02SL-018-03	2.1 ± 0.4	1.6 ± 0.3	1.2 ± 0.4	1.1 ± 0.3	1.2 ± 0.2	1.6 ± 0.3	1.3 ± 0.3	1.1 ± 0.3	1.5 ± 0.2	1.9 ± 0.3	0.05 ± 0.05	0.1 ± 0.4	1.9 ± 0.3	2.2 ± 0.6
A02SL-018-05	—	—	—	—	—	—	—	—	1.34 ± 0.20	—	—	—	—	1.4 ± 0.7
A02SL-019-02	—	—	—	—	2.1 ± 0.4	1.5 ± 0.3	1.9 ± 0.3	—	1.9 ± 0.2	1.8 ± 0.3	0.05 ± 0.05	—	2.1 ± 0.3	2.7 ± 0.8
A02SL-019-06	1.3 ± 0.3	1.2 ± 0.3	1.3 ± 0.4	1.2 ± 0.3	1.4 ± 0.3	1.2 ± 0.3	1.0 ± 0.2	1.2 ± 0.3	1.60 ± 0.20	2.0 ± 0.3	0.07 ± 0.06	-0.1 ± 0.4	1.7 ± 0.3	2.4 ± 0.6
A02SL-020-02	2.3 ± 0.4	2.4 ± 0.4	1.0 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	2.0 ± 0.4	1.2 ± 0.3	1.2 ± 0.3	1.2 ± 0.2	1.5 ± 0.3	0.09 ± 0.07	0.0 ± 0.4	1.4 ± 0.3	3.1 ± 0.8
A02SL-020-03	2.0 ± 0.3	1.8 ± 0.3	1.2 ± 0.3	1.2 ± 0.3	1.3 ± 0.3	2.1 ± 0.5	1.5 ± 0.3	1.2 ± 0.3	1.3 ± 0.3	1.6 ± 0.3	0.08 ± 0.06	0.1 ± 0.3	1.7 ± 0.3	2.4 ± 1.1
A02SL-021-03	3.2 ± 0.3	—	1.8 ± 0.3	—	1.9 ± 0.3	2.8 ± 0.3	2.0 ± 0.3	—	2.0 ± 0.3	2.7 ± 0.3	0.06 ± 0.04	—	2.6 ± 0.3	3.9 ± 1.3
A02SL-021-04	—	—	—	—	1.7 ± 0.3	1.4 ± 0.3	1.7 ± 0.3	—	1.33 ± 0.20	1.2 ± 0.2	0.03 ± 0.04	—	1.4 ± 0.3	1.8 ± 0.7
A02SL-022-03	—	—	—	—	—	—	—	—	0.75 ± 0.17	—	—	—	—	1.8 ± 0.6
A02SL-022-04	2.0 ± 0.4	—	1.9 ± 0.4	—	1.6 ± 0.3	1.5 ± 0.3	1.5 ± 0.3	—	2.1 ± 0.3	1.3 ± 0.3	0.09 ± 0.07	—	1.3 ± 0.2	3.0 ± 0.8
A02SL-023-02	1.6 ± 0.3	—	1.4 ± 0.4	—	1.1 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	—	1.2 ± 0.3	3.0 ± 0.4	0.20 ± 0.10	—	3.2 ± 0.4	2.8 ± 0.8
A02SL-024-03	—	—	—	—	—	—	—	—	0.56 ± 0.18	—	—	—	—	3.9 ± 1.0
A02SL-024-06	—	—	—	—	—	—	—	—	0.52 ± 0.16	—	—	—	—	1.8 ± 0.7
A02SL-024-07	1.6 ± 0.3	—	1.4 ± 0.4	—	1.4 ± 0.3	1.4 ± 0.3	1.3 ± 0.3	—	1.33 ± 0.20	2.2 ± 0.4	0.07 ± 0.06	—	2.3 ± 0.4	2.3 ± 0.8
A02SL-025-06	—	—	—	—	—	—	—	—	0.73 ± 0.18	—	—	—	—	2.0 ± 0.4
A02SL-025-07	—	—	—	—	—	—	—	—	0.38 ± 0.19	—	—	—	—	1.1 ± 0.7
A02SL-026-07	—	—	—	—	—	—	—	—	0.48 ± 0.17	—	—	—	—	0.4 ± 0.9
A02SL-027-01	—	—	—	—	1.0 3± 0.18	0.48 ± 0.12	1.00 ± 0.18	—	0.42 ± 0.16	5.1 ± 0.4	0.28 ± 0.08	—	6.7 ± 0.8	5.5 ± 0.8
A02SL-027-06	—	—	—	—	—	—	—	—	0.75 ± 0.14	—	—	—	—	1.6 ± 0.6
A02SL-028-01	0.67 ± 0.16	0.13 ± 0.16	2.3 ± 0.4	1.6 ± 0.3	2.5 ± 0.2	0.72 ± 0.10	2.4 ± 0.2	1.6 ± 0.3	2.6 ± 0.4	64 ± 5	5.50 ± 0.19	5.3 ± 0.7	247 ± 14	212 ± 6

TABLE 4-75
COPC CONCENTRATIONS IN IA02 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [ab]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A02SL-028-02	—	—	—	—	0.37 ± 0.13	0.25 ± 0.11	0.33 ± 0.12	—	0.21 ± 0.11	5.2 ± 0.5	0.49 ± 0.12	—	20.3 ± 1.4	17.4 ± 1.5
A02SL-030-06	1.35 ± 0.18	—	1.7 ± 0.3	—	2.2 ± 0.4	1.7 ± 0.3	2.1 ± 0.3	—	1.7 ± 0.3	1.1 ± 0.2	0.08 ± 0.07	—	1.0 ± 0.2	2.2 ± 0.7
A02SL-031-06	—	—	—	—	1.8 ± 0.3	1.2 ± 0.2	1.7 ± 0.3	—	1.8 ± 0.2	1.5 ± 0.3	0.14 ± 0.09	—	1.8 ± 0.3	1.3 ± 0.9
A02SL-031-07	—	—	—	—	—	—	—	—	0.63 ± 0.19	—	—	—	—	0.7 ± 0.4
A02SL-032-03	—	—	—	—	—	—	—	—	0.85 ± 0.16	—	—	—	—	2.8 ± 0.7
A02SL-033-03	—	—	—	—	—	—	—	—	0.38 ± 0.16	—	—	—	—	2.4 ± 0.6
A02SL-034-03	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	5.2 ± 1.2
A02SL-035-02	—	—	—	—	1.6 ± 0.3	2.0 ± 0.3	1.5 ± 0.3	—	1.38 ± 0.20	4.3 ± 0.6	0.24 ± 0.11	—	4.1 ± 0.5	5.4 ± 0.9
A02SL-036-03	—	—	—	—	—	—	—	—	0.70 ± 0.19	—	—	—	—	1.0 ± 0.5
A02SL-036-05	—	—	—	—	—	—	—	—	0.47 ± 0.18	—	—	—	—	1.8 ± 0.6
A02SL-037-05	—	—	—	—	2.1 ± 0.4	1.9 ± 0.3	2.3 ± 0.4	—	3.1 ± 0.3	1.7 ± 0.3	0.16 ± 0.10	—	2.1 ± 0.4	4.3 ± 0.9
A02SL-037-06	1.4 ± 0.3	1.0 ± 0.2	1.1 ± 0.4	1.2 ± 0.3	0.90 ± 0.20	1.2 ± 0.2	1.0 ± 0.2	1.2 ± 0.3	1.42 ± 0.18	0.72 ± 0.18	0.04 ± 0.04	0.2 ± 0.4	0.67 ± 0.17	1.6 ± 0.7
A02SL-038-03	—	—	—	—	—	—	—	—	2.0 ± 0.2	—	—	—	—	1.9 ± 0.7
A02SL-038-04	—	—	—	—	—	—	—	—	1.44 ± 0.18	—	—	—	—	1.7 ± 0.6
A02SL-039-03	—	—	—	—	1.0 ± 0.2	0.9 ± 0.2	1.0 ± 0.2	—	0.82 ± 0.18	28 ± 3	1.4 ± 0.3	—	32 ± 3	26 ± 2
A02SL-039-06	—	—	—	—	—	—	—	—	0.90 ± 0.19	—	—	—	—	3.1 ± 1.1
A02SL-040-04	—	—	—	—	—	—	—	—	0.84 ± 0.20	—	—	—	—	2.8 ± 0.7
A02SL-041-02	—	—	—	—	—	—	—	—	0.71 ± 0.17	—	—	—	—	2.0 ± 0.6
A02SL-042-06	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	0.6 ± 0.7
A02SL-043-06	—	—	—	—	—	—	—	—	0.87 ± 0.18	—	—	—	—	1.5 ± 0.6

TABLE 4-75
COPC CONCENTRATIONS IN IA02 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [ab]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A02SL-208-06	—	—	—	—	—	—	—	—	1.9 ± 0.3	—	—	—	—	2.1 ± 0.8
A02SL-208-07	—	—	—	—	—	—	—	—	1.8 ± 0.3	—	—	—	—	3.4 ± 1.0
A02SL-215-10	—	—	—	—	—	—	—	—	2.2 ± 0.3	—	—	—	—	3.4 ± 0.9
A02SL-215-11	—	—	—	—	—	—	—	—	2.3 ± 0.3	—	—	—	—	2.0 ± 0.6
A02SL-216-10	—	—	—	—	—	—	—	—	2.8 ± 0.3	—	—	—	—	2.8 ± 1.2
A02SL-216-13	—	—	—	—	2.0 ± 0.3	2.1 ± 0.4	2.1 ± 0.3	—	2.2 ± 0.4	2.5 ± 0.4	0.13 ± 0.08	—	2.2 ± 0.3	4.0 ± 0.9
A02SL-217-02	—	—	—	—	—	—	—	—	0.63 ± 0.19	—	—	—	—	3.1 ± 1.2
A02SL-229-02	—	—	—	—	0.43 ± 0.14	0.31 ± 0.12	0.46 ± 0.14	—	0.28 ± 0.16	6.4 ± 0.7	0.55 ± 0.17	—	14.5 ± 1.4	10.9 ± 1.8
A02SL-234-02	—	—	—	—	0.45 ± 0.17	0.53 ± 0.17	0.37 ± 0.15	—	0.31 ± 0.15	11.2 ±1.2	0.57 ± 0.19	—	14.0 ± 1.4	8.2 ± 1.4

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-76
SOR FOR IA02 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	On-site Gamma [f]
A02SL-001-03	—	1.3 ± 0.4
A02SL-002-02	—	0.49 ± 0.16
A02SL-004-06	—	0.3 ± 0.4
A02SL-004-07	1.3 ± 0.5	1.5 ± 0.5
A02SL-005-02	1.14 ± 0.10	0.74 ± 0.16
A02SL-006-03	1.70 ± 0.13	3.4 ± 0.5
A02SL-007-05	1.66 ± 0.13	1.30 ± 0.17
A02SL-008-02	—	0
A02SL-009-03	—	1.6 ± 0.4
A02SL-009-04	0.7 ± 0.3	2.2 ± 0.6
A02SL-010-02	—	1.3 ± 0.5
A02SL-011-02	—	0
A02SL-012-02	0.45 ± 0.05	1.3 ± 0.4
A02SL-013-03	—	0.4 ± 0.4
A02SL-014-06	—	1.0 ± 0.6
A02SL-015-10	2.0 ± 0.4	2.6 ± 0.5
A02SL-015-11	1.9 ± 0.4	2.9 ± 0.4
A02SL-016-02	1.0 ± 0.3	2.2 ± 0.5
A02SL-016-03	2.1 ± 0.4	3.6 ± 0.5
A02SL-017-02	—	1.3 ± 0.5
A02SL-018-03	1.0 ± 0.3	1.8 ± 0.4
A02SL-018-05	—	1.5 ± 0.4
A02SL-019-02	1.7 ± 0.4	2.9 ± 0.5
A02SL-019-06	0.6 ± 0.3	2.2 ± 0.4
A02SL-020-02	1.0 ± 0.3	1.6 ± 0.4
A02SL-020-03	1.3 ± 0.4	1.7 ± 0.6
A02SL-021-03	2.7 ± 0.3	3.3 ± 0.6
A02SL-021-04	1.3 ± 0.4	1.4 ± 0.4
A02SL-022-03	—	0.3 ± 0.4
A02SL-022-04	1.1 ± 0.3	3.4 ± 0.6
A02SL-023-02	0.8 ± 0.3	1.4 ± 0.6
A02SL-024-03	—	0.48 ± 0.16
A02SL-024-06	—	0
A02SL-024-07	1.1 ± 0.3	1.7 ± 0.4
A02SL-025-06	—	0.2 ± 0.4
A02SL-025-07	—	0
A02SL-026-07	—	0
A02SL-027-01	0.95 ± 0.18	0.72 ± 0.12
A02SL-027-06	—	0.3 ± 0.3
A02SL-028-01	25.0 ± 1.2	36.5 ± 1.2
A02SL-028-02	1.76 ± 0.10	2.6 ± 0.2
A02SL-030-06	1.9 ± 0.4	2.5 ± 0.6
A02SL-031-06	1.2 ± 0.3	2.4 ± 0.5
A02SL-031-07	—	0
A02SL-032-03	—	0.8 ± 0.3
A02SL-033-03	—	0.25 ± 0.10
A02SL-034-03	—	0.9 ± 0.5
A02SL-035-02	1.9 ± 0.3	2.3 ± 0.4
A02SL-036-03	—	0
A02SL-036-05	—	0
A02SL-037-05	2.2 ± 0.4	5.6 ± 0.6
A02SL-037-06	0.4 ± 0.2	1.6 ± 0.4
A02SL-038-03	—	2.8 ± 0.5
A02SL-038-04	—	1.7 ± 0.4
A02SL-039-03	4.7 ± 0.4	4.3 ± 0.5
A02SL-039-06	—	0.9 ± 0.4
A02SL-040-04	—	0.8 ± 0.4
A02SL-041-02	—	0
A02SL-042-06	—	1.2 ± 0.5
A02SL-043-06	—	0.5 ± 0.4
A02SL-208-06	—	2.6 ± 0.5
A02SL-208-07	—	2.8 ± 0.7
A02SL-215-10	—	3.6 ± 0.7
A02SL-215-11	—	3.3 ± 0.6
A02SL-216-10	—	4.8 ± 0.6
A02SL-216-13	2.3 ± 0.4	3.7 ± 0.7
A02SL-217-02	—	0.36 ± 0.19
A02SL-229-02	1.44 ± 0.12	1.6 ± 0.3
A02SL-234-02	1.77 ± 0.14	1.1 ± 0.2

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-77
ICP-MS RESULTS FOR URANIUM ISOTOPES IN IA02 SUBSURFACE SOIL SAMPLE
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
Natural uranium [c]							—	0.0054%	0.7204%	—	99.2742%
Low enrichment [c]							—	0.0290%	3.4989%	—	96.4722%
Depleted uranium [c]							—	0.0010%	0.1991%	0.0003%	99.7996%
Recycled uranium [c]							—	0.0082%	0.9700%	0.0680%	98.9500%
A02SL-028-01	[0.01]	0.011	2.1	0.017	822	824	ND	0.0013%	0.25%	0.0021%	99.7%

Notes:
[a] Bracketed numbers are the laboratory reporting limits.
[b] Relative mass abundances were calculated using uranium isotopic data in Table 3-30. "ND" represents samples for which the isotope was not detected above the laboratory reporting limit; these values are assigned a zero value in the calculations.
[c] Traub, RJ. 2006. *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium*. Battelle-TBD-6001 rev. F0, Battelle, Richland, Washington.

TABLE 4-78
COPC CONCENTRATIONS IN IA02 NON-NATIVE SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/L)							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A08-A01-SW-001	0.01 ± 0.07	0.5 ± 0.5	0.20 ± 0.09	0.03 ± 0.04	-0.01 ± 0.03	0.15 ± 0.12	0.05 ± 0.09	0.09 ± 0.10
A08-A01-SW-004	0.14 ± 0.11	0.4 ± 0.5	0.15 ± 0.10	0.12 ± 0.08	0.06 ± 0.07	0.5 ± 0.2	0.05 ± 0.09	0.29 ± 0.17
A08-A01-SW-005	0.06 ± 0.09	0.3 ± 0.4	0.12 ± 0.09	0.12 ± 0.06	0.03 ± 0.03	0.03 ± 0.09	0.02 ± 0.06	0.04 ± 0.08
A08-A01-SW-006	0.14 ± 0.09	0.4 ± 0.3	0.13 ± 0.07	0.05 ± 0.03	0.01 ± 0.03	2.7 ± 0.4	0.15 ± 0.10	2.5 ± 0.4
A08-A01-SW-007	0.25 ± 0.15	-0.4 ± 0.6	0.12 ± 0.07	0.19 ± 0.09	-0.01 ± 0.04	33 ± 4	1.6 ± 0.5	33 ± 4
A08-A01-SW-011	0.09 ± 0.11	0.5 ± 0.5	0.05 ± 0.07	0.09 ± 0.05	-0.01 ± 0.03	16 ± 2	0.9 ± 0.3	19 ± 3
A08-A01-SW-012	0.09 ± 0.12	0.4 ± 0.5	0.18 ± 0.09	0.16 ± 0.07	0.03 ± 0.04	0.6 ± 0.2	0.05 ± 0.09	0.5 ± 0.2

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] Uranium and thorium concentrations determined by alpha spectroscopy; radium concentrations determined by gas flow proportional counting.

TABLE 4-79
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS IN IA02 NON-NATIVE SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration [a, b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A08-A01-SW-001	0.5 ± 0.5	0.3 ± 0.3
A08-A01-SW-004	0.5 ± 0.5	0.9 ± 0.5
A08-A01-SW-005	0.3 ± 0.4	0.1 ± 0.3
A08-A01-SW-006	0.5 ± 0.3	7.6 ± 1.1
A08-A01-SW-007	-0.2 ± 0.6	98 ± 13
A08-A01-SW-011	0.5 ± 0.5	56 ± 8
A08-A01-SW-012	0.5 ± 0.5	1.5 ± 0.6

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-80
COPC CONCENTRATIONS IN IA02 NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	*Gamma*	*GFPC*	*Gamma*	*Alpha*	*Alpha*	*Alpha*	*Gamma*	*Onsite*	*Alpha*	*Alpha*	*Gamma*	*Alpha*	*Onsite*
A08-A01-SD-001R	0.31 ± 0.11	0.06 ± 0.08	0.4 ± 0.2	0.07 ± 0.17	0.29 ± 0.09	0.40 ± 0.10	0.23 ± 0.07	0.07 ± 0.17	—	6.2 ± 0.6	0.31 ± 0.09	0.24 ± 0.16	6.7 ± 0.7	—
A08-A01-SD-002	0.76 ± 0.14	0.49 ± 0.14	0.6 ± 0.3	0.3 ± 0.3	0.55 ± 0.16	0.55 ± 0.16	0.38 ± 0.13	0.3 ± 0.3	—	1.6 ± 0.3	0.11 ± 0.08	-0.1 ± 0.4	1.8 ± 0.3	—
A08-A01-SD-003	0.32 ± 0.16	0.17 ± 0.10	0.3 ± 0.4	0.27 ± 0.20	0.46 ± 0.16	0.72 ± 0.20	0.48 ± 0.15	0.27 ± 0.20	—	1.2 ± 0.3	0.01 ± 0.05	0.0 ± 0.9	1.0 ± 0.2	—
A08-A01-SD-004	0.8 ± 0.2	0.5 ± 0.3	1.0 ± 0.6	0.5 ± 0.4	0.6 ± 0.3	0.5 ± 0.3	0.5 ± 0.3	0.5 ± 0.4	—	10.3 ± 1.7	0.7 ± 0.3	0.3 ± 0.5	10.7 ± 1.8	—
A08-A01-SD-005	0.31 ± 0.14	0.12 ± 0.11	0.6 ± 0.5	0.18 ± 0.18	0.35 ± 0.14	0.31 ± 0.12	0.26 ± 0.11	0.18 ± 0.18	—	1.8 ± 0.4	0.16 ± 0.10	0.0 ± 0.2	1.8 ± 0.4	—
A08-A01-SD-006	0.56 ± 0.13	0.06 ± 0.18	0.5 ± 0.3	0.34 ± 0.19	0.57 ± 0.18	0.68 ± 0.19	0.36 ± 0.13	0.34 ± 0.19	—	1.9 ± 0.4	0.06 ± 0.06	0.2 ± 0.3	2.0 ± 0.4	—
A08-A01-SD-007	0.62 ± 0.19	0.14 ± 0.07	0.3 ± 0.4	0.14 ± 0.10	0.26 ± 0.11	0.43 ± 0.15	0.18 ± 0.09	0.14 ± 0.10	—	18 ± 2	0.8 ± 0.2	0.37 ± 0.19	18 ± 2	—
A08-A01-SD-008	0.9 ± 0.2	0.76 ± 0.19	1.1 ± 0.5	0.5 ± 0.2	0.42 ± 0.15	0.59 ± 0.18	0.46 ± 0.15	0.5 ± 0.2	—	20 ± 3	1.0 ± 0.3	0.8 ± 0.3	19 ± 3	—
A08-A01-SD-009	0.54 ± 0.17	0.38 ± 0.11	0.5 ± 0.5	0.27 ± 0.11	0.43 ± 0.16	0.45 ± 0.15	0.30 ± 0.12	0.27 ± 0.11	—	2.1 ± 0.4	0.13 ± 0.09	0.08 ± 0.16	2.2 ± 0.4	—
A08-A01-SD-010	0.45 ± 0.16	0.14 ± 0.12	0.7 ± 0.4	0.3 ± 0.2	0.50 ± 0.16	0.40 ± 0.14	0.37 ± 0.13	0.3 ± 0.2	—	6.4 ± 0.9	0.34 ± 0.14	0.3 ± 0.3	6.6 ± 1.0	—
A08-A01-SD-011	0.50 ± 0.18	0.18 ± 0.16	0.5 ± 0.4	0.3 ± 0.3	0.51 ± 0.17	0.39 ± 0.14	0.40 ± 0.15	0.3 ± 0.3	—	36 ± 5	2.2 ± 0.5	2.6 ± 0.6	41 ± 5	—
A08-A01-SD-012	0.55 ± 0.18	0.58 ± 0.16	0.2 ± 0.3	0.13 ± 0.19	0.21 ± 0.10	0.9 ± 0.2	0.26 ± 0.11	0.13 ± 0.19	—	6.0 ± 0.9	0.23 ± 0.11	0.2 ± 0.3	5.5 ± 0.8	—
A08-A01-SD-013	0.9 ± 0.2	0.47 ± 0.14	0.6 ± 0.4	0.57 ± 0.17	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	0.57 ± 0.17	—	2.6 ± 0.5	0.13 ± 0.09	0.0 ± 0.4	2.5 ± 0.5	—

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-81
SOR FOR IA02 NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-A01-SD-001R	0.85 ± 0.07
A08-A01-SD-002	0
A08-A01-SD-003	0
A08-A01-SD-004	1.45 ± 0.18
A08-A01-SD-005	0
A08-A01-SD-006	0
A08-A01-SD-007	2.6 ± 0.3
A08-A01-SD-008	2.9 ± 0.3
A08-A01-SD-009	0.22 ± 0.04
A08-A01-SD-010	0.86 ± 0.10
A08-A01-SD-011	5.9 ± 0.6
A08-A01-SD-012	0.76 ± 0.09
A08-A01-SD-013	0.4 ± 0.4

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-82
COPC CONCENTRATIONS IN IA02 GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a,b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A02MW06-F	0.07 ± 0.08	0.3 ± 0.3	0.02 ± 0.06	0.30 ± 0.12	-0.01 ± 0.03	1.7 ± 0.3	0.07 ± 0.07	1.5 ± 0.3
A02MW06-U	0.09 ± 0.08	0.2 ± 0.3	0.03 ± 0.07	0.07 ± 0.06	0.01 ± 0.04	2.1 ± 0.4	0.06 ± 0.07	1.7 ± 0.3
A02MW08-F	0.24 ± 0.11	0.0 ± 0.2	-0.01 ± 0.05	0.18 ± 0.09	-0.01 ± 0.03	0.29 ± 0.11	0.01 ± 0.04	0.12 ± 0.08
A02MW08-U	0.23 ± 0.11	0.1 ± 0.2	0.02 ± 0.06	0.18 ± 0.10	0.01 ± 0.04	0.45 ± 0.15	—	0.26 ± 0.11
A02MW09-F	0.09 ± 0.09	0.0 ± 0.3	-0.01 ± 0.05	0.25 ± 0.11	0.02 ± 0.04	4.3 ± 0.6	0.18 ± 0.10	4.5 ± 0.6
A02MW09-U	0.09 ± 0.08	-0.4 ± 0.3	0.02 ± 0.05	0.21 ± 0.11	0.01 ± 0.03	4.2 ± 0.6	0.25 ± 0.12	4.7 ± 0.6
A02MW11-F	0.36 ± 0.13	0.2 ± 0.2	-0.02 ± 0.08	0.19 ± 0.10	0.00 ± 0.04	2.3 ± 0.4	0.17 ± 0.10	2.0 ± 0.4
A02MW11-U	0.24 ± 0.11	0.3 ± 0.2	0.01 ± 0.07	0.09 ± 0.07	0.02 ± 0.05	2.6 ± 0.4	0.20 ± 0.11	2.6 ± 0.4
A02MW1-F	0.21 ± 0.08	0.6 ± 0.2	0.02 ± 0.06	0.22 ± 0.08	0.04 ± 0.05	1.10 ± 0.19	0.02 ± 0.05	1.07 ± 0.19
A02MW1-U	0.25 ± 0.09	1.0 ± 0.2	-0.01 ± 0.05	0.29 ± 0.11	0.00 ± 0.04	1.2 ± 0.2	0.02 ± 0.04	0.90 ± 0.17
A02MW2-F	0.15 ± 0.09	0.0 ± 0.4	0.02 ± 0.04	0.20 ± 0.10	-0.01 ± 0.03	6.0 ± 0.7	0.31 ± 0.13	6.8 ± 0.8
A02MW2-U	0.17 ± 0.09	0.3 ± 0.3	0.02 ± 0.04	0.22 ± 0.11	0.00 ± 0.06	6.2 ± 0.7	0.27 ± 0.12	7.2 ± 0.8
A02MW3-F	0.20 ± 0.12	0.0 ± 0.3	0.05 ± 0.11	0.10 ± 0.07	-0.01 ± 0.04	1.9 ± 0.3	0.08 ± 0.07	1.9 ± 0.3
A02MW3-U	0.20 ± 0.11	0.07 ± 0.19	0.00 ± 0.05	0.22 ± 0.10	0.00 ± 0.04	2.1 ± 0.3	0.02 ± 0.06	1.7 ± 0.3
A02MW4-F	0.15 ± 0.08	0.09 ± 0.20	0.05 ± 0.06	0.23 ± 0.09	0.00 ± 0.04	17.9 ± 1.4	0.73 ± 0.16	16.1 ± 1.3
A02MW4-U	0.38 ± 0.10	0.27 ± 0.17	0.13 ± 0.08	0.21 ± 0.10	0.01 ± 0.05	17.9 ± 1.4	0.75 ± 0.17	16.2 ± 1.3
A02MW5-F	0.19 ± 0.11	0.1 ± 0.2	0.02 ± 0.06	0.30 ± 0.13	-0.01 ± 0.04	2.6 ± 0.4	0.19 ± 0.10	2.2 ± 0.4
A02MW5-U	0.12 ± 0.10	0.2 ± 0.2	0.06 ± 0.09	0.27 ± 0.12	-0.01 ± 0.04	2.5 ± 0.4	0.07 ± 0.07	2.3 ± 0.4

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-83
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS IN IA02 GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration[a,b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A02MW06-F	0.4 ± 0.3	4.4 ± 0.8
A02MW06-U	0.3 ± 0.3	5.2 ± 1.0
A02MW08-F	0.3 ± 0.3	0.4 ± 0.2
A02MW08-U	0.4 ± 0.3	0.8 ± 0.3
A02MW09-F	0.1 ± 0.3	13.6 ± 1.7
A02MW09-U	-0.3 ± 0.3	14.2 ± 1.8
A02MW11-F	0.5 ± 0.3	6.1 ± 1.1
A02MW11-U	0.5 ± 0.3	8.0 ± 1.3
A02MW1-F	0.8 ± 0.2	3.2 ± 0.6
A02MW1-U	1.2 ± 0.3	2.7 ± 0.5
A02MW2-F	0.1 ± 0.4	20 ± 2
A02MW2-U	0.4 ± 0.3	21 ± 2
A02MW3-F	0.2 ± 0.3	5.7 ± 1.0
A02MW3-U	0.3 ± 0.2	5.0 ± 0.9
A02MW4-F	0.2 ± 0.2	48 ± 4
A02MW4-U	0.66 ± 0.20	49 ± 4
A02MW5-F	0.3 ± 0.3	6.6 ± 1.0
A02MW5-U	0.3 ± 0.3	6.8 ± 1.1

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-84
COPC CONCENTRATIONS IN IA03 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A03SL-001-01	—	—	—	—	—	—	—	—	0.6 ± 0.4	—	—	—	—	1.9 ± 1.1
A03SL-002-01	—	—	—	—	0.8 ± 0.3	1.4 ± 0.4	1.1 ± 0.3	—	1.00 ± 0.17	1.4 ± 0.3	0.07 ± 0.06	—	1.3 ± 0.3	2.6 ± 0.6
A03SL-003-01	—	—	—	—	—	—	—	—	0.6 ± 0.3	—	—	—	—	1.7 ± 0.7
A03SL-004-01	—	—	—	—	—	—	—	—	0.4 ± 0.2	—	—	—	—	1.9 ± 0.7
A03SL-005-01	—	—	—	—	—	—	—	—	0.9 ± 0.3	—	—	—	—	2.1 ± 1.1
A03SL-006-01	—	—	—	—	—	—	—	—	0.57 ± 0.17	—	—	—	—	3.4 ± 0.7
A03SL-007-01	—	—	—	—	—	—	—	—	0.69 ± 0.17	—	—	—	—	2.1 ± 0.5
A03SL-008-01	—	—	—	—	—	—	—	—	0.53 ± 0.18	—	—	—	—	2.8 ± 0.7
A03SL-009-01	1.8 ± 0.3	0.81 ± 0.14	1.3 ± 0.5	1.0 ± 0.2	1.4 ± 0.3	1.3 ± 0.3	1.1 ± 0.3	1.0 ± 0.2	1.2 ± 0.3	2.1 ± 0.4	0.10 ± 0.07	0.05 ± 0.20	2.3 ± 0.4	3.5 ± 1.4
A03SL-010-01	—	—	—	—	—	—	—	—	0.54 ± 0.16	—	—	—	—	2.1 ± 0.7
A03SL-011-01	—	—	—	—	1.5 ± 0.3	1.5 ± 0.3	1.7 ± 0.3	—	2.5 ± 0.3	2.6 ± 0.4	0.10 ± 0.08	—	2.6 ± 0.4	3.3 ± 0.8
A03SL-012-01	—	—	—	—	—	—	—	—	0.67 ± 0.15	—	—	—	—	1.9 ± 0.6
A03SL-013-01	—	—	—	—	—	—	—	—	0.92 ± 0.18	—	—	—	—	2.0 ± 0.7
A03SL-014-01	—	—	—	—	—	—	—	—	0.30 ± 0.14	—	—	—	—	2.0 ± 0.6
A03SL-015-01	—	—	—	—	—	—	—	—	0.50 ± 0.13	—	—	—	—	1.9 ± 0.7
A03SL-016-01	—	—	—	—	—	—	—	—	0.55 ± 0.15	—	—	—	—	2.1 ± 0.7
A03SL-017-01	—	—	—	—	—	—	—	—	0.46 ± 0.17	—	—	—	—	3.0 ± 1.0
A03SL-018-01	0.85 ± 0.15	1.4 ± 0.3	0.85 ± 0.15	0.8 ± 0.2	1.2 ± 0.3	1.0 ± 0.2	1.0 ± 0.3	0.8 ± 0.2	1.3 ± 0.3	3.2 ± 0.5	0.11 ± 0.08	0.4 ± 0.3	3.5 ± 0.5	3.3 ± 0.7
A03SL-019-01	—	—	—	—	—	—	—	—	0.61 ± 0.14	—	—	—	—	1.5 ± 0.6
A03SL-020-01	—	—	—	—	—	—	—	—	0.82 ± 0.17	—	—	—	—	3.0 ± 0.8

TABLE 4-84
COPC CONCENTRATIONS IN IA03 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A03SL-021-01	—	—	—	—	0.45 ± 0.17	2.6 ± 0.4	0.58 ± 0.19	—	0.69 ± 0.15	4.7 ± 0.6	0.25 ± 0.11	—	4.4 ± 0.6	4.5 ± 1.0
A03SL-022-01	—	—	—	—	—	—	—	—	0.52 ± 0.16	—	—	—	—	4.2 ± 0.8
A03SL-023-01	—	—	—	—	—	—	—	—	0.55 ± 0.15	—	—	—	—	2.5 ± 0.7
A03SL-024-01	—	—	—	—	—	—	—	—	0.44 ± 0.14	—	—	—	—	7.6 ± 1.0
A03SL-025-01	—	—	—	—	—	—	—	—	0.34 ± 0.12	—	—	—	—	2.7 ± 0.9
A03SL-026-01	—	—	—	—	0.46 ± 0.16	0.8 ± 0.2	0.52 ± 0.17	—	0.53 ± 0.14	10.6 ± 1.1	0.48 ± 0.17	—	11.0 ± 1.2	8.7 ± 1.2
A03SL-027-01	—	—	—	—	0.46 ± 0.17	0.64 ± 0.20	0.61 ± 0.19	—	0.58 ± 0.18	4.4 ± 0.6	0.19 ± 0.10	—	4.8 ± 0.6	4.7 ± 0.9
A03SL-028-01	—	—	—	—	0.41 ± 0.11	0.49 ± 0.12	0.39 ± 0.10	—	0.32 ± 0.13	6.2 ± 0.5	0.33 ± 0.09	—	6.1 ± 0.5	5.6 ± 0.8
A03SL-029-01	—	—	—	—	0.60 ± 0.18	0.9 ± 0.2	0.44 ± 0.15	—	0.30 ± 0.15	5.6 ± 0.7	0.18 ± 0.09	—	6.2 ± 0.7	5.5 ± 0.7
A03SL-030-01	—	—	—	—	—	—	—	—	0.47 ± 0.13	—	—	—	—	2.4 ± 0.6
A03SL-031-01	—	—	—	—	0.53 ± 0.16	0.9 ± 0.2	0.45 ± 0.15	—	0.48 ± 0.14	24 ± 2	1.0 ± 0.2	—	24 ± 2	15.5 ± 1.3
A03SL-032-01	—	—	—	—	—	—	—	—	0.48 ± 0.13	—	—	—	—	3.0 ± 0.6
A03SL-033-01	—	—	—	—	0.56 ± 0.17	0.9 ± 0.2	0.42 ± 0.14	—	0.50 ± 0.15	5.9 ± 0.7	0.26 ± 0.11	—	6.2 ± 0.7	5.5 ± 1.2
A03SL-034-01	—	—	—	—	—	—	—	—	0.47 ± 0.19	—	—	—	—	2.9 ± 0.8
A03SL-035-01	—	—	—	—	0.46 ± 0.20	0.47 ± 0.19	0.20 ± 0.12	—	0.09 ± 0.13	6.9 ± 0.8	0.31 ± 0.13	—	7.6 ± 0.9	4.0 ± 1.2
A03SL-036-01	1.0 ± 0.2	0.9 ± 0.3	0.6 ± 0.3	0.5 ± 0.3	0.72 ± 0.18	1.0 ± 0.2	0.73 ± 0.18	0.5 ± 0.3	0.7 ± 0.3	3.5 ± 0.5	0.13 ± 0.08	0.0 ± 0.5	3.7 ± 0.5	4.9 ± 1.2
A03SL-037-01	—	—	—	—	1.3 ± 0.3	0.82 ± 0.20	1.0 ± 0.2	—	1.3 ± 0.2	7.5 ± 0.9	0.30± 0.13	—	7.4 ± 0.8	7.1 ± 1.2
A03SL-038-01	0.67 ± 0.20	—	0.2 ± 0.2	—	0.50 ± 0.16	0.75 ± 0.20	0.28 ± 0.12	—	0.45 ± 0.15	56 ± 5	3.2 ± 0.5	—	58 ± 5	40 ± 2
A03SL-039-01	—	—	—	—	—	—	—	—	0.25 ± 0.13	—	—	—	—	4.0 ± 1.0

TABLE 4-84
COPC CONCENTRATIONS IN IA03 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A03SL-040-01	0.40 ± 0.15	—	0.3 ± 0.2	—	0.56 ± 0.17	0.65 ± 0.18	0.40 ± 0.14	—	0.30 ± 0.12	5.8 ± 0.7	0.34 ± 0.13	—	5.8 ± 0.7	6.3 ± 0.8
A03SL-041-01	—	—	—	—	—	—	—	—	0.75 ± 0.15	—	—	—	—	2.8 ± 0.7
A03SL-042-01	—	—	—	—	1.1 ± 0.2	1.2 ± 0.2	1.0 ± 0.2	—	0.91 ± 0.19	4.1 ± 0.5	0.26 ± 0.12	—	4.2 ± 0.5	6.7 ± 1.0
A03SL-201-01	—	—	—	—	—	—	—	—	0.45 ± 0.17	—	—	—	—	2.5 ± 0.7
A03SL-202-01	—	—	—	—	—	—	—	—	0.47 ± 0.15	—	—	—	—	1.7 ± 0.5
A03SL-203-01	1.9 ± 0.3	—	1.5 ± 0.4	—	1.6 ± 0.3	1.1 ± 0.3	1.4 ± 0.3	—	2.6 ± 0.4	1.4 ± 0.3	0.04 ± 0.05	—	1.4 ± 0.3	3.9 ± 1.0
A03SL-204-01	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	2.1 ± 0.7
A03SL-205-01	—	—	—	—	—	—	—	—	0.44 ± 0.17	—	—	—	—	2.2 ± 0.7
A03SL-206-01	—	—	—	—	—	—	—	—	0.79 ± 0.19	—	—	—	—	2.8 ± 0.8
A03SL-207-01	—	—	—	—	—	—	—	—	0.38 ± 0.15	—	—	—	—	2.8 ± 0.8
A03SL-208-01	—	—	—	—	—	—	—	—	0.6 ± 0.3	—	—	—	—	3.4 ± 0.9
A03SL-209-01	0.8 ± 0.2	—	0.20 ± 0.19	—	0.66 ± 0.18	1.0 ± 0.2	0.52 ± 0.16	—	0.59 ± 0.18	14.5 ± 1.4	0.8 ± 0.2	—	15.9 ± 1.5	10.3 ± 1.4
A03SL-210-01	—	—	—	—	—	—	—	—	0.49 ± 0.15	—	—	—	—	3.0 ± 0.7
A03SL-214-01	—	—	—	—	—	—	—	—	0.28 ± 0.15	—	—	—	—	2.0 ± 0.6
A03SL-215-01	—	—	—	—	—	—	—	—	0.44 ± 0.16	—	—	—	—	2.5 ± 0.7
A03SL-216-01	—	—	—	—	—	—	—	—	0.58 ± 0.14	—	—	—	—	1.3 ± 0.7
A03SL-217-01	—	—	—	—	0.58 ± 0.17	0.75 ± 0.19	0.63 ± 0.17	—	0.56 ± 0.15	3.3 ± 0.5	0.11 ± 0.08	—	3.3 ± 0.5	4.3 ± 0.7
A03SL-218-01	—	—	—	—	—	—	—	—	0.59 ± 0.15	—	—	—	—	3.8 ± 0.7
A03SL-220-01	—	—	—	—	—	—	—	—	0.44 ± 0.15	—	—	—	—	2.7 ± 0.7

TABLE 4-84
COPC CONCENTRATIONS IN IA03 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A03SL-221-01	1.1 ± 0.3	—	0.7 ± 0.4	—	0.58 ± 0.17	0.65 ± 0.18	0.73 ± 0.19	—	1.5 ± 0.3	3.7 ± 0.5	0.12 ± 0.08	—	3.9 ± 0.5	3.7 ± 1.1
A03SL-222-01	—	—	—	—	—	—	—	—	0.56 ± 0.16	—	—	—	—	2.0 ± 0.8
A03SL-223-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	2.9 ± 0.9
A03SL-224-01	0.8 ± 0.2	—	0.3 ± 0.3	—	0.77 ± 0.20	1.0 ± 0.2	1.1 ± 0.2	—	0.46 ± 0.18	11.1 ± 1.1	0.68 ± 0.19	—	11.9 ± 1.2	10.1 ± 1.7
A03SL-225-01	—	—	—	—	—	—	—	—	0.31 ± 0.13	—	—	—	—	2.6 ± 0.9
A03SL-226-01	—	0.52 ± 0.12	—	0.42 ± 0.14	0.56 ± 0.16	1.0 ± 0.2	0.68 ± 0.18	0.42 ± 0.14	0.64 ± 0.14	5.7 ± 0.7	0.18 ± 0.10	0.22 ± 0.18	6.7 ± 0.8	6.3 ± 1.4
A03SL-228-01	0.9 ± 0.2	—	0.6 ± 0.3	—	0.54 ± 0.18	0.52 ± 0.17	0.41 ± 0.15	—	0.48 ± 0.14	7.6 ± 0.8	0.35 ± 0.14	—	7.9 ± 0.9	5.7 ± 1.1
A03SL-230-01	—	—	—	—	—	—	—	—	0.33 ± 0.17	—	—	—	—	2.2 ± 0.7
A03SL-231-01	0.67 ± 0.18	—	0.8 ± 0.3	—	0.54 ± 0.17	0.9 ± 0.2	0.51 ± 0.16	—	0.69 ± 0.14	20.8 ± 2.0	1.0 ± 0.2	—	20.4 ± 1.9	14.7 ± 1.6
A03SL-232-01	0.73 ± 0.18	—	0.8 ± 0.4	—	0.67 ± 0.19	1.0 ± 0.2	0.53 ± 0.17	—	0.69 ± 0.17	4.8 ± 0.6	0.35 ± 0.13	—	5.2 ± 0.6	5.7 ± 0.7
A03SL-233-01	0.84 ± 0.20	—	0.8 ± 0.4	—	0.72 ± 0.19	0.85 ± 0.20	0.83 ± 0.20	—	0.54 ± 0.14	4.4 ± 0.6	0.34 ± 0.13	—	4.8 ± 0.6	5.9 ± 0.8
A03SL-234-01	0.85 ± 0.20	—	0.8 ± 0.4	—	0.9 ± 0.2	0.9 ± 0.2	0.8 ± 0.2	—	0.99 ± 0.18	3.6 ± 0.5	0.16 ± 0.09	—	4.4 ± 0.6	4.5 ± 0.8
A03SL-236-01	—	—	—	—	—	—	—	—	1.03 ± 0.20	—	—	—	—	2.2 ± 0.7
A03SL-237-01	1.0 ± 0.2	—	1.2 ± 0.4	—	1.3 ± 0.3	0.9 ± 0.2	1.0 ± 0.2	—	1.0 ± 0.3	5.9 ± 0.7	0.22 ± 0.10	—	6.3 ± 0.7	8.6 ± 1.1
A03SL-239-01	—	—	—	—	0.7 ± 0.2	0.63 ± 0.20	0.54 ± 0.18	—	0.50 ± 0.14	7.5 ± 0.8	0.41 ± 0.14	—	7.4 ± 0.8	4.4 ± 1.1
A03SL-240-01	—	—	—	—	—	—	—	—	0.17 ± 0.12	—	—	—	—	4.0 ± 1.0
A03SL-241-01	—	—	—	—	—	—	—	—	0.68 ± 0.17	—	—	—	—	3.8 ± 0.9

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-85
SOR FOR IA03 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
A03SL-001-01	—	0
A03SL-002-01	0.8 ± 0.6	1.0 ± 0.4
A03SL-003-01	—	0
A03SL-004-01	—	0
A03SL-005-01	—	0.5 ± 0.7
A03SL-006-01	—	0.40 ± 0.11
A03SL-007-01	—	0
A03SL-008-01	—	0.30 ± 0.10
A03SL-009-01	1.2 ± 0.5	1.6 ± 0.6
A03SL-010-01	—	0
A03SL-011-01	2.5 ± 0.7	4.1 ± 0.6
A03SL-012-01	—	0
A03SL-013-01	—	0.6 ± 0.4
A03SL-014-01	—	0
A03SL-015-01	—	0
A03SL-016-01	—	0
A03SL-017-01	—	0.34 ± 0.15
A03SL-018-01	0.8 ± 0.4	1.7 ± 0.5
A03SL-019-01	—	0
A03SL-020-01	—	0.7 ± 0.4
A03SL-021-01	1.5 ± 0.3	0.57 ± 0.15
A03SL-022-01	—	0.52 ± 0.12
A03SL-023-01	—	0.26 ± 0.10
A03SL-024-01	—	1.05 ± 0.15
A03SL-025-01	—	0.29 ± 0.13
A03SL-026-01	1.49 ± 0.12	1.21 ± 0.18
A03SL-027-01	0.56 ± 0.06	0.59 ± 0.13
A03SL-028-01	0.80 ± 0.05	0.74 ± 0.13
A03SL-029-01	0.76 ± 0.07	0.72 ± 0.11
A03SL-030-01	—	0.24 ± 0.09
A03SL-031-01	3.5 ± 0.2	2.26 ± 0.19
A03SL-032-01	—	0.33 ± 0.10
A03SL-033-01	0.78 ± 0.07	0.73 ± 0.18
A03SL-034-01	—	0.33 ± 0.13
A03SL-035-01	0.96 ± 0.09	0.49 ± 0.18
A03SL-036-01	0.42 ± 0.05	0.63 ± 0.18
A03SL-037-01	1.4 ± 0.4	2.4 ± 0.5
A03SL-038-01	8.7 ± 0.5	6.0 ± 0.4
A03SL-039-01	—	0.50 ± 0.16
A03SL-040-01	0.74 ± 0.07	0.85 ± 0.13
A03SL-041-01	—	0.31 ± 0.11
A03SL-042-01	1.1 ± 0.4	1.5 ± 0.4
A03SL-201-01	—	0.25 ± 0.10
A03SL-202-01	—	0
A03SL-203-01	1.3 ± 0.6	4.4 ± 0.8
A03SL-204-01	—	0
A03SL-205-01	—	0
A03SL-206-01	—	0.6 ± 0.4

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
A03SL-207-01	—	0.31 ± 0.12
A03SL-208-01	—	0.40 ± 0.14
A03SL-209-01	2.14± 0.15	1.5 ± 0.2
A03SL-210-01	—	0.33 ± 0.11
A03SL-214-01	—	0
A03SL-215-01	—	0.25 ± 0.10
A03SL-216-01	—	0
A03SL-217-01	0.38 ± 0.05	0.54 ± 0.11
A03SL-218-01	—	0.46 ± 0.12
A03SL-220-01	—	0.29 ± 0.10
A03SL-221-01	0.45 ± 0.05	2.2 ± 0.5
A03SL-222-01	—	0
A03SL-223-01	—	0.32 ± 0.14
A03SL-224-01	2.0 ± 0.4	1.4 ± 0.3
A03SL-225-01	—	0.28 ± 0.13
A03SL-226-01	0.80 ± 0.08	0.8 ± 0.2
A03SL-228-01	1.04 ± 0.09	0.75 ± 0.17
A03SL-230-01	—	0
A03SL-231-01	3.1 ± 0.2	2.1 ± 0.2
A03SL-232-01	0.62 ± 0.06	0.74 ± 0.11
A03SL-233-01	0.56 ± 0.06	0.79 ± 0.12
A03SL-234-01	0.48 ± 0.05	1.3 ± 0.4
A03SL-236-01	—	0.8 ± 0.4
A03SL-237-01	1.2 ± 0.4	1.9 ± 0.6
A03SL-239-01	0.99 ± 0.09	0.55 ± 0.16
A03SL-240-01	—	0.49 ± 0.15
A03SL-241-01	—	0.45 ± 0.13

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 ⇒ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-86
COPC CONCENTRATIONS IN IA03 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a] [b]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A03SL-001-02	—	—	—	—	—	—	—	—	0.60 ± 0.16	—	—	—	—	2.6 ± 0.7
A03SL-003-02	—	—	—	—	—	—	—	—	0.81 ± 0.20	—	—	—	—	2.3 ± 1.0
A03SL-006-02	—	—	—	—	—	—	—	—	0.65 ± 0.19	—	—	—	—	1.1 ± 0.5
A03SL-007-02	—	—	—	—	—	—	—	—	0.62 ± 0.17	—	—	—	—	2.1 ± 0.6
A03SL-008-03	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	3.1 ± 0.6
A03SL-008-05	—	—	—	—	—	—	—	—	0.65 ± 0.15	—	—	—	—	2.6 ± 0.7
A03SL-009-02	1.6 ± 0.3	—	1.2 ± 0.4	—	1.2 ± 0.3	1.2 ± 0.3	0.9 ± 0.2	—	1.1 ± 0.4	2.2 ± 0.3	0.14 ± 0.08	—	2.5 ± 0.4	2.4 ± 0.9
A03SL-010-06	—	—	—	—	—	—	—	—	0.31 ± 0.14	—	—	—	—	1.2 ± 0.6
A03SL-011-02	—	—	—	—	1.9 ± 0.4	1.8 ± 0.3	1.9 ± 0.4	—	2.1 ± 0.3	1.6 ± 0.3	0.07 ± 0.06	—	1.9 ± 0.3	2.2 ± 0.8
A03SL-011-03	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	2.2 ± 0.7
A03SL-012-02	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	1.1 ± 0.6
A03SL-013-02	—	—	—	—	—	—	—	—	0.54 ± 0.15	—	—	—	—	1.2 ± 0.6
A03SL-015-02	1.1 ± 0.2	0.86 ± 0.17	0.5 ± 0.3	0.9 ± 0.2	1.1 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	0.9 ± 0.2	1.2 ± 0.2	1.9 ± 0.3	0.04 ± 0.04	0.2 ± 0.2	2.1 ± 0.3	3.8 ± 0.8
A03SL-016-02	—	—	—	—	—	—	—	—	0.67 ± 0.17	—	—	—	—	2.4 ± 0.7
A03SL-018-02	—	—	—	—	—	—	—	—	0.66 ± 0.16	—	—	—	—	3.2 ± 0.7
A03SL-018-03	—	—	—	—	0.7 ± 0.2	0.51 ± 0.18	0.8 ± 0.2	—	0.75 ± 0.18	9.4 ± 1.0	0.62 ± 0.18	—	9.3 ± 1.0	8.0 ± 1.0
A03SL-019-10	—	—	—	—	—	—	—	—	0.70 ± 0.14	—	—	—	—	1.2 ± 0.6
A03SL-019-11	—	—	—	—	—	—	—	—	0.55 ± 0.18	—	—	—	—	1.3 ± 0.6
A03SL-020-02	—	—	—	—	—	—	—	—	0.95 ± 0.20	—	—	—	—	1.6 ± 0.7

TABLE 4-86
COPC CONCENTRATIONS IN IA03 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A03SL-021-02	—	—	—	—	—	—	—	—	0.45 ± 0.13	—	—	—	—	4.1 ± 0.7
A03SL-022-02	—	—	—	—	0.68 ± 0.19	1.4 ± 0.3	0.71 ± 0.19	—	0.48 ± 0.14	6.3 ± 0.7	0.39 ± 0.14	—	7.6 ± 0.8	7.6 ± 1.0
A03SL-023-03	—	—	—	—	—	—	—	—	0.47 ± 0.14	—	—	—	—	3.9 ± 0.7
A03SL-025-02	—	—	—	—	—	—	—	—	0.56 ± 0.20	—	—	—	—	3.1 ± 0.9
A03SL-027-02	—	—	—	—	—	—	—	—	0.65 ± 0.15	—	—	—	—	2.5 ± 0.6
A03SL-028-03	1.7 ± 0.2	—	2.1 ± 0.3	—	2.8 ± 0.6	1.4 ± 0.4	2.9 ± 0.6	—	3.3 ± 0.3	3.1 ± 0.4	0.13 ± 0.08	—	2.9 ± 0.4	3.9 ± 0.9
A03SL-028-05	—	—	—	—	1.0 ± 0.3	0.9 ± 0.2	0.8 ± 0.2	—	1.61 ± 0.20	6.0 ± 0.7	0.32 ± 0.14	—	7.3 ± 0.8	7.3 ± 0.9
A03SL-029-11	—	—	—	—	—	—	—	—	0.83 ± 0.17	—	—	—	—	2.4 ± 0.7
A03SL-030-02	—	—	—	—	0.26 ± 0.11	2.2 ± 0.4	0.44 ± 0.15	—	0.5 ± 0.2	7.5 ± 0.8	0.34 ± 0.13	—	7.6 ± 0.8	8.4 ± 1.1
A03SL-031-02	0.72 ± 0.20	—	0.08 ± 0.19	—	0.53 ± 0.16	1.0 ± 0.2	0.39 ± 0.14	—	0.41 ± 0.15	18.7 ± 1.8	1.1 ± 0.3	—	19.0 ± 1.8	13.3 ± 1.2
A03SL-032-02	—	—	—	—	—	—	—	—	0.58 ± 0.16	—	—	—	—	2.4 ± 0.9
A03SL-033-02	—	—	—	—	—	—	—	—	0.48 ± 0.14	—	—	—	—	4.3 ± 1.1
A03SL-033-03	—	—	—	—	—	—	—	—	0.48 ± 0.16	—	—	—	—	5.0 ± 0.8
A03SL-035-02	0.33 ± 0.14	—	0.6 ± 0.3	—	0.72 ± 0.18	0.37 ± 0.14	0.48 ± 0.17	—	0.52 ± 0.19	76 ± 7	3.7 ± 0.6	—	79 ± 7	53 ± 3
A03SL-036-02	—	—	—	—	—	—	—	—	0.50 ± 0.14	—	—	—	—	0.7 ± 0.4
A03SL-037-02	—	—	—	—	—	—	—	—	0.82 ± 0.16	—	—	—	—	3.8 ± 1.2
A03SL-038-10	—	—	—	—	0.82 ± 0.19	1.0 ± 0.2	0.66 ± 0.17	—	0.6 ± 0.2	5.9 ± 0.7	0.30 ± 0.13	—	5.7 ± 0.7	7.2 ± 1.0
A03SL-038-11	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	4.3 ± 1.3
A03SL-039-02	0.61 ± 0.19	—	0.6 ± 0.3	—	0.61 ± 0.18	0.61 ± 0.18	0.52 ± 0.16	—	0.31 ± 0.18	7.2 ± 0.8	0.43 ± 0.15	—	7.2 ± 0.8	30 ± 3

TABLE 4-86
COPC CONCENTRATIONS IN IA03 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A03SL-041-02	—	—	—	—	—	—	—	—	0.53 ± 0.16	—	—	—	—	1.7 ± 0.7
A03SL-042-02	—	—	—	—	0.38 ± 0.15	0.36 ± 0.15	0.18 ± 0.10	—	1.0 ± 0.2	3.5 ± 0.5	0.11 ± 0.08	—	3.9 ± 0.5	4.9 ± 0.8
A03SL-201-02	—	—	—	—	—	—	—	—	0.45 ± 0.14	—	—	—	—	2.5 ± 0.6
A03SL-202-05	—	—	—	—	—	—	—	—	0.51 ± 0.14	—	—	—	—	1.8 ± 0.9
A03SL-203-02	—	—	—	—	—	—	—	—	1.05 ± 0.19	—	—	—	—	1.7 ± 0.7
A03SL-207-06	—	—	—	—	—	—	—	—	0.61 ± 0.15	—	—	—	—	3.2 ± 0.7
A03SL-208-09	—	—	—	—	—	—	—	—	0.56 ± 0.16	—	—	—	—	3.4 ± 0.7
A03SL-209-06	—	—	—	—	—	—	—	—	0.31 ± 0.14	—	—	—	—	1.0 ± 0.6
A03SL-210-06	—	—	—	—	—	—	—	—	0.19 ± 0.12	—	—	—	—	0.9 ± 0.5
A03SL-214-06	—	—	—	—	0.67 ± 0.14	1.11 ± 0.18	0.56 ± 0.12	—	0.7 ± 0.2	4.4 ± 0.4	0.28 ± 0.08	—	5.3 ± 0.5	5.0 ± 1.0
A03SL-215-06	—	—	—	—	—	—	—	—	0.40 ± 0.15	—	—	—	—	3.3 ± 0.8
A03SL-216-10	1.0 ± 0.2	—	0.7 ± 0.4	—	0.83 ± 0.19	1.0 ± 0.2	0.87 ± 0.20	—	0.88 ± 0.16	6.5 ± 0.7	0.30 ± 0.12	—	6.3 ± 0.7	7.2 ± 0.8
A03SL-216-14	—	—	—	—	—	—	—	—	0.9 ± 0.3	—	—	—	—	3.6 ± 1.2
A03SL-217-13	0.31 ± 0.11	0.15 ± 0.11	0.4 ± 0.2	0.27 ± 0.19	0.38 ± 0.15	0.28 ± 0.12	0.26 ± 0.12	0.27 ± 0.19	0.44 ± 0.19	119 ± 9	3.7 ± 0.2	4.4 ± 0.8	122 ± 9	85 ± 4
A03SL-217-14	0.9 ± 0.2	—	0.4 ± 0.2	—	0.48 ± 0.16	0.62 ± 0.18	0.42 ± 0.15	—	0.68 ± 0.17	35 ± 3	1.9 ± 0.4	—	39 ± 4	27 ± 2
A03SL-218-10	—	—	—	—	—	—	—	—	0.44 ± 0.15	—	—	—	—	0.4 ± 0.7
A03SL-220-02	—	—	—	—	—	—	—	—	1.14 ± 0.17	—	—	—	—	1.5 ± 0.7
A03SL-222-10	—	—	—	—	0.37 ± 0.14	1.0 ± 0.3	0.43 ± 0.15	—	2.5 ± 0.3	5.3 ± 0.6	0.48 ± 0.16	—	7.6 ± 0.8	6.7 ± 1.1
A03SL-222-13	—	—	—	—	—	—	—	—	0.62 ± 0.20	—	—	—	—	1.6 ± 0.7

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REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A03SL-223-05	—	—	—	—	0.70 ± 0.20	1.1 ± 0.3	0.59 ± 0.18	—	0.77 ± 0.16	7.2 ± 0.8	0.34 ± 0.13	—	8.1 ± 0.9	7.0 ± 1.2
A03SL-224-02	—	—	—	—	2.3 ± 0.4	0.9 ± 0.2	2.5 ± 0.4	—	0.33 ± 0.19	6.7 ± 0.8	0.39 ± 0.15	—	6.4 ± 0.7	5.4 ± 1.3
A03SL-224-05	—	—	—	—	0.84 ± 0.20	1.0 ± 0.2	0.80 ± 0.19	—	1.16 ± 0.20	6.1 ± 0.7	0.22 ± 0.11	—	6.4 ± 0.7	5.1 ± 1.2
A03SL-225-10	—	—	—	—	—	—	—	—	0.97 ± 0.20	—	—	—	—	1.5 ± 0.7
A03SL-226-25	—	—	—	—	—	—	—	—	0.60 ± 0.16	—	—	—	—	1.0 ± 0.7
A03SL-227-04	0.10 ± 0.07	—	0.7 ± 0.4	—	0.73 ± 0.19	0.73 ± 0.19	0.54 ± 0.17	—	0.32 ± 0.19	4.3 ± 0.6	0.22 ± 0.11	—	4.4 ± 0.6	5.4 ± 1.1
A03SL-227-18	—	—	—	—	—	—	—	—	0.59 ± 0.18	—	—	—	—	4.2 ± 0.8
A03SL-228-06	0.80 ± 0.15	—	0.6 ± 0.3	—	0.54 ± 0.17	0.8 ± 0.2	0.52 ± 0.16	—	0.62 ± 0.17	5.0 ± 0.6	0.23 ± 0.11	—	5.5 ± 0.7	5.2 ± 1.0
A03SL-230-06	—	—	—	—	—	—	—	—	0.86 ± 0.19	—	—	—	—	2.5 ± 0.7
A03SL-231-02	0.84 ± 0.20	—	0.9 ± 0.4	—	0.8 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	—	1.6 ± 0.3	18.7 ± 1.8	0.8 ± 0.2	—	18.6 ± 1.8	17 ± 2
A03SL-231-05	—	—	—	—	0.9 ± 0.2	1.0 ± 0.3	0.9 ± 0.2	—	0.74 ± 0.16	13.1 ± 1.3	0.71 ± 0.20	—	13.2 ± 1.3	10.3 ± 1.4
A03SL-232-06	0.73 ± 0.18	0.61 ± 0.12	0.8 ± 0.3	0.61 ± 0.22	0.8 ± 0.2	0.9 ± 0.2	0.59 ± 0.18	0.61 ± 0.12	1.05 ± 0.17	6.2 ± 0.7	0.35 ± 0.13	0.30 ± 0.18	6.4 ± 0.7	5.5 ± 1.0
A03SL-233-07	—	0.42 ± 0.14	—	2.1 ± 0.3	1.3 ± 0.3	0.6 ± 0.2	0.9 ± 0.3	2.1 ± 0.3	2.7 ± 0.2	4.8 ± 0,6	0.26 ± 0.12	0.2 ± 0.3	5.2 ± 0.6	5.1 ± 1.2
A03SL-233-09	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	2.6 ± 0.9
A03SL-234-13	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	3.8 ± 0.7
A03SL-237-10	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	1.5 ± 0.7
A03SL-239-10	—	—	—	—	—	—	—	—	2.3 ± 0.2	—	—	—	—	3.4 ± 1.0
A03SL-239-11	—	—	—	—	3.5 ± 0.5	3.0 ± 0.5	2.8 ± 0.4	—	3.7 ± 0.4	4.9 ± 0.6	0.19 ± 0.10	—	4.6 ± 0.6	5.6 ± 1.7
A03SL-239-13	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	2.2 ± 1.0

TABLE 4-86
COPC CONCENTRATIONS IN IA03 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a] [b]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A03SL-240-06	0.9 ± 0.2	—	0.9 ± 0.4	—	0.50 ± 0.18	0.8 ± 0.2	0.61 ± 0.19	—	1.1 ± 0.2	15 .0± 1.5	0.8 ± 0.2	—	16.3 ± 1.3	14.5 ± 1.6
A03SL-240-07	1.0 ± 0.2	—	0.7 ± 0.3	—	0.75 ± 0.14	0.93 ± 0.16	0.72 ± 0.14	—	0.64 ± 0.19	22.1 ± 1.5	1.19 ± 0.19	—	23.2 ± 1.6	17.7 ± 1.9

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-87
SOR FOR IA03 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
A03SL-001-02	—	0.28 ± 0.10
A03SL-003-02	—	0.6 ± 0.4
A03SL-006-02	—	0
A03SL-007-02	—	0
A03SL-008-03	—	0.9 ± 0.5
A03SL-008-05	—	0.29 ± 0.10
A03SL-009-02	0.5 ± 0.3	1.2 ± 0.8
A03SL-010-06	—	0
A03SL-011-02	1.7 ± 0.4	2.9 ± 0.5
A03SL-011-03	—	1.0 ± 0.4
A03SL-012-02	—	0
A03SL-013-02	—	0
A03SL-015-02	0.5 ± 0.3	1.7 ± 0.5
A03SL-016-02	—	0.24 ± 0.10
A03SL-018-02	—	0.37 ± 0.11
A03SL-018-03	1.30 ± 0.10	1.4 ± 0.4
A03SL-019-10	—	0
A03SL-019-11	—	0
A03SL-020-02	—	0.7 ± 0.4
A03SL-021-02	—	0.51 ± 0.10
A03SL-022-02	1.21 ± 0.18	1.05 ± 0.15
A03SL-023-03	—	0.47 ± 0.11
A03SL-025-02	—	0.36 ± 0.14
A03SL-027-02	—	0.26 ± 0.09
A03SL-028-03	2.9 ± 0.6	5.9 ± 0.7
A03SL-028-05	0.89 ± 0.08	3.0 ± 0.4
A03SL-029-11	—	0.7 ± 0.4
A03SL-030-02	1.8 ± 0.2	1.18 ± 0.18
A03SL-031-02	2.83 ± 0.19	1.92 ± 0.18
A03SL-032-02	—	0.24 ± 0.14
A03SL-033-02	—	0.54 ± 0.17
A03SL-033-03	—	0.65 ± 0.12
A03SL-035-02	11.8 ± 0.7	8.0 ± 0.5
A03SL-036-02	—	0
A03SL-037-02	—	0.9 ± 0.4
A03SL-038-10	0.77 ± 0.07	0.99 ± 0.16
A03SL-038-11	—	0.8 ± 0.5
A03SL-039-02	0.98 ± 0.09	4.5 ± 0.4
A03SL-041-02	—	0
A03SL-042-02	0.45 ± 0.05	1.3 ± 0.5
A03SL-201-02	—	0.26 ± 0.09
A03SL-202-05	—	0
A03SL-203-02	—	0.9 ± 0.4
A03SL-207-06	—	0.38 ± 0.11
A03SL-208-09	—	0.40 ± 0.11
A03SL-209-06	—	0
A03SL-210-06	—	0
A03SL-214-06	0.76 ± 0.12	0.65 ± 0.15
A03SL-215-06	—	0.39 ± 0.12
A03SL-216-10	0.86 ± 0.08	1.5 ± 0.4
A03SL-216-14	—	0.9 ± 0.6
A03SL-217-13	18.2 ± 1.0	12.9 ± 0.7
A03SL-217-14	5.7 ± 0.4	4.0 ± 0.3
A03SL-218-10	—	0
A03SL-220-02	—	1.1 ± 0.3
A03SL-222-10	0.86 ± 0.08	4.7 ± 0.7
A03SL-222-13	—	0
A03SL-223-05	1.17 ± 0.17	1.2 ± 0.4
A03SL-224-02	2.7 ± 0.4	0.7 ± 0.2
A03SL-224-05	0.83 ± 0.08	1.8 ± 0.4
A03SL-225-10	—	0.7 ± 0.4
A03SL-226-25	—	0
A03SL-227-04	0.55 ± 0.06	0.71 ± 0.17
A03SL-227-18	—	0.53 ± 0.12
A03SL-228-06	0.69 ± 0.07	0.67 ± 0.16
A03SL-230-06	—	0.8 ± 0.4
A03SL-231-02	2.78 ± 0.19	4.6 ± 0.6
A03SL-231-05	1.86 ± 0.14	1.7 ± 0.4
A03SL-232-06	0.85 ± 0.08	1.6 ± 0.4
A03SL-233-07	0.65 ± 0.06	4.9 ± 0.5
A03SL-233-09	—	0.5 ± 0.5
A03SL-234-13	—	1.6 ± 0.4
A03SL-237-10	—	0
A03SL-239-10	—	3.8 ± 0.5
A03SL-239-11	4.1 ± 0.5	7.1 ± 0.8
A03SL-239-13	—	0.9 ± 0.4
A03SL-240-06	2.23 ± 0.16	3.2 ± 0.5
A03SL-240-07	3.41 ± 0.16	2.6 ± 0.3

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-88
ICP-MS RESULTS FOR URANIUM ISOTOPES IN IA03 SUBSURFACE SOIL SAMPLE
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
Natural uranium [c]							—	0.0054%	0.7204%	—	99.2742%
Low enrichment [c]							—	0.0290%	3.4989%	—	96.4722%
Depleted uranium [c]							—	0.0010%	0.1991%	0.0003%	99.7996%
Recycled uranium [c]							—	0.0082%	0.9700%	0.0680%	98.9500%
A03SL-217-13	[0.01]	0.023	2.7	[0.01]	486	489	ND	0.0047%	0.55%	ND	99.4%

Notes:
[a] Bracketed numbers are the laboratory reporting limits.
[b] Relative mass abundances were calculated using uranium isotopic data in Table 3-30. "ND" represents samples for which the isotope was not detected above the laboratory reporting limit; these values are assigned a zero value in the calculations.
[c] Traub, RJ. 2006. *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium.* Battelle-TBD-6001 rev. F0, Battelle, Richland, Washington.

TABLE 4-89
COPC CONCENTRATIONS IN IA03 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A03-SD-001	1.0 ± 0.3	0.7 ± 0.2	0.7 ± 0.4	0.9 ± 0.5	0.6 ± 0.2	1.1 ± 0.3	0.6 ± 0.2	0.9 ± 0.5	—	2.8 ± 0.5	0.17 ± 0.09	-0.1 ± 1.3	2.8 ± 0.5	—
A03-SD-002	—	1.03 ± 0.17	—	0.9 ± 0.2	1.0 ± 0.3	1.2 ± 0.3	1.0 ± 0.3	0.9 ± 0.2	—	1.1 ± 0.3	0.10 ± 0.07	0.0 ± 0.7	1.6 ± 0.3	—
A03-SD-003	1.1 ± 0.3	1.1 ± 0.3	0.7 ± 0.4	0.7 ± 0.3	0.5 ± 0.3	0.9 ± 0.4	0.7 ± 0.3	0.7 ± 0.3	—	1.4 ± 0.3	0.09 ± 0.07	0.2 ± 0.4	1.5 ± 0.3	—
A03-SD-004	—	0.39 ± 0.17	—	0.7 ± 0.3	0.79 ± 0.20	1.2 ± 0.2	0.71 ± 0.18	0.7 ± 0.3	—	0.80 ± 0.20	0.04 ± 0.05	0.1 ± 0.3	1.0 ± 0.2	—
A03-SD-005	1.2 ± 0.3	1.6 ± 0.3	0.9 ± 0.4	1.3 ± 0.4	0.9 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	1.3 ± 0.4	—	2.0 ± 0.4	0.10 ± 0.07	0.1 ± 0.4	2.5 ± 0.4	—
A03-SD-006	—	0.38 ± 0.13	—	0.31 ± 0.16	0.55 ± 0.19	0.8 ± 0.2	0.52 ± 0.18	0.31 ± 0.16	—	2.7 ± 0.5	0.13 ± 0.08	0.0 ± 0.7	3.0 ± 0.5	—

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-90
SOR FOR IA03 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A03-SD-001	0.45 ± 0.19
A03-SD-002	0.5 ± 0.5
A03-SD-003	0
A03-SD-004	0.16 ± 0.14
A03-SD-005	0.8 ± 0.5
A03-SD-006	0.32 ± 0.05

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha spectroscopy laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-91
COPC CONCENTRATIONS IN IA03 GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a,b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A03MW13D-F	0.25 ± 0.10	0.0 ± 0.3	0.05 ± 0.07	0.23 ± 0.11	0.00 ± 0.01	20.9 ± 2.0	1.0 ± 0.2	22 ± 2
A03MW13D-U	0.21 ± 0.10	0.0 ± 0.3	0.04 ± 0.07	0.24 ± 0.11	0.07 ± 0.06	19.9 ± 1.9	0.9 ± 0.2	22 ± 2
A03MW14-F	0.29 ± 0.12	0.2 ± 0.3	0.15 ± 0.12	0.18 ± 0.09	0.00 ± 0.04	0.9 ± 0.2	0.04 ± 0.06	0.9 ± 0.2
A03MW14-U	0.27 ± 0.10	0.0 ± 0.2	0.15 ± 0.10	0.17 ± 0.08	0.00 ± 0.03	1.1 ± 0.2	0.04 ± 0.05	1.0 ± 0.2
A03MW15-F	0.13 ± 0.10	-0.4 ± 0.2	0.11 ± 0.10	0.28 ± 0.12	0.00 ± 0.04	0.19 ± 0.11	0.02 ± 0.06	0.12 ± 0.09
A03MW15-U	0.05 ± 0.09	0.0 ± 0.2	0.01 ± 0.06	0.21 ± 0.11	0.03 ± 0.05	0.30 ± 0.14	0.13 ± 0.10	0.21 ± 0.12
A03MW16-F	0.16 ± 0.09	0.2 ± 0.3	0.04 ± 0.08	0.21 ± 0.10	0.00 ± 0.03	6.7 ± 0.8	0.36 ± 0.14	7.4 ± 0.8
A03MW16-U	0.20 ± 0.11	0.1 ± 0.2	0.10 ± 0.09	0.18 ± 0.10	0.00 ± 0.04	6.6 ± 0.8	0.36 ± 0.14	7.3 ± 0.8
A03MW17-F	0.33 ± 0.10	0.0 ± 0.2	0.13 ± 0.06	0.27 ± 0.08	0.00 ± 0.02	0.66 ± 0.13	0.04 ± 0.04	0.68 ± 0.13
A03MW17-U	0.39 ± 0.11	0.1 ± 0.3	0.04 ± 0.05	0.14 ± 0.08	-0.01 ± 0.03	0.64 ± 0.17	0.03 ± 0.05	0.60 ± 0.17
A03MW606D-RF	0.17 ± 0.15	0.2 ± 0.4	0.07 ± 0.16	0.12 ± 0.12	0.01 ± 0.06	2.5 ± 0.6	0.20 ± 0.17	2.4 ± 0.6
A03MW606D-RU	0.23 ± 0.15	0.2 ± 0.4	0.05 ± 0.08	0.13 ± 0.11	-0.01 ± 0.02	2.7 ± 0.6	0.16 ± 0.14	2.9 ± 0.6
A03MW607D-F	0.21 ± 0.12	-0.1 ± 0.2	0.03 ± 0.07	0.13 ± 0.09	0.02 ± 0.04	0.09 ± 0.07	0.01 ± 0.04	0.02 ± 0.04
A03MW607D-U	0.20 ± 0.10	0.2 ± 0.3	0.13 ± 0.08	0.17 ± 0.09	0.02 ± 0.03	0.03 ± 0.04	-0.01 ± 0.04	0.01 ± 0.04

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-92
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS
IN IA03 GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration[a,b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A03MW13D-F	0.3 ± 0.3	65 ± 6
A03MW13D-U	0.2 ± 0.3	65 ± 6
A03MW14-F	0.5 ± 0.3	2.8 ± 0.7
A03MW14-U	0.3 ± 0.3	2.9 ± 0.6
A03MW15-F	-0.3 ± 0.2	0.4 ± 0.3
A03MW15-U	0.0 ± 0.2	0.7 ± 0.4
A03MW16-F	0.4 ± 0.3	22 ± 2
A03MW16-U	0.3 ± 0.3	22 ± 2
A03MW17-F	0.3 ± 0.3	2.0 ± 0.4
A03MW17-U	0.5 ± 0.3	1.8 ± 0.5
A03MW606D-RF	0.4 ± 0.5	7.2 ± 1.7
A03MW606D-RU	0.4 ± 0.4	8.7 ± 1.8
A03MW607D-F	0.1 ± 0.3	0.05 ± 0.12
A03MW607D-U	0.4 ± 0.3	0.01 ± 0.12

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-93
COPC CONCENTRATIONS IN IA04A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-001-01	—	—	—	—	—	—	—	—	0.18 ± 0.13	—	—	—	—	0.7 ± 0.4
A04ASL-002-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	2.1 ± 0.6
A04ASL-003-01	0.75 ± 0.11	0.77 ± 0.11	0.9 ± 0.2	0.87 ± 0.12	0.80 ± 0.14	0.87 ± 0.15	0.83 ± 0.14	0.87 ± 0.12	0.87 ± 0.19	7.9 ± 0.9	0.42 ± 0.15	0.29 ± 0.18	8.9 ± 1.0	6.1 ± 1.1
A04ASL-004-01	—	—	—	—	—	—	—	—	0.12 ± 0.10	—	—	—	—	0.4 ± 0.3
A04ASL-005-01	—	—	—	—	—	—	—	—	0.53 ± 0.17	—	—	—	—	2.8 ± 0.8
A04ASL-006-01	—	—	—	—	—	—	—	—	1.13 ± 0.20	—	—	—	—	1.1 ± 0.5
A04ASL-007-01	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	1.1 ± 0.6
A04ASL-008-01	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	1.1 ± 0.8
A04ASL-009-01	—	—	—	—	0.59 ± 0.19	2.3 ± 0.4	0.41 ± 0.15	—	0.64 ± 0.14	11.2 ± 1.2	0.53 ± 0.17	—	11.4 ± 1.2	8.0 ± 1.1
A04ASL-010-01	—	—	—	—	—	—	—	—	0.13 ± 0.10	—	—	—	—	0.1 ± 0.3
A04ASL-011-01	—	—	—	—	—	—	—	—	0.76 ± 0.16	—	—	—	—	1.4 ± 0.6
A04ASL-012-01	—	—	—	—	—	—	—	—	1.1 ± 0.3	—	—	—	—	1.7 ± 0.6
A04ASL-013-01	—	—	—	—	—	—	—	—	0.58 ± 0.15	—	—	—	—	1.3 ± 0.5
A04ASL-014-01	0.60 ± 0.15	—	0.6 ± 0.3	—	0.8 ± 0.3	0.6 ± 0.2	0.8 ± 0.3	—	0.59 ± 0.18	15.4 ± 1.5	0.55 ± 0.18	—	13.9 ± 1.4	7.5 ± 1.1
A04ASL-015-01	—	—	—	—	—	—	—	—	1.26 ± 0.19	—	—	—	—	1.8 ± 0.7
A04ASL-016-01	—	—	—	—	—	—	—	—	0.78 ± 0.17	—	—	—	—	1.7 ± 0.6
A04ASL-017-01	—	—	—	—	—	—	—	—	0.90 ± 0.18	—	—	—	—	1.3 ± 0.5
A04ASL-018-01	—	—	—	—	—	—	—	—	0.18 ± 0.12	—	—	—	—	0.05 ± 0.07
A04ASL-019-01	—	—	—	—	—	—	—	—	0.11 ± 0.13	—	—	—	—	0.8 ± 0.4
A04ASL-020-01	—	—	—	—	0.04 ± 0.05	8.7 ± 1.0	0.02 ± 0.04	—	0.50 ± 0.15	15.6 ± 1.5	0.8 ± 0.2	—	15.9 ± 1.6	9.1 ± 1.5
A04ASL-021-01	—	—	—	—	—	—	—	—	0.70 ± 0.16	—	—	—	—	0.6 ± 0.5
A04ASL-022-01	—	—	—	—	—	—	—	—	0.85 ± 0.18	—	—	—	—	1.2 ± 0.8
A04ASL-023-01	—	—	—	—	—	—	—	—	0.53 ± 0.15	—	—	—	—	3.0 ± 0.8
A04ASL-024-01	0.62 ± 0.16	—	0.7 ± 0.4	—	0.50 ± 0.19	0.7 ± 0.2	0.30 ± 0.14	—	0.34 ± 0.13	7.0 ± 0.8	0.35 ± 0.14	—	6.5 ± 0.8	5.3 ± 0.9

TABLE 4-93
COPC CONCENTRATIONS IN IA04A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-025-01	—	—	—	—	—	—	—	—	0.26 ± 0.14	—	—	—	—	3.0 ± 0.7
A04ASL-026-01	—	—	—	—	—	—	—	—	0.84 ± 0.19	—	—	—	—	1.3 ± 0.7
A04ASL-027-01	—	—	—	—	—	—	—	—	0.15 ± 0.12	—	—	—	—	0.6 ± 0.4
A04ASL-028-01	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	1.4 ± 0.6
A04ASL-029-01	—	—	—	—	—	—	—	—	0.80 ± 0.20	—	—	—	—	1.4 ± 0.5
A04ASL-030-01	—	—	—	—	—	—	—	—	0.60 ± 0.15	—	—	—	—	2.9 ± 0.7
A04ASL-031-01	1.2 ± 0.2	—	0.9 ± 0.5	—	1.0 ± 0.2	1.0 ± 0.2	0.82 ± 0.19	—	0.89 ± 0.17	1.1 ± 0.2	0.06 ± 0.06	—	1.0 ± 0.2	100 ± 4
A04ASL-032-01	—	—	—	—	—	—	—	—	0.83 ± 0.18	—	—	—	—	1.2 ± 0.7
A04ASL-033-01	—	—	—	—	—	—	—	—	0.33 ± 0.14	—	—	—	—	3.0 ± 0.7
A04ASL-034-01	—	—	—	—	0.81 ± 0.15	0.92 ± 0.16	0.77 ± 0.14	—	0.57 ± 0.19	1.41 ± 0.19	0.09 ± 0.05	—	1.41 ± 0.19	1.7 ± 0.6
A04ASL-035-01	—	—	—	—	—	—	—	—	0.72 ± 0.15	—	—	—	—	3.5 ± 0.7
A04ASL-036-01	—	—	—	—	—	—	—	—	0.57 ± 0.19	—	—	—	—	2.7 ± 0.8
A04ASL-037-01	—	—	—	—	—	—	—	—	0.61 ± 0.16	—	—	—	—	1.9 ± 0.7
A04ASL-038-01	0.64 ± 0.15	—	0.8 ± 0.3	0.73 ± 0.19	0.7 ± 0.2	0.58 ± 0.20	0.44 ± 0.17	0.73 ± 0.19	0.63 ± 0.17	6.5 ± 0.8	0.20 ± 0.11	0.1 ± 0.3	6.1 ± 0.7	5.6 ± 1.3
A04ASL-039-01	—	—	—	—	—	—	—	—	0.62 ± 0.17	—	—	—	—	3.9 ± 0.8
A04ASL-040-01	—	—	—	—	—	—	—	—	0.54 ± 0.15	—	—	—	—	2.1 ± 0.6
A04ASL-042-01	—	—	—	—	—	—	—	—	0.73 ± 0.18	—	—	—	—	2.5 ± 0.7
A04ASL-044-01	—	—	—	—	0.7 ± 0.2	1.0 ± 0.3	0.6 ± 0.2	—	0.55 ± 0.16	10.1 ± 1.1	0.44 ± 0.16	—	9.9 ± 1.1	9.5 ± 1.1
A04ASL-045-01	—	—	—	—	—	—	—	—	0.22 ± 0.12	—	—	—	—	0.3 ± 0.4
A04ASL-046-01	—	—	—	—	—	—	—	—	0.07 ± 0.06	—	—	—	—	0.4 ± 0.3
A04ASL-047-01	—	—	—	—	—	—	—	—	0.36 ± 0.16	—	—	—	—	1.7 ± 0.6
A04ASL-048-01	—	—	—	—	—	—	—	—	0.49 ± 0.19	—	—	—	—	2.5 ± 0.8
A04ASL-051-01	0.63 ± 0.15	0.48 ± 0.14	1.0 ± 0.3	1.3 ± 0.3	1.3 ± 0.2	0.69 ± 0.16	1.4 ± 0.2	1.3 ± 0.3	1.5 ± 0.3	149 ± 12	8.00 ± 0.14	4.4 ± 0.7	152 ± 12	68 ± 3
A04ASL-052-01	—	—	—	—	—	—	—	—	0.80 ± 0.17	—	—	—	—	3.9 ± 0.7

TABLE 4-93
COPC CONCENTRATIONS IN IA04A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-053-01	—	—	—	—	—	—	—	—	0.4 ± 0.2	—	—	—	—	0.7 ± 0.4
A04ASL-054-01	0.61 ± 0.15	—	0.7 ± 0.3	—	0.9 ± 0.3	0.7 ± 0.2	0.8 ± 0.3	—	0.67 ± 0.19	16.6 ± 1.6	0.66 ± 0.20	—	16.3 ± 1.6	14.5 ± 1.7
A04ASL-055-01	0.51 ± 0.11	—	0.51 ± 0.11	—	0.6 ± 0.2	0.5 ± 0.2	0.43 ± 0.20	—	0.60 ± 0.19	19.4 ± 1.9	1.2 ± 0.3	—	20.4 ± 2.0	14.9 ± 1.9
A04ASL-056-01	1.2 ± 0.2	—	2.0 ± 0.4	—	2.0 ± 0.4	1.0 ± 0.2	1.9 ± 0.4	—	1.9 ± 0.2	67 ± 6	4.1 ± 0.7	—	67 ± 6	58 ± 3
A04ASL-057-01	—	—	—	—	—	—	—	—	0.08 ± 0.10	—	—	—	—	0.6 ± 0.4
A04ASL-058-01	—	—	—	—	0.16 ± 0.08	5.7 ± 0.7	0.01 ± .02	—	0.61 ± 0.18	7.7 ± 0.9	0.37 ± 0.14	—	7.6 ± 0.9	14.7 ± 1.5
A04ASL-059-01	—	—	—	—	1.1 ± 0.3	1.2 ± 0.3	0.9 ± 0.3	—	0.68 ± 0.19	5.2 ± 0.6	0.23 ± 0.11	—	4.9 ± 0.6	5.3 ± 1.2
A04ASL-060-01	—	—	—	—	0.6 ± 0.2	0.6 ± 0.2	0.5 ± 0.2	—	0.55 ± 0.20	10.4 ± 1.1	0.51 ± 0.18	—	9.5 ± 1.0	7.5 ± 1.1
A04ASL-061-01	0.76 ± 0.15	—	0.8 ± 0.3	—	0.77 ± 0.13	1.03 ± 0.16	0.86 ± 0.14	—	0.60 ± 0.18	4.8 ± 0.4	0.14 ± 0.06	—	5.1 ± 0.4	6.1 ± 1.1
A04ASL-062-01	0.62 ± 0.15	—	1.4 ± 0.4	—	1.1 ± 0.3	0.66 ± 0.19	1.1 ± 0.2	—	1.4 ± 0.2	19.3 ± 1.9	1.0 ± 0.3	—	23 ± 2	19.4 ± 1.7
A04ASL-063-01	—	—	—	—	—	—	—	—	0.28 ± 0.11	—	—	—	—	2.2 ± 0.6
A04ASL-064-01	—	—	—	—	—	—	—	—	0.49 ± 0.16	—	—	—	—	3.6 ± 0.9
A04ASL-065-01	—	—	—	—	—	—	—	—	0.22 ± 0.11	—	—	—	—	1.5 ± 0.6
A04ASL-066-01	—	—	—	—	—	—	—	—	0.47 ± 0.16	—	—	—	—	2.7 ± 0.6
A04ASL-067-01	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	2.3 ± 0.6
A04ASL-068-01	—	—	—	—	—	—	—	—	0.98 ± 0.18	—	—	—	—	2.0 ± 0.6
A04ASL-069-01	—	—	—	—	—	—	—	—	0.48 ± 0.14	—	—	—	—	2.4 ± 0.9
A04ASL-070-01	—	—	—	—	—	—	—	—	0.47 ± 0.16	—	—	—	—	1.0 ± 0.6
A04ASL-071-01	—	—	—	—	—	—	—	—	0.98 ± 0.17	—	—	—	—	2.8 ± 1.0
A04ASL-072-01	—	—	—	—	—	—	—	—	0.21 ± 0.12	—	—	—	—	1.0 ± 0.5
A04ASL-073-01	—	—	—	—	—	—	—	—	0.61 ± 0.15	—	—	—	—	1.7 ± 0.7
A04ASL-076-01	—	—	—	—	—	—	—	—	0.71 ± 0.16	—	—	—	—	0.5 ± 0.6
A04ASL-077-01	—	—	—	—	—	—	—	—	0.72 ± 0.17	—	—	—	—	2.8 ± 0.9
A04ASL-203-01	—	0.51 ± 0.13	—	0.42 ± 0.17	1.0 ± 0.2	0.77 ± 0.20	0.8 ± 0.2	0.42 ± 0.17	1.1 ± 0.2	5.6 ± 0.7	0.21 ± 0.11	0.3 ± 0.2	5.9 ± 0.7	4.9 ± 1.0

TABLE 4-93
COPC CONCENTRATIONS IN IA04A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-208-01	—	—	—	—	—	—	—	—	0.55 ± 0.16	—	—	—	—	1.4 ± 0.6
A04ASL-209-01	—	—	—	—	—	—	—	—	0.22 ± 0.12	—	—	—	—	0.7 ± 0.4
A04ASL-210-01	—	—	—	—	—	—	—	—	0.12 ± 0.13	—	—	—	—	0.6 ± 0.3
A04ASL-211-01	—	—	—	—	—	—	—	—	0.47 ± 0.15	—	—	—	—	1.1 ± 0.6
A04ASL-213-01	—	—	—	—	—	—	—	—	0.61 ± 0.19	—	—	—	—	1.5 ± 0.6
A04ASL-214-01	—	—	—	—	1.2 ± 0.3	1.0 ± 0.2	0.79 ± 0.20	—	0.86 ± 0.15	8.0 ± 0.9	0.45 ± 0.16	—	7.5 ± 0.8	7.6 ± 0.9
A04ASL-215-01	—	—	—	—	—	—	—	—	0.43 ± 0.16	—	—	—	—	2.3 ± 0.6
A04ASL-220-01	—	—	—	—	0.51 ± 0.15	0.67 ± 0.18	0.45 ± 0.15	—	0.48 ± 0.14	15.2 ± 1.5	0.69 ± 0.20	—	13.6 ± 1.4	12.0 ± 1.0
A04ASL-224-01	—	—	—	—	—	—	—	—	0.41 ± 0.14	—	—	—	—	3.7 ± 1.0
A04ASL-225-01	—	—	—	—	—	—	—	—	1.00 ± 0.17	—	—	—	—	2.1 ± 0.6
A04ASL-228-01	—	—	—	—	—	—	—	—	0.60 ± 0.19	—	—	—	—	1.7 ± 0.6
A04ASL-230-01	—	—	—	—	—	—	—	—	0.71 ± 0.18	—	—	—	—	3.2 ± 0.8
A04ASL-236-01	—	—	—	—	—	—	—	—	0.58 ± 0.14	—	—	—	—	1.7 ± 0.9
A04ASL-238-01	0.59 ± 0.16	—	0.3 ± 0.2	—	1.0 ± 0.2	1.1 ± 0.2	1.0 ± 0.2	—	0.43 ± 0.16	2.5 ± 0.4	0.12 ± 0.08	—	2.5 ± 0.4	11.4 ± 1.2
A04ASL-239-01	—	—	—	—	—	—	—	—	0.65 ± 0.17	—	—	—	—	3.3 ± 1.0
A04ASL-241-01	0.84 ± 0163	—	1.0 ± 0.3	—	0.60 ± 0.15	0.73 ± 0.16	0.55 ± 0.14	—	1.0 ± 0.2	17.1 ± 1.2	0.81 ± 0.16	—	17.8 ± 1.2	14.4 ± 1.6
A04ASL-243-01	—	—	—	—	—	—	—	—	0.13 ± 0.10	—	—	—	—	0.8 ± 0.4
A04ASL-244-01	0.87 ± 0.10	0.78 ± 0.13	0.9 ± 0.3	0.95 ± 0.16	0.79 ± 0.16	0.85 ± 0.16	0.77 ± 0.15	0.95 ± 0.16	0.88 ± 0.19	6.2 ± 0.7	0.23 ± 0.11	0.2 ± 0.2	6.0 ± 0.7	5.9 ± 0.9
A04ASL-247-01	—	—	—	—	—	—	—	—	0.55 ± 0.14	—	—	—	—	1.8 ± 0.6
A04ASL-249-01	—	—	—	—	—	—	—	—	0.05 ± 0.04	—	—	—	—	0.3 ± 0.4
A04ASL-250-01	—	—	—	—	—	—	—	—	0.84 ± 0.15	—	—	—	—	3.2 ± 0.9
A04ASL-271-01	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	1.5 ± 0.6
A04ASL-274-01	—	—	—	—	—	—	—	—	0.84 ± 0.16	—	—	—	—	2.6 ± 0.7
A04ASL-275-01	—	—	—	—	—	—	—	—	0.26 ± 0.11	—	—	—	—	0.8 ± 0.5

TABLE 4-93
COPC CONCENTRATIONS IN IA04A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-276-01	0.59 ± 0.20	—	0.5 ± 0.4	—	0.6 4± 0.20	0.31 ± 0.14	0.65 ± 0.20	—	0.66 ± 0.19	71 ± 6	2.5 ± 1.0	—	68 ± 6	38 ± 3
A04ASL-278-01	—	—	—	—	0.49 ± 0.18	0.8 ± 0.2	0.64 ± 0.20	—	0.93 ± 0.18	6.3 ± 0.8	0.46 ± 0.16	—	6.2 ± 0.8	6.5 ± 0.9
A04ASL-301-01	—	—	—	—	—	—	—	—	0.16 ± 0.12	—	—	—	—	0.4 ± 0.4
A04ASL-302-01	—	—	—	—	—	—	—	—	0.13 ± 0.13	—	—	—	—	0.8 ± 0.5
A04ASL-303-01	—	—	—	—	—	—	—	—	0.11 ± 0.12	—	—	—	—	0.6 ± 0.4
A04ASL-304-01	—	—	—	—	—	—	—	—	0.58 ± 0.19	—	—	—	—	1.1 ± 0.7
A04ASL-305-01	—	—	—	—	—	—	—	—	0.12 ± 0.11	—	—	—	—	0.3 ± 0.4
A04ASL-310-01	—	—	—	—	—	—	—	—	0.70 ± 0.17	—	—	—	—	2.0 ± 0.6
A04ASL-311-01	—	—	—	—	—	—	—	—	0.33 ± 0.16	—	—	—	—	2.3 ± 0.8
A04ASL-312-01	—	—	—	—	—	—	—	—	0.13 ± 0.06	—	—	—	—	0.9 ± 0.4
A04ASL-313-01	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	1.9 ± 0.7
A04ASL-314-01	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	2.6 ± 0.9
A04ASL-315-01	—	—	—	—	—	—	—	—	0.0 ± 0.2	—	—	—	—	1.9 ± 0.6
A04ASL-316-01	—	—	—	—	—	—	—	—	0.44 ± 0.19	—	—	—	—	2.6 ± 0.8
A04ASL-317-01	—	—	—	—	—	—	—	—	0.33 ± 0.18	—	—	—	—	0.6 ± 0.4
A04ASL-318-01	0.67 ± 0.20	0.48 ± 0.12	0.6 ± 0.4	0.47 ± 0.20	0.52 ± 0.18	0.52 ± 0.18	0.51 ± 0.18	0.47 ± 0.20	0.43 ± 0.15	11.2 ± 1.2	0.50 ± 0.17	0.3 ± 0.2	10.6 ± 1.1	6.1 ± 1.2
A04ASL-319-01	—	—	—	—	0.54 ± 0.16	0.60 ± 0.17	0.62 ± 0.17	—	0.32 ± 0.17	7.7 ± 0.8	0.38 ± 0.13	—	7.7 ± 0.8	5.6 ± 1.6
A04ASL-320-01	—	—	—	—	0.8 ± 0.3	0.28 ± 0.14	0.8 ± 0.3	—	0.70 ± 0.19	65 ± 8	3.8 ± 1.7	—	66 ± 8	44 ± 3
A04ASL-321-01	—	—	—	—	—	—	—	—	0.25 ± 0.17	—	—	—	—	1.0 ± 0.6
A04ASL-322-01	—	—	—	—	—	—	—	—	0.29 ± 0.18	—	—	—	—	1.6 ± 0.7
A04ASL-323-01	—	—	—	—	—	—	—	—	0.74 ± 0.19	—	—	—	—	2.3 ± 0.7

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-94
SOR FOR IA04A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
A04ASL-001-01	—	0
A04ASL-002-01	—	0
A04ASL-003-01	1.13 ± 0.10	1.3 ± 0.4
A04ASL-004-01	—	0
A04ASL-005-01	—	0.30 ± 0.12
A04ASL-006-01	—	1.0 ± 0.4
A04ASL-007-01	—	0.3 ± 0.4
A04ASL-008-01	—	0
A04ASL-009-01	2.3 ± 0.3	1.11 ± 0.17
A04ASL-010-01	—	0
A04ASL-011-01	—	0.2 ± 0.3
A04ASL-012-01	—	1.0 ± 0.5
A04ASL-013-01	—	0
A04ASL-014-01	2.06 ± 0.15	1.03 ± 0.17
A04ASL-015-01	—	1.3 ± 0.4
A04ASL-016-01	—	0.3 ± 0.4
A04ASL-017-01	—	0.5 ± 0.4
A04ASL-018-01	—	0
A04ASL-019-01	—	0
A04ASL-020-01	6.5 ± 0.6	1.3 ± 0.2
A04ASL-021-01	—	0
A04ASL-022-01	—	0.4 ± 0.4
A04ASL-023-01	—	0.34 ± 0.12
A04ASL-024-01	0.89 ± 0.08	0.68 ± 0.13
A04ASL-025-01	—	0.33 ± 0.10
A04ASL-026-01	—	0.4 ± 0.4
A04ASL-027-01	—	0
A04ASL-028-01	—	0
A04ASL-029-01	—	0.3 ± 0.4
A04ASL-030-01	—	0.31 ± 0.11
A04ASL-031-01	0	15.8 ± 0.8
A04ASL-032-01	—	0.4 ± 0.4
A04ASL-033-01	—	0.34 ± 0.10
A04ASL-034-01	0	0
A04ASL-035-01	—	0.42 ± 0.11
A04ASL-036-01	—	0.29 ± 0.13
A04ASL-037-01	—	0
A04ASL-038-01	0.82 ± 0.08	0.74 ± 0.20
A04ASL-039-01	—	0.48 ± 0.13
A04ASL-040-01	—	0
A04ASL-042-01	—	0.27 ± 0.11
A04ASL-044-01	1.37 ± 0.12	1.34 ± 0.17
A04ASL-045-01	—	0
A04ASL-046-01	—	0
A04ASL-047-01	—	0
A04ASL-048-01	—	0.25 ± 0.12
A04ASL-051-01	24.3 ± 1.3	12.1 ± 0.7
A04ASL-052-01	—	0.8 ± 0.4

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
A04ASL-053-01	—	0
A04ASL-054-01	2.33 ± 0.17	2.1 ± 0.3
A04ASL-055-01	3.0 ± 0.2	2.2 ± 0.3
A04ASL-056-01	12.6 ± 0.9	11.5 ± 0.6
A04ASL-057-01	—	0
A04ASL-058-01	3.7 ± 0.4	2.1 ± 0.2
A04ASL-059-01	1.0 ± 0.5	0.69 ± 0.18
A04ASL-060-01	1.36 ± 0.11	1.04 ± 0.17
A04ASL-061-01	0.62 ± 0.05	0.81 ± 0.17
A04ASL-062-01	3.6 ± 0.5	4.5 ± 0.6
A04ASL-063-01	—	0
A04ASL-064-01	—	0.43 ± 0.13
A04ASL-065-01	—	0
A04ASL-066-01	—	0.28 ± 0.10
A04ASL-067-01	—	0.6 ± 0.5
A04ASL-068-01	—	0.7 ± 0.4
A04ASL-069-01	—	0.24 ± 0.13
A04ASL-070-01	—	0
A04ASL-071-01	—	1.0 ± 0.4
A04ASL-072-01	—	0
A04ASL-073-01	—	0
A04ASL-076-01	—	0
A04ASL-077-01	—	0.31 ± 0.13
A04ASL-203-01	0.73 ± 0.07	1.6 ± 0.5
A04ASL-208-01	—	0
A04ASL-209-01	—	0
A04ASL-210-01	—	0
A04ASL-211-01	—	0
A04ASL-213-01	—	0
A04ASL-214-01	1.03 ± 0.09	1.5 ± 0.3
A04ASL-215-01	—	0.23 ± 0.10
A04ASL-220-01	2.03 ± 0.15	1.71 ± 0.16
A04ASL-224-01	—	0.44 ± 0.16
A04ASL-225-01	—	0.7 ± 0.4
A04ASL-228-01	—	0
A04ASL-230-01	—	0.37 ± 0.13
A04ASL-236-01	—	0
A04ASL-238-01	0.6 ± 0.4	1.63 ± 0.19
A04ASL-239-01	—	0.38 ± 0.16
A04ASL-241-01	2.47 ± 0.13	2.9 ± 0.5
A04ASL-243-01	—	0
A04ASL-244-01	0.79 ± 0.08	1.3 ± 0.4
A04ASL-247-01	—	0
A04ASL-249-01	—	0
A04ASL-250-01	—	0.8 ± 0.3
A04ASL-271-01	—	0.6 ± 0.5
A04ASL-274-01	—	0.7 ± 0.3
A04ASL-275-01	—	0

TABLE 4-94
SOR FOR IA04A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
A04ASL-276-01	10.5 ± 0.7	5.7 ± 0.4
A04ASL-278-01	0.81 ± 0.08	1.5 ± 0.4
A04ASL-301-01	—	0
A04ASL-302-01	—	0
A04ASL-303-01	—	0
A04ASL-304-01	—	0
A04ASL-305-01	—	0
A04ASL-310-01	—	0
A04ASL-311-01	—	0.22 ± 0.12
A04ASL-312-01	—	0
A04ASL-313-01	—	0.4 ± 0.5
A04ASL-314-01	—	0.5 ± 0.5
A04ASL-315-01	—	0
A04ASL-316-01	—	0.28 ± 0.12
A04ASL-317-01	—	0
A04ASL-318-01	1.50 ± 0.12	0.82 ± 0.19
A04ASL-319-01	1.03 ± 0.09	0.7 ± 0.2
A04ASL-320-01	10.1 ± 0.9	6.7 ± 0.4
A04ASL-321-01	—	0
A04ASL-322-01	—	0
A04ASL-323-01	—	0.22 ± 0.11

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-95
ICP-MS RESULTS FOR URANIUM ISOTOPES FOR IA04A SURFACE SOIL SAMPLE
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
Natural uranium [c]							—	0.0054%	0.7204%	—	99.2742%
Low enrichment [c]							—	0.0290%	3.4989%	—	96.4722%
Depleted uranium [c]							—	0.0010%	0.1991%	0.0003%	99.7996%
Recycled uranium [c]							—	0.0082%	0.9700%	0.0680%	98.9500%
A04ASL-051-01	[0.01]	0.024	2.9	[0.01]	447	450	ND	0.0053%	0.64%	ND	99.4%

Notes:
[a] Bracketed numbers are the laboratory reporting limits.
[b] Relative mass abundances were calculated using uranium isotopic data in Table 3-30. "ND" represents samples for which the isotope was not detected above the laboratory reporting limit; these values are assigned a zero value in the calculations.
[c] Traub, RJ. 2006. *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium*. Battelle-TBD-6001 rev. F0, Battelle, Richland, Washington.

TABLE 4-96
COPC CONCENTRATIONS IN IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-001-03	—	—	—	—	—	—	—	—	1.3 ± 0.3	—	—	—	—	3.5 ± 0.8
A04ASL-001-05	—	—	—	—	—	—	—	—	0.44 ± 0.19	—	—	—	—	2.6 ± 0.8
A04ASL-002-03	—	—	—	—	—	—	—	—	0.7 ± 0.3	—	—	—	—	1.2 ± 0.5
A04ASL-002-04	—	—	—	—	—	—	—	—	0.86 ± 0.18	—	—	—	—	1.3 ± 0.7
A04ASL-003-03	1.8 ± 0.3	—	1.5 ± 0.4	—	0.10 ± 0.05	5.3 ± 0.4	0.01 ± 0.02	—	3.1 ± 0.3	8.2 ± 0.6	0.41 ± 0.10	—	8.4 ± 0.6	4.4 ± 1.0
A04ASL-004-03	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	1.4 ± 0.6
A04ASL-004-04	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	2.8 ± 0.8
A04ASL-005-03	—	—	—	—	—	—	—	—	0.70 ± 0.19	—	—	—	—	1.7 ± 0.7
A04ASL-006-03	—	—	—	—	—	—	—	—	0.65 ± 0.15	—	—	—	—	1.2 ± 0.6
A04ASL-007-06	—	—	—	—	—	—	—	—	0.62 ± 0.20	—	—	—	—	0.7 ± 0.5
A04ASL-008-02	—	—	—	—	—	—	—	—	1.09 ± 0.19	—	—	—	—	1.2 ± 0.6
A04ASL-009-06	—	—	—	—	—	—	—	—	1.08 ± 0.11	—	—	—	—	8.8 ± 0.7
A04ASL-011-03	—	—	—	—	—	—	—	—	0.83 ± 0.17	—	—	—	—	1.0 ± 0.6
A04ASL-011-04	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	1.0 ± 0.6
A04ASL-012-03	—	—	—	—	—	—	—	—	0.69 ± 0.20	—	—	—	—	0.10 ± 0.14
A04ASL-012-04	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	1.3 ± 0.8
A04ASL-013-02	—	—	—	—	—	—	—	—	0.26 ± 0.16	—	—	—	—	1.0 ± 0.6
A04ASL-016-03	—	—	—	—	—	—	—	—	0.79 ± 0.17	—	—	—	—	1.2 ± 0.5
A04ASL-016-04	—	—	—	—	—	—	—	—	0.65 ± 0.20	—	—	—	—	2.0 ± 1.1
A04ASL-017-03	—	—	—	—	—	—	—	—	0.64 ± 0.18	—	—	—	—	1.0 ± 0.5
A04ASL-018-03	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	1.1 ± 0.5
A04ASL-019-06	—	—	—	—	—	—	—	—	0.34 ± 0.14	—	—	—	—	2.6 ± 0.7
A04ASL-021-03	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	1.1 ± 0.6
A04ASL-021-04	—	—	—	—	—	—	—	—	0.63 ± 0.20	—	—	—	—	1.0 ± 0.7

TABLE 4-96
COPC CONCENTRATIONS IN IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-022-03	—	—	—	—	—	—	—	—	0.85 ± 0.17	—	—	—	—	0.5 ± 0.5
A04ASL-026-03	—	—	—	—	—	—	—	—	0.72 ± 0.19	—	—	—	—	1.4 ± 0.7
A04ASL-027-03	—	—	—	—	—	—	—	—	1.14 ± 0.19	—	—	—	—	1.3 ± 0.5
A04ASL-027-04	—	—	—	—	—	—	—	—	1.2 ± 0.3	—	—	—	—	1.5 ± 0.8
A04ASL-028-02	—	—	—	—	—	—	—	—	0.99 ± 0.17	—	—	—	—	0.9 ± 0.5
A04ASL-029-03	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	2.1 ± 0.7
A04ASL-030-02	—	—	—	—	—	—	—	—	0.68 ± 0.18	—	—	—	—	2.3 ± 0.7
A04ASL-031-02	—	—	—	—	—	—	—	—	0.4 ± 0.2	—	—	—	—	147 ± 5
A04ASL-031-03	—	—	—	—	—	—	—	—	1.5 ± 0.3	—	—	—	—	65 ± 4
A04ASL-031-04	—	—	—	—	—	—	—	—	0.9 ± 0.3	—	—	—	—	33 ± 3
A04ASL-031-05	—	—	—	—	—	—	—	—	0.70 ± 0.20	—	—	—	—	64 ± 3
A04ASL-031-06	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	19.7 ± 1.7
A04ASL-031-07	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	4.5 ± 0.9
A04ASL-031-08	—	—	—	—	—	—	—	—	0.46 ± 0.15	—	—	—	—	3.3 ± 0.7
A04ASL-031-09	—	—	—	—	—	—	—	—	0.9 ± 0.3	—	—	—	—	105 ± 3
A04ASL-031-10	—	—	—	—	—	—	—	—	0.53 ± 0.18	—	—	—	—	99 ± 3
A04ASL-031-11	—	—	—	—	—	—	—	—	0.69 ± 0.19	—	—	—	—	3.4 ± 0.7
A04ASL-031-12	—	—	—	—	—	—	—	—	0.63 ± 0.17	—	—	—	—	2.5 ± 0.7
A04ASL-032-03	—	—	—	—	—	—	—	—	0.81 ± 0.20	—	—	—	—	0.9 ± 0.5
A04ASL-032-04	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	0.7 ± 0.5
A04ASL-033-03	—	—	—	—	—	—	—	—	0.72 ± 0.18	—	—	—	—	8.1 ± 1.4
A04ASL-033-04	—	—	—	—	—	—	—	—	1.05 ± 0.18	—	—	—	—	6.5 ± 1.4
A04ASL-036-02	—	—	—	—	—	—	—	—	1.0 ± 0.3	—	—	—	—	3.2 ± 0.7
A04ASL-037-02	—	—	—	—	—	—	—	—	0.64 ± 0.18	—	—	—	—	3.1 ± 0.6

TABLE 4-96
COPC CONCENTRATIONS IN IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-038-02	—	—	—	—	—	—	—	—	0.57 ± 0.14	—	—	—	—	8.1 ± 1.3
A04ASL-039-02	—	—	—	—	—	—	—	—	0.76 ± 0.17	—	—	—	—	3.5 ± 0.7
A04ASL-042-03	—	—	—	—	—	—	—	—	0.79 ± 0.18	—	—	—	—	4.5 ± 1.0
A04ASL-045-03	—	—	—	—	—	—	—	—	0.19 ± 0.10	—	—	—	—	0.4 ± 0.3
A04ASL-046-06	—	—	—	—	—	—	—	—	0.54 ± 0.15	—	—	—	—	0.9 ± 0.6
A04ASL-047-02	—	—	—	—	—	—	—	—	0.96 ± 0.17	—	—	—	—	2.4 ± 1.0
A04ASL-048-02	—	—	—	—	—	—	—	—	1.5 ± 0.2	—	—	—	—	3.6 ± 0.8
A04ASL-051-02	1.2 ± 0.2	—	1.8 ± 0.4	—	2.3 ± 0.5	0.9 ± 0.3	1.7 ± 0.4	—	1.7 ± 0.3	96 ± 9	4.8 ± 0.8	—	100 ± 9	77 ± 2
A04ASL-052-02	—	—	—	—	1.0 ± 0.2	1.3 ± 0.3	1.0 ± 0.3	—	1.0 ± 0.2	2.0 ± 0.4	0.10 ± 0.08	—	2.1 ± 0.4	3.3 ± 0.6
A04ASL-053-02	—	—	—	—	—	—	—	—	0.53 ± 0.13	—	—	—	—	0.7 ± 0.4
A04ASL-055-02	1.2 ± 0.2	—	0.8 ± 0.3	—	0.61 ± 0.18	0.77 ± 0.20	0.50 ± 0.16	—	0.54 ± 0.17	15.7 ± 1.6	0.68 ± 0.20	—	15.1 ± 1.5	14.4 ± 2.0
A04ASL-056-04	0.80 ± 0.17	—	1.0 ± 0.3	—	0.05 ± 0.06	2.8 ± 0.4	0.02 ± 0.03	—	0.9 ± 0.3	3.2 ± 0.4	0.16 ± 0.09	—	3.5 ± 0.5	54 ± 3
A04ASL-056-05	1.03 ± 0.20	—	1.0 ± 0.3	—	0.8 ± 0.2	0.8 ± 0.2	0.9 ± 0.2	—	0.9 ± 0.2	27 ± 3	1.0 ± 0.3	—	25 ± 2	22.8 ± 1.9
A04ASL-057-05	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.6 ± 0.6
A04ASL-057-06	—	—	—	—	—	—	—	—	0.63 ± 0.15	—	—	—	—	1.4 ± 0.6
A04ASL-058-02	0.79 ± 0.17	—	0.9 ± 0.3	—	1.0 ± 0.2	0.54 ± 0.17	0.9 ± 0.2	—	0.9 ± 0.4	20.5 ± 2.0	1.0 ± 0.3	—	23 ± 2	20 ± 3
A04ASL-059-02	—	—	—	—	—	—	—	—	1.06 ± 0.18	—	—	—	—	2.4 ± 0.6
A04ASL-061-02	—	—	—	—	—	—	—	—	0.95 ± 0.19	—	—	—	—	8.8 ± 1.2
A04ASL-062-02	1.06 ± 0.20	—	1.5 ± 0.4	—	1.9 ± 0.3	1.0 ± 0.2	1.6 ± 0.3	—	1.9 ± 0.3	15.0 ± 1.5	0.9 ± 0.2	—	19.9 ± 1.9	20.1 ± 1.9
A04ASL-063-03	0.40 ± 0.12	—	0.7 ± 0.3	—	0.39 ± 0.14	0.42 ± 0.14	0.32 ± 0.13	—	0.43 ± 0.15	24 ± 2	1.2 ± 0.3	—	25 ± 2	13.7 ± 1.6
A04ASL-064-02	—	—	—	—	—	—	—	—	0.54 ± 0.14	—	—	—	—	6.2 ± 1.1
A04ASL-065-02	—	—	—	—	—	—	—	—	0.66 ± 0.15	—	—	—	—	4.4 ± 1.1
A04ASL-066-03	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	1.7 ± 0.8
A04ASL-067-02	—	—	—	—	0.57 ± 0.17	1.0 ± 0.2	0.9 ± 0.2	—	1.13 ± 0.20	2.0 ± 0.6	0.14 ± 0.08	—	2.3 ± 0.4	3.1 ± 1.0

TABLE 4-96
COPC CONCENTRATIONS IN IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-068-02	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.3 ± 0.5
A04ASL-069-02	—	—	—	—	—	—	—	—	0.45 ± 0.13	—	—	—	—	1.5 ± 0.5
A04ASL-073-02	—	—	—	—	—	—	—	—	0.84 ± 0.18	—	—	—	—	2.2 ± 0.7
A04ASL-076-02	—	—	—	—	—	—	—	—	0.79 ± 0.17	—	—	—	—	1.3 ± 0.6
A04ASL-076-03	—	—	—	—	—	—	—	—	0.65 ± 0.19	—	—	—	—	2.1 ± 0.7
A04ASL-077-06	—	—	—	—	—	—	—	—	0.67 ± 0.20	—	—	—	—	1.6 ± 0.7
A04ASL-077-07	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	0.9 ± 0.6
A04ASL-203-06	—	—	—	—	1.5 ± 0.3	1.3 ± 0.3	1.2 ± 0.3	—	1.7 ± 0.3	13.9 ± 1.4	0.66 ± 0.20	—	13.4 ± 1.4	9.8 ± 1.9
A04ASL-203-09	—	—	—	—	—	—	—	—	0.79 ± 0.17	—	—	—	—	2.4 ± 0.7
A04ASL-208-15	—	—	—	—	—	—	—	—	0.46 ± 0.19	—	—	—	—	1.0 ± 0.6
A04ASL-209-10	0.78 ± 0.19	—	0.7 ± 0.2	—	1.0 ± 0.2	1.2 ± 0.3	0.78 ± 0.20	—	0.46 ± 0.18	4.4 ± 0.6	0.29 ± 0.14	—	4.5 ± 0.6	5.2 ± 1.5
A04ASL-210-03	—	—	—	—	—	—	—	—	0.90 ± 0.18	—	—	—	—	2.1 ± 0.7
A04ASL-211-06	—	—	—	—	—	—	—	—	0.38 ± 0.13	—	—	—	—	0.7 ± 0.5
A04ASL-213-14	—	—	—	—	—	—	—	—	0.56 ± 0.19	—	—	—	—	1.5 ± 0.6
A04ASL-213-17	—	—	—	—	—	—	—	—	0.47 ± 0.16	—	—	—	—	0.9 ± 0.6
A04ASL-214-03	—	—	—	—	—	—	—	—	0.95 ± 0.17	—	—	—	—	3.8 ± 1.0
A04ASL-214-05	0.66 ± 0.15	0.61 ± 0.16	0.63 ± 0.16	0.66 ± 0.19	0.75 ± 0.16	0.73 ± 0.16	0.59 ± 0.14	0.66 ± 0.19	0.9 ± 0.2	199 ± 16	10 ± 3	6.4 ± 1.7	202 ± 16	110 ± 4
A04ASL-214-06	—	—	—	—	1.8 ± 0.4	4.1 ± 0.6	1.7 ± 0.4	—	2.3 ± 0.2	42 ± 4	2.2 ± 0.5	—	43 ± 4	34 ± 2
A04ASL-214-09	—	—	—	—	0.8 ± 0.2	0.71 ± 0.19	0.71 ± 0.19	—	1.2 ± 0.2	36 ± 3	1.7 ± 0.4	—	36 ± 3	25.9 ± 1.8
A04ASL-215-03	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	3.2 ± 1.1
A04ASL-215-05	—	—	—	—	—	—	—	—	0.43 ± 0.16	—	—	—	—	5.8 ± 1.1
A04ASL-218-04	—	—	—	—	—	—	—	—	0.70 ± 0.16	—	—	—	—	1.1 ± 0.7
A04ASL-218-15	—	—	—	—	—	—	—	—	0.55 ± 0.17	—	—	—	—	1.0 ± 0.7
A04ASL-218-17	—	—	—	—	—	—	—	—	0.38 ± .17	—	—	—	—	0.5 ± 0.3

TABLE 4-96
COPC CONCENTRATIONS IN IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-220-14	—	—	—	—	0.9 ± 0.2	0.68 ± 0.18	0.72 ± 0.19	—	0.60 ± 0.16	3.9 ± 0.5	0.13 ± 0.09	—	3.7 ± 0.5	5.2 ± 0.8
A04ASL-220-15	—	—	—	—	—	—	—	—	0.96 ± 0.17	—	—	—	—	7.1 ± 1.0
A04ASL-223-06	—	—	—	—	—	—	—	—	0.67 ± 0.16	—	—	—	—	8.1 ± 0.9
A04ASL-224-10	—	—	—	—	1.3 ± 0.3	0.78 ± 0.20	1.2 ± 0.3	—	1.9 ± 0.3	60 ± 5	2.6 ± 0.5	—	60 ± 5	44 ± 3
A04ASL-224-11	0.7 ± 0.2	—	1.0 ± 0.3	—	1.04 ± 0.16	0.90 ± 0.15	0.95 ± 0.15	—	2.2 ± 0.3	45 ± 3	2.2 ± 0.3	—	46 ± 3	37 ± 2
A04ASL-224-14	—	—	—	—	1.2 ± 0.3	1.2 ± 0.3	0.74 ± 0.20	—	1.0 ± 0.2	3.1 ± 0.5	0.17 ± 0.11	—	2.5 ± 0.4	3.4 ± 0.7
A04ASL-224-15	—	—	—	—	—	—	—	—	0.80 ± 0.17	—	—	—	—	1.6 ± 0.6
A04ASL-225-06	—	—	—	—	—	—	—	—	0.62 ± .18	—	—	—	—	8.6 ± 1.1
A04ASL-228-02	—	—	—	—	—	—	—	—	0.53 ± .16	—	—	—	—	1.4 ± 0.6
A04ASL-230-05	—	—	—	—	1.0 ± 0.2	1.3 ± 0.3	0.9 ± 0.2	—	1.4 ± 0.2	10.4 ± 1.1	0.49 ± 0.17	—	10.7 ± 1.1	13.2 ± 1.6
A04ASL-230-06	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	10.5 ± 1.5
A04ASL-236-09	0.63 ± 0.19	—	2.1 ± 0.4	—	0.57 ± 0.16	0.64 ± 0.17	0.38 ± 0.13	—	2.1 ± 0.3	13.8 ± 1.4	0.72 ± 0.20	—	11.4 ± 1.2	5.1 ± 0.9
A04ASL-236-10	—	—	—	—	—	—	—	—	0.53 ± 0.17	—	—	—	—	2.1 ± 0.7
A04ASL-238-05	0.80 ± 0.20	—	0.4 ± 0.2	—	0.55 ± 0.17	0.9 ± 0.2	0.45 ± 0.15	—	1.0 ± 0.2	13.2 ± 1.4	0.7 ± 0.2	—	13.1 ± 1.4	10.7 ± 1.4
A04ASL-239-03	1.00 ± 0.17	0.97 ± 0.16	0.8 ± 0.3	0.93 ± 0.20	1.1 ± 0.3	1.0 ± 0.3	1.0 ± 0.3	0.93 ± 0.20	1.1 ± 0.2	5.4 ± 0.7	0.25 ± 0.12	0.3 ± 0.6	5.4 ± 0.7	4.0 ± 1.5
A04ASL-239-04	—	—	—	—	—	—	—	—	0.61 ± 0.15	—	—	—	—	8.7 ± 1.1
A04ASL-240-02	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	0.9 ± 0.4
A04ASL-241-06	—	—	—	—	—	—	—	—	0.73 ± .19	—	—	—	—	6.0 ± 1.0
A04ASL-241-07	—	—	—	—	—	—	—	—	0.44 ± .16	—	—	—	—	5.5 ± 1.2
A04ASL-243-03	—	1.0 ± 0.3	—	0.8 ± 0.3	—	—	—	0.8 ± 0.3	0.80 ± 0.18	—	—	0.3 ± 0.6	—	6.6 ± 1.1
A04ASL-244-02	—	—	—	—	0.6 ± 0.3	0.7 ± 0.3	0.8 ± 0.3	—	0.60 ± 0.17	42 ± 4	2.4 ± 0.4	—	43 ± 4	41 ± 3
A04ASL-244-03	—	—	—	—	—	—	—	—	0.42 ± 0.16	—	—	—	—	9.9 ± 1.1
A04ASL-247-03	—	—	—	—	—	—	—	—	1.9 ± 0.2	—	—	—	—	2.2 ± 0.8
A04ASL-247-04	—	—	—	—	—	—	—	—	1.7 ± 0.3	—	—	—	—	2.2 ± 0.8

TABLE 4-96
COPC CONCENTRATIONS IN IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-249-03	—	1.3 ± 0.2	—	1.3 ± 0.2	—	—	—	1.3 ± 0.2	1.6 ± 0.2	—	—	0.1 ± 0.6	—	1.6 ± 0.6
A04ASL-249-06	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	1.4 ± 0.8
A04ASL-250-04	0.9 ± 0.2	—	0.7 ± 0.4	—	0.71 ± 0.20	1.1 ± 0.3	0.57 ± 0.17	—	0.5 ± 0.2	16.8 ± 1.6	0.9 ± 0.2	—	16.5 ± 1.6	11.7 ± 1.5
A04ASL-266-02	—	—	—	—	—	—	—	—	1.4 ± 0.3	—	—	—	—	3.8 ± 0.8
A04ASL-270-03	—	—	—	—	—	—	—	—	0.82 ± 0.16	—	—	—	—	1.6 ± 0.6
A04ASL-271-03	—	—	—	—	—	—	—	—	0.64 ± 0.16	—	—	—	—	1.6 ± 0.7
A04ASL-274-02	—	0.74 ± 0.15	—	0.51 ± 0.19	—	—	—	0.51 ± 0.19	1.07 ± 0.19	—	—	0.2 ± 0.5	—	4.2 ± 1.1
A04ASL-274-10	—	—	—	—	—	—	—	—	0.99 ± 0.18	—	—	—	—	2.6 ± 1.1
A04ASL-274-11	—	—	—	—	0.57 ± 0.18	1.3 ± 0.53	0.72 ± 0.20	—	1.0 ± 0.2	2.5 ± 0.4	0.11 ± 0.07	—	2.6 ± 0.4	3.3 ± 0.8
A04ASL-275-03	—	—	—	—	—	—	—	—	1.98 ± 0.20	—	—	—	—	3.5 ± 0.8
A04ASL-276-05	—	—	—	—	0.85 ± 0.20	0.89 ± 0.20	0.83 ± 0.20	—	1.0 ± 0.2	12.6 ± 1.3	0.59 ± 0.18	—	12.5 ± 1.3	11.6 ± 1.4
A04ASL-278-10	1.0 ± 0.2	0.6 0± 0.17	0.7 ± 0.2	0.7 ± 0.2	0.62 ± 0.16	0.91 ± 0.18	0.76 ± 0.17	0.7 ± 0.2	0.96 ± 0.20	339 ± 25	18 ± 4	10 ± 2	347 ± 26	250 ± 5
A04ASL-278-19	—	—	—	—	—	—	—	—	0.55 ± 0.15	—	—	—	—	8.6 ± 1.4
A04ASL-301-06	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	5.4 ± 0.9
A04ASL-301-07	—	—	—	—	—	—	—	—	0.84 ± 0.19	—	—	—	—	1.8 ± 0.6
A04ASL-302-06	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	7.1 ± 1.0
A04ASL-302-07	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	3.0 ± 0.7
A04ASL-303-03	—	1.9 ± 0.3	—	1.0 ± 0.3	—	—	—	1.0 ± 0.3	1.2 ± 0.2	—	—	0.0 ± 1.8	—	3.6 ± 0.7
A04ASL-304-03	—	—	—	—	—	—	—	—	0.53 ± .20	—	—	—	—	0.7 ± 0.5
A04ASL-305-14	—	—	—	—	—	—	—	—	0.55 ± 0.19	—	—	—	—	0.6 ± 0.5
A04ASL-305-17	—	—	—	—	—	—	—	—	0.38 ± .12	—	—	—	—	0.4 ± 0.3
A04ASL-306-01	—	—	—	—	—	—	—	—	0.07 ± 0.15	—	—	—	—	0.4 ± 0.7
A04ASL-306-03	—	—	—	—	—	—	—	—	0.69 ± 0.20	—	—	—	—	1.1 ± 0.7
A04ASL-307-01	—	—	—	—	—	—	—	—	0.42 ± 0.16	—	—	—	—	1.0 ± 0.6

TABLE 4-96
COPC CONCENTRATIONS IN IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-307-06	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	1.3 ± 0.7
A04ASL-307-07	—	—	—	—	—	—	—	—	0.43 ± 0.18	—	—	—	—	0.9 ± 0.6
A04ASL-308-01	—	—	—	—	—	—	—	—	0.7 ± 0.3	—	—	—	—	1.3 ± 0.8
A04ASL-308-06	—	—	—	—	—	—	—	—	0.44 ± 0.16	—	—	—	—	0.7 ± 0.6
A04ASL-308-07	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	1.2 ± 0.6
A04ASL-309-01	—	—	—	—	0.9 ± 0.2	0.65 ± 0.20	0.8 ± 0.2	—	0.65 ± 0.17	12.7 ± 1.3	0.55 ± 0.18	—	13.6 ± 1.4	10.4 ± 1.3
A04ASL-309-06	—	—	—	—	—	—	—	—	0.63 ± 0.17	—	—	—	—	2.1 ± 0.7
A04ASL-310-02	—	—	—	—	—	—	—	—	1.5 ± 0.2	—	—	—	—	4.7 ± 0.9
A04ASL-310-09	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	0.9 ± 0.5
A04ASL-311-06	—	—	—	—	—	—	—	—	1.2 ± 0.3	—	—	—	—	1.2 ± 0.8
A04ASL-311-07	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.3 ± 0.7
A04ASL-312-03	—	—	—	—	—	—	—	—	0.85 ± 0.20	—	—	—	—	3.2 ± 0.9
A04ASL-312-04	—	—	—	—	—	—	—	—	0.8 ± 0.3	—	—	—	—	2.3 ± 0.9
A04ASL-313-06	—	—	—	—	—	—	—	—	0.50 ± 0.15	—	—	—	—	0.6 ± 0.5
A04ASL-314-03	—	—	—	—	3.6 ± 0.6	2.7 ± 0.5	3.1 ± 0.5	—	3.6 ± 0.5	2.4 ± 0.4	0.11 ± 0.08	—	2.6 ± 0.4	4.6 ± 1.6
A04ASL-314-07	—	—	—	—	—	—	—	—	0.65 ± 0.18	—	—	—	—	0.8 ± 0.7
A04ASL-315-03	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	8.8 ± 1.7
A04ASL-315-05	—	—	—	—	—	—	—	—	0.8 ± 0.3	—	—	—	—	1.8 ± 0.8
A04ASL-316-06	—	—	—	—	—	—	—	—	0.77 ± 0.20	—	—	—	—	2.3 ± 1.0
A04ASL-317-02	—	—	—	—	—	—	—	—	0.8 ± 0.3	—	—	—	—	2.8 ± 0.8
A04ASL-318-02	—	—	—	—	0.23 ± 0.18	0.6 ± 0.3	0.5 ± 0.2	—	0.3 ± 0.2	25 ± 2	1.1 ± 0.3	—	25 ± 2	22 ± 2
A04ASL-319-02	—	—	—	—	—	—	—	—	0.72 ± 0.18	—	—	—	—	10.3 ± 1.4
A04ASL-320-03	—	—	—	—	—	—	—	—	1.0 ± 0.3	—	—	—	—	1.9 ± 0.8
A04ASL-321-03	—	—	—	—	—	—	—	—	0.03 ± 0.03	—	—	—	—	2.2 ± 0.9

TABLE 4-96
COPC CONCENTRATIONS IN IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04ASL-322-03	—	—	—	—	—	—	—	—	0.73 ± 0.18	—	—	—	—	2.5 ± 0.9
A04ASL-322-09	—	0.47 ± 0.14	—	0.48 ± 0.17	—	—	—	0.48 ± 0.17	0.45 ± 0.13	—	—	0.0 ± 0.4	—	0.6 ± 0.5

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-97
SOR FOR IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
A04ASL-001-03	—	1.9 ± 0.6
A04ASL-001-05	—	0.27 ± 0.12
A04ASL-002-03	—	0
A04ASL-002-04	—	0.5 ± 0.4
A04ASL-003-03	3.6 ± 0.3	5.6 ± 0.6
A04ASL-004-03	—	0.6 ± 0.4
A04ASL-004-04	—	0.8 ± 0.5
A04ASL-005-03	—	0
A04ASL-006-03	—	0
A04ASL-007-06	—	0
A04ASL-008-02	—	1.0 ± 0.4
A04ASL-009-06	—	2.2 ± 0.3
A04ASL-011-03	—	0.4 ± 0.4
A04ASL-011-04	—	0
A04ASL-012-03	—	0
A04ASL-012-04	—	1.1 ± 0.5
A04ASL-013-02	—	0
A04ASL-016-03	—	0.3 ± 0.4
A04ASL-016-04	—	0
A04ASL-017-03	—	0
A04ASL-018-03	—	0.6 ± 0.4
A04ASL-019-06	—	0.28 ± 0.11
A04ASL-021-03	—	0.3 ± 0.5
A04ASL-021-04	—	0
A04ASL-022-03	—	0.5 ± 0.4
A04ASL-026-03	—	0
A04ASL-027-03	—	1.1 ± 0.4
A04ASL-027-04	—	1.3 ± 0.5
A04ASL-028-02	—	0.8 ± 0.4
A04ASL-029-03	—	0
A04ASL-030-02	—	0.23 ± 0.11
A04ASL-031-02	—	22.6 ± 0.7
A04ASL-031-03	—	11.6 ± 0.9
A04ASL-031-04	—	5.5 ± 0.7
A04ASL-031-05	—	9.7 ± 0.5
A04ASL-031-06	—	2.9 ± 0.3
A04ASL-031-07	—	0.57 ± 0.14
A04ASL-031-08	—	0.38 ± 0.11
A04ASL-031-09	—	16.6 ± 0.7
A04ASL-031-10	—	15.1 ± 0.5
A04ASL-031-11	—	0.40 ± 0.11
A04ASL-031-12	—	0.27 ± 0.11
A04ASL-032-03	—	0.4 ± 0.4
A04ASL-032-04	—	0.5 ± 0.4
A04ASL-033-03	—	1.1 ± 0.2
A04ASL-033-04	—	1.7 ± 0.4
A04ASL-036-02	—	1.2 ± 0.5
A04ASL-037-02	—	0.35 ± 0.10
A04ASL-038-02	—	1.13 ± 0.19
A04ASL-039-02	—	0.7 ± 0.4

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
A04ASL-042-03	—	0.9 ± 0.4
A04ASL-045-03	—	0
A04ASL-046-06	—	0
A04ASL-047-02	—	0.9 ± 0.4
A04ASL-048-02	—	2.1 ± 0.5
A04ASL-051-02	16.1 ± 1.0	13.9 ± 0.8
A04ASL-052-02	0.6 ± 0.3	1.2 ± 0.5
A04ASL-053-02	—	0
A04ASL-055-02	2.19 ± 0.16	2.1 ± 0.3
A04ASL-056-04	1.5 ± 0.2	8.7 ± 0.7
A04ASL-056-05	3.9 ± 0.3	3.9 ± 0.5
A04ASL-057-05	—	0
A04ASL-057-06	—	0
A04ASL-058-02	3.3 ± 0.2	3.5 ± 0.9
A04ASL-059-02	—	1.2 ± 0.4
A04ASL-061-02	—	1.9 ± 0.4
A04ASL-062-02	3.5 ± 0.3	5.6 ± 0.7
A04ASL-063-03	3.6 ± 0.2	2.0 ± 0.2
A04ASL-064-02	—	0.83 ± 0.16
A04ASL-065-02	—	0.55 ± 0.16
A04ASL-066-03	—	0.4 ± 0.5
A04ASL-067-02	0.22 ± 0.04	1.4 ± 0.4
A04ASL-068-02	—	0
A04ASL-069-02	—	0
A04ASL-073-02	—	0.4 ± 0.4
A04ASL-076-02	—	0.3 ± 0.3
A04ASL-076-03	—	0
A04ASL-077-06	—	0
A04ASL-077-07	—	0
A04ASL-203-06	2.7 ± 0.3	3.5 ± 0.8
A04ASL-203-09	—	0.6 ± 0.4
A04ASL-208-15	—	0
A04ASL-209-10	0.73 ± 0.16	0.7 ± 0.2
A04ASL-210-03	—	0.6 ± 0.4
A04ASL-211-06	—	0
A04ASL-213-14	—	0
A04ASL-213-17	—	0
A04ASL-214-03	—	1.1 ± 0.4
A04ASL-214-05	31 ± 2	17.4 ± 0.8
A04ASL-214-06	9.2 ± 0.6	8.6 ± 0.6
A04ASL-214-09	5.5 ± 0.3	5.1 ± 0.5
A04ASL-215-03	—	1.0 ± 0.5
A04ASL-215-05	—	0.77 ± 0.17
A04ASL-218-04	—	0
A04ASL-218-15	—	0
A04ASL-218-17	—	0
A04ASL-220-14	0.47 ± 0.05	0.69 ± 0.12
A04ASL-220-15	—	1.6 ± 0.4
A04ASL-223-06	—	1.12 ± 0.14
A04ASL-224-10	9.6 ± 0.6	9.2 ± 0.7

TABLE 4-97
SOR FOR IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
A04ASL-224-11	7.1 ± 0.3	8.6 ± 0.6
A04ASL-224-14	0.47 ± 0.05	1.2 ± 0.5
A04ASL-224-15	—	0.4 ± 0.4
A04ASL-225-06	—	1.21 ± 0.17
A04ASL-228-02	—	0
A04ASL-230-05	1.69 ± 0.19	3.5 ± 0.5
A04ASL-230-06	—	1.7 ± 0.5
A04ASL-236-09	1.78 ± 0.14	3.6 ± 0.6
A04ASL-236-10	—	0
A04ASL-238-05	1.86 ± 0.15	2.3 ± 0.5
A04ASL-239-03	0.9 ± 0.3	1.6 ± 0.6
A04ASL-239-04	—	1.22 ± 0.17
A04ASL-240-02	—	0
A04ASL-241-06	—	1.0 ± 0.4
A04ASL-241-07	—	0.72 ± 0.18
A04ASL-243-03	—	1.3 ± 0.4
A04ASL-244-02	6.5 ± 0.4	6.2 ± 0.4
A04ASL-244-03	—	1.40 ± 0.17
A04ASL-247-03	—	2.8 ± 0.5
A04ASL-247-04	—	2.3 ± 0.7
A04ASL-249-03	—	1.9 ± 0.4
A04ASL-249-06	—	0.3 ± 0.4
A04ASL-250-04	2.6 ± 0.2	1.7 ± 0.2
A04ASL-266-02	—	2.1 ± 0.5
A04ASL-270-03	—	0.4 ± 0.3
A04ASL-271-03	—	0
A04ASL-274-02	—	1.4 ± 0.4
A04ASL-274-10	—	1.0 ± 0.4
A04ASL-274-11	0.50 ± 0.16	1.2 ± 0.5
A04ASL-275-03	—	3.2 ± 0.4
A04ASL-276-05	1.77 ± 0.14	2.4 ± 0.5
A04ASL-278-10	53 ± 3	39.0 ± 0.9
A04ASL-278-19	—	1.2 ± 0.2
A04ASL-301-06	—	0.71 ± 0.14
A04ASL-301-07	—	0.4 ± 0.4
A04ASL-302-06	—	0.97 ± 0.15
A04ASL-302-07	—	0.7 ± 0.5
A04ASL-303-03	—	1.6 ± 0.4
A04ASL-304-03	—	0
A04ASL-305-14	—	0
A04ASL-305-17	—	0
A04ASL-306-01	—	0
A04ASL-306-03	—	0
A04ASL-307-01	—	0
A04ASL-307-06	—	0.6 ± 0.5
A04ASL-307-07	—	0
A04ASL-308-01	—	0.3 ± 0.5
A04ASL-308-06	—	0
A04ASL-308-07	—	0.6 ± 0.4
A04ASL-309-01	1.86 ± 0.14	1.5 ± 0.2
A04ASL-309-06	—	0
A04ASL-310-02	—	2.3 ± 0.5
A04ASL-310-09	—	0
A04ASL-311-06	—	1.2 ± 0.5
A04ASL-311-07	—	0
A04ASL-312-03	—	0.8 ± 0.4
A04ASL-312-04	—	0.7 ± 0.7
A04ASL-313-06	—	0
A04ASL-314-03	3.9 ± 0.5	6.6 ± 1.1
A04ASL-314-07	—	0
A04ASL-315-03	—	1.5 ± 0.5
A04ASL-315-05	—	0.3 ± 0.5
A04ASL-316-06	—	0.5 ± 0.4
A04ASL-317-02	—	0.7 ± 0.6
A04ASL-318-02	3.7 ± 0.2	3.2 ± 0.4
A04ASL-319-02	—	1.5 ± 0.2
A04ASL-320-03	—	0.9 ± 0.7
A04ASL-321-03	—	0.22 ± 0.14
A04ASL-322-03	—	0.26 ± 0.13
A04ASL-322-09	—	0

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-98
ICP-MS RESULTS FOR URANIUM ISOTOPES IN IA04A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
Natural uranium [c]							—	0.0054%	0.7204%	—	99.2742%
Low enrichment [c]							—	0.0290%	3.4989%	—	96.4722%
Depleted uranium [c]							—	0.0010%	0.1991%	0.0003%	99.7996%
Recycled uranium [c]							—	0.0082%	0.9700%	0.0680%	98.9500%
A04ASL-214-05	[0.01]	0.037	4.1	[0.01]	669	673	ND	0.0055%	0.61%	ND	99.4%
A04ASL-278-10	[0.005]	0.047	5.4	[0.005]	1040	1045	ND	0.0045%	0.52%	ND	99.5%

Notes:

[a] Bracketed numbers are the laboratory reporting limits.

[b] Relative mass abundances were calculated using uranium isotopic data in Table 3-30. "ND" represents samples for which the isotope was not detected above the laboratory reporting limit; these values are assigned a zero value in the calculations.

[c] Traub, RJ. 2006. *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium*. Battelle-TBD-6001 rev. F0, Battelle, Richland, Washington.

TABLE 4-99
COPC CONCENTRATIONS IN IA04A NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A08-A01-SD-003	0.32 ± 0.16	0.17 ± 0.10	0.3 ± 0.4	0.27 ± 0.20	0.46 ± 0.16	0.72 ± 0.20	0.48 ± 0.15	0.27 ± 0.20	—	1.2 ± 0.3	0.01 ± 0.05	0.0 ± 0.9	1.0 ± 0.2	—
A08-A01-SD-009	0.54 ± 0.17	0.38 ± 0.11	0.5 ± 0.5	0.27 ± 0.11	0.43 ± 0.16	0.45 ± 0.15	0.30 ± 0.12	0.27 ± 0.11	—	2.1 ± 0.4	0.13 ± 0.09	0.08 ± 0.16	2.2 ± 0.4	—
A08-A01-SD-010	0.45 ± 0.16	0.14 ± 0.12	0.7 ± 0.4	0.3 ± 0.2	0.50 ± 0.16	0.40 ± 0.14	0.37 ± 0.13	0.3 ± 0.2	—	6.4 ± 0.9	0.34 ± 0.14	0.3 ± 0.3	6.6 ± 1.0	—
A08-A01-SD-011	0.50 ± 0.18	0.18 ± 0.16	0.5 ± 0.4	0.3 ± 0.3	0.51 ± 0.17	0.39 ± 0.14	0.40 ± 0.15	0.3 ± 0.3	—	36 ± 5	2.2 ± 0.5	2.6 ± 0.6	41 ± 5	—
A08-A01-SD-013	0.9 ± 0.2	0.47 ± 0.14	0.6 ± 0.4	0.57 ± 0.17	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	0.57 ± 0.17	—	2.6 ± 0.5	0.13 ± 0.09	0.0 ± 0.4	2.5 ± 0.5	—

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-100
SOR FOR IA04A NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-A01-SD-003	0
A08-A01-SD-009	0.22 ± 0.04
A08-A01-SD-010	0.86 ± 0.10
A08-A01-SD-011	5.9 ± 0.6
A08-A01-SD-013	0.4 ± 0.4

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. Only alpha laboratory data are available to calculate SORs for sediments.
[b] 0 ⇒ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-101
COPC CONCENTRATIONS IN IA04A GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a,b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A04AMW20-F	0.05 ± 0.06	0.3 ± 0.2	0.01 ± 0.06	0.22 ± 0.10	0.00 ± 0.04	3.8 ± 0.4	0.16 ± 0.09	3.6 ± 0.5
A04AMW20-U	0.08 ± 0.06	0.1 ± 0.2	0.01 ± 0.08	0.11 ± 0.06	0.04 ± 0.05	3.8 ± 0.4	0.19 ± 0.11	3.8 ± 0.5
A04AMW21-F	0.25 ± 0.07	0.08 ± 0.17	0.05 ± 0.06	0.10 ± 0.05	0.00 ± 0.03	1.7 ± 0.2	0.07 ± 0.05	1.6 ± 0.2
A04AMW21-U	0.27 ± 0.07	0.10 ± 0.17	0.09 ± 0.08	0.16 ± 0.08	-0.01 ± 0.03	1.7 ± 0.3	0.03 ± 0.05	1.9 ± 0.3
A04AMW22-F	0.28 ± 0.12	0.2 ± 0.2	0.04 ± 0.06	0.14 ± 0.07	0.02 ± 0.03	5.7 ± 0.8	0.31 ± 0.13	5.2 ± 0.7
A04AMW22-U	0.17 ± 0.10	0.0 ± 0.2	0.05 ± 0.07	0.08 ± 0.06	-0.01 ± 0.03	7.6 ± 0.9	0.56 ± 0.16	7.9 ± 0.9
A04AMW23-F	0.18 ± 0.10	0.4 ± 0.3	0.10 ± 0.08	0.13 ± 0.09	0.01 ± 0.04	3.1 ± 0.5	0.10 ± 0.08	2.7 ± 0.4
A04AMW23-U	0.15 ± 0.10	0.2 ± 0.3	0.08 ± 0.10	0.17 ± 0.09	0.01 ± 0.04	2.5 ± 0.4	0.06 ± 0.06	2.5 ± 0.4
A04AMW601D-F	0.15 ± 0.10	0.3 ± 0.3	0.01 ± 0.06	0.20 ± 0.10	-0.01 ± 0.03	6.9 ± 0.8	0.31 ± 0.13	7.2 ± 0.8
A04AMW601D-U	0.18 ± 0.10	0.2 ± 0.3	0.08 ± 0.08	0.25 ± 0.12	0.01 ± 0.04	6.3 ± 0.8	0.42 ± 0.15	5.9 ± 0.7
A04AMW602D-F	0.23 ± 0.11	0.5 ± 0.3	0.01 ± 0.04	0.18 ± 0.08	0.07 ± 0.05	31 ± 2	1.6 ± 0.3	31 ± 2
A04AMW602D-U	0.22 ± 0.10	0.3 ± 0.3	0.01 ± 0.05	0.17 ± 0.09	0.00 ± 0.04	29 ± 3	1.6 ± 0.3	30 ± 3
A04AMW603D-F	0.22 ± 0.11	0.2 ± 0.3	0.10 ± 0.09	0.29 ± 0.12	0.01 ± 0.05	1.7 ± 0.3	0.04 ± 0.06	1.3 ± 0.3
A04AMW603D-U	0.13 ± 0.11	0.1 ± 0.3	0.04 ± 0.10	0.17 ± 0.10	0.00 ± 0.06	4.5 ± 0.6	0.14 ± 0.10	4.0 ± 0.6

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-102
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS IN IA04A GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration[a,b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A04AMW20-F	0.3 ± 0.2	10.9 ± 1.5
A04AMW20-U	0.2 ± 0.2	11.3 ± 1.5
A04AMW21-F	0.33 ± 0.18	4.8 ± 0.7
A04AMW21-U	0.36 ± 0.19	5.8 ± 1.0
A04AMW22-F	0.5 ± 0.3	16 ± 2
A04AMW22-U	0.2 ± 0.2	24 ± 3
A04AMW23-F	0.5 ± 0.3	8.2 ± 1.3
A04AMW23-U	0.3 ± 0.3	7.4 ± 1.2
A04AMW601D-F	0.5 ± 0.3	22 ± 2
A04AMW601D-U	0.4 ± 0.3	18 ± 2
A04AMW602D-F	0.8 ± 0.3	92 ± 7
A04AMW602D-U	0.5 ± 0.3	90 ± 8
A04AMW603D-F	0.4 ± 0.3	4.0 ± 0.9
A04AMW603D-U	0.2 ± 0.3	12.1 ± 1.7

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-103
COPC CONCENTRATIONS IN IA04B SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE.

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04BSL-001-01	—	—	—	—	0.38 ± 0.10	0.53 ± 0.11	0.35 ± 0.09	—	0.16 ± 0.10	0.59 ± 0.12	0.05 ± 0.04	—	0.68 ± 0.12	1.2 ± 0.4
A04BSL-002-01	0.57 ± 0.16	—	0.3 ± 0.2	—	0.46 ± 0.15	0.74 ± 0.19	0.46 ± 0.15	—	0.37 ± 0.13	1.2 ± 0.3	0.08 ± 0.06	—	1.1 ± 0.2	1.3 ± 0.5
A04BSL-004-01	—	—	—	—	0.31 ± 0.13	0.32 ± 0.13	0.34 ± 0.13	—	0.16 ± 0.09	0.25 ± 0.10	0.02 ± 0.03	—	0.27 ± 0.11	0.6 ± 0.4
A04BSL-005-01	0.88 ± 0.20	—	0.2 ± 0.2	—	0.66 ± 0.19	0.69 ± 0.19	0.60 ± 0.17	—	0.36 ± 0.12	3.2 ± 0.5	0.05 ± 0.05	—	2.9 ± 0.4	1.7 ± 0.7
A04BSL-006-01	0.79 ± 0.20	—	0.4 ± 0.2	—	0.69 ± 0.19	0.75 ± 0.20	0.46 ± 0.15	—	0.43 ± 0.13	1.1 ± 0.2	0.05 ± 0.05	—	0.9 ± 0.2	1.1 ± 0.5
A04BSL-008-01	—	—	—	—	0.49 ± 0.16	0.42 ± 0.14	0.41 ± 0.14	—	0.32 ± 0.13	2.2 ± 0.4	0.15 ± 0.09	—	2.3 ± 0.4	0.8 ± 0.5
A04BSL-009-01	—	—	—	—	0.31 ± 0.12	0.27 ± 0.11	0.19 ± 0.09	—	0.16 ± 0.16	0.18 ± 0.09	0.01 ± 0.03	—	0.23 0.10	0.5 ± 0.5
A04BSL-010-01	—	—	—	—	0.42 ± 0.14	0.35 ± 0.13	0.26 ± 0.11	—	0.26 ± 0.12	0.38 ± 0.13	0.01 ± 0.03	—	0.46 ± 0.14	0.2 ± 0.2
A04BSL-011-01	1.2 ± 0.2	—	0.4 ± 0.2	—	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	—	0.78 ± 0.17	1.2 ± 0.3	0.18 ± 0.10	—	1.4 ± 0.3	1.3 ± 0.5
A04BSL-012-01	—	—	—	—	—	—	—	—	0.10 ± 0.06	—	—	—	—	0.2 ± 0.3
A04BSL-013-01	—	—	—	—	0.17 ± 0.10	0.38 ± 0.14	0.31 ± 0.13	—	0.11 ± 0.09	0.30 ± 0.12	0.02 ± 0.04	—	0.39 ± 0.13	0.2 ± 0.2
A04BSL-014-01	—	—	—	—	0.29 ± 0.13	0.33 ± 0.14	0.27 ± 0.12	—	0.22 ± 0.11	0.30 ± 0.12	0.03 ± 0.04	—	0.44 ± 0.14	0.5 ± 0.4
A04BSL-015-01	—	—	—	—	—	—	—	—	0.12 ± 0.07	—	—	—	—	0.5 ± 0.4
A04BSL-016-01	0.65 ± 0.18	1.30 ± 0.18	0.7 ± 0.3	0.83 ± 0.16	0.50 ± 0.16	0.61 ± 0.18	0.64 ± 0.18	0.83 ± 0.16	0.64 ± 0.12	2.2 ± 0.4	0.13 ± 0.08	0.1 ± 0.2	2.4 ± 0.4	2.4 ± 0.5
A04BSL-017-01	—	—	—	—	—	—	—	—	0.22 ± 0.10	—	—	—	—	0.5 ± 0.4
A04BSL-019-01	—	—	—	—	0.58 ± 0.17	0.41 ± 0.15	0.21 ± 0.10	—	0.20 ± 0.12	0.66 ± 0.18	0.01 ± 0.03	—	0.58 ± 0.16	0.7 ± 0.5
A04BSL-021-01	0.53 ± 0.16	—	0.5 ± 0.3	—	0.69 ± 0.19	1.0 ± 0.2	0.44 ± 0.14	—	0.33 ± 0.13	1.2 ± 0.2	0.10 ± 0.07	—	1.2 ± 0.2	1.4 ± 0.6
A04BSL-022-01	—	—	—	—	—	—	—	—	0.23 ± 0.12	—	—	—	—	0.4 ± 0.3
A04BSL-024-01	—	—	—	—	—	—	—	—	0.14 ± 0.09	—	—	—	—	0.2 ± 0.3
A04BSL-025-01	0.36 ± 0.14	—	0.8 ± 0.4	—	0.23 ± 0.12	0.47 ± 0.16	0.32 ± 0.14	—	0.22 ± 0.14	1.0 ± 0.2	0.01 ± 0.03	—	1.0 ± 0.2	1.0 ± 0.5
A04BSL-027-01	0.54 ± 0.13	—	0.54 ± 0.13	—	0.46 ± 0.15	0.46 ± 0.14	0.54 ± 0.15	—	0.45 ± 0.15	0.47 ± 0.15	0.02 ± 0.04	—	0.56 ± 0.16	0.5 ± 0.6
A04BSL-028-01	0.41 ± 0.15	—	0.2 ± 0.3	—	0.36 ± 0.13	0.45 ± 0.14	0.36 ± 0.13	—	0.34 ± 0.17	0.86 ± 0.20	0.05 ± 0.05	—	1.1 ± 0.2	1.6 ± 0.6
A04BSL-029-01	—	—	—	—	—	—	—	—	0.10 ± 0.10	—	—	—	—	0.4 ± 0.3

TABLE 4-103
COPC CONCENTRATIONS IN IA04B SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE.

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04BSL-030-01	—	—	—	—	—	—	—	—	0.27 ± 0.10	—	—	—	—	0.6 ± 0.3
A04BSL-031-01	—	—	—	—	—	—	—	—	0.27 ± 0.13	—	—	—	—	0.7 ± 0.4
A04BSL-032-01	—	—	—	—	—	—	—	—	0.13 ± 0.10	—	—	—	—	-0.02 ± 0.03
A04BSL-033-01	—	—	—	—	0.41 ± 0.11	0.52 ± 0.12	0.36 ± 0.10	—	0.20 ± 0.11	0.54 ± 0.11	0.01 ± 0.02	—	0.61 ± 0.11	0.8 ± 0.4
A04BSL-036-01	—	—	—	—	—	—	—	—	0.09 ± 0.14	—	—	—	—	0.17 ± 0.13
A04BSL-038-01	—	—	—	—	—	—	—	—	0.05 ± 0.08	—	—	—	—	0.4 ± 0.3
A04BSL-039-01	1.1 ± 0.3	—	1.0 ± 0.4	—	1.0 ± 0.2	1.3 ± 0.3	1.1 ± 0.2	—	0.82 ± 0.19	1.3 ± 0.3	0.05 ± 0.05	—	1.4 ± 0.3	1.8 ± 0.7
A04BSL-040-01	—	—	—	—	—	—	—	—	0.27 ± 0.14	—	—	—	—	0.5 ± 0.3
A04BSL-042-01	1.5 ± 0.3	—	1.1 ± 0.3	—	0.74 ± 0.19	1.3 ± 0.3	0.76 ± 0.19	—	1.9 ± 0.3	1.2 ± 0.3	0.11 ± 0.08	—	1.4 ± 0.3	8.3 ± 1.3
A04BSL-043-01	0.7 ± 0.2	—	1.2 ± 0.4	—	0.8 ± 0.2	1.0 ± 0.2	0.55 ± 0.17	—	1.0 ± 0.3	6.2 ± 0.7	0.32 ± 0.13	—	9.5 ± 1.0	11.9 ± 1.6
A04BSL-219-01	—	—	—	—	—	—	—	—	0.15 ± 0.13	—	—	—	—	0.5 ± 0.5
A04BSL-221-01	0.57 ± 0.19	—	0.6 ± 0.3	—	0.56 ± 0.17	0.71 ± 0.20	0.37 ± 0.14	—	0.20 ± 0.17	0.81 ± 0.19	0.04 ± 0.04	—	0.91 ± 0.20	1.1 ± 0.7
A04BSL-309-01	—	—	—	—	0.26 ± 0.12	0.23 ± 0.11	0.28 ± 0.12	—	0.04 ± 0.06	0.22 ± 0.10	0.02 ± 0.04	—	0.21 ± 0.09	0.7 ± 0.4
A04BSL-310-01	—	—	—	—	0.43 ± 0.11	0.43 ± 0.10	0.29 ± 0.08	—	0.31 ± 0.17	0.38 ± 0.09	0.01 ± 0.02	—	0.32 ± 0.08	1.0 ± 0.5
A04BSL-311-01	—	—	—	—	—	—	—	—	0.20 ± 0.11	—	—	—	—	0.21 ± 0.14
A04BSL-312-01	—	—	—	—	—	—	—	—	0.20 ± 0.12	—	—	—	—	0.7 ± 0.5

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-104
SOR FOR IA04B SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
A04BSL-001-01	0	0
A04BSL-002-01	0	0
A04BSL-004-01	0	0
A04BSL-005-01	0.34 ± 0.05	0
A04BSL-006-01	0	0
A04BSL-008-01	0.22 ± 0.04	0
A04BSL-009-01	0	0
A04BSL-010-01	0	0
A04BSL-011-01	0.2 ± 0.4	0.3 ± 0.4
A04BSL-012-01	—	0
A04BSL-013-01	0	0
A04BSL-014-01	0	0
A04BSL-015-01	—	0
A04BSL-016-01	0.23 ± 0.04	0.24 ± 0.08
A04BSL-017-01	—	0
A04BSL-019-01	0	0
A04BSL-021-01	0	0
A04BSL-022-01	—	0
A04BSL-024-01	—	0
A04BSL-025-01	0	0
A04BSL-027-01	0	0
A04BSL-028-01	0	0
A04BSL-029-01	—	0
A04BSL-030-01	—	0
A04BSL-031-01	—	0
A04BSL-032-01	—	0
A04BSL-033-01	0	0
A04BSL-036-01	—	0
A04BSL-038-01	—	0
A04BSL-039-01	0.7 ± 0.5	0.3 ± 0.4
A04BSL-040-01	—	0
A04BSL-042-01	0.25 ± 0.15	3.7 ± 0.6
A04BSL-043-01	1.04 ± 0.09	2.5 ± 0.6
A04BSL-219-01	—	0
A04BSL-221-01	0	0
A04BSL-309-01	0	0
A04BSL-310-01	0	0
A04BSL-311-01	—	0
A04BSL-312-01	—	0

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 ⇒ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-105
COPC CONCENTRATIONS IN IA04B SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a,b]	Concentration [c] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04BSL-001-05	—	—	—	—	—	—	—	—	0.49 ± 0.13	—	—	—	—	0.9 ± 0.4
A04BSL-002-05	—	—	—	—	—	—	—	—	0.17 ± 0.09	—	—	—	—	1.0 ± 0.4
A04BSL-003-01	—	—	—	—	0.29 ± 0.12	0.43 ± 0.15	0.18 ± 0.09	—	0.28 ± 0.18	0.31 ± 0.12	0.05 ± 0.05	—	0.27 ± 0.11	0.5 ± 0.4
A04BSL-003-03	—	—	—	—	—	—	—	—	0.72 ± 0.14	—	—	—	—	0.9 ± 0.7
A04BSL-004-02	—	—	—	—	—	—	—	—	0.26 ± 0.10	—	—	—	—	0.9 ± 0.4
A04BSL-005-02	—	—	—	—	—	—	—	—	0.20 ± 0.12	—	—	—	—	0.9 ± 0.5
A04BSL-006-06	—	—	—	—	—	—	—	—	0.64 ± 0.14	—	—	—	—	0.4 ± 0.4
A04BSL-007-06	1.2 ± 0.2	0.89 ± 0.18	0.5 ± 0.2	0.9 ± 0.3	1.2 ± 0.3	1.6 ± 0.4	1.0 ± 0.3	0.9 ± 0.3	0.85 ± 0.17	2.6 ± 0.4	0.13 ± 0.08	0.2 ± 0.4	2.8 ± 0.4	5.8 ± 1.3
A04BSL-008-03	—	—	—	—	1.0 ± 0.2	1.1 ± 0.2	0.79 ± 0.19	—	0.9 ± 0.2	0.87 ± 0.20	0.05 ± 0.05	—	1.1 ± 0.2	1.4 ± 0.8
A04BSL-009-06	—	—	—	—	—	—	—	—	0.36 ± 0.12	—	—	—	—	0.8 ± 0.5
A04BSL-012-06	—	—	—	—	1.11 ± 0.17	1.19 ± 0.17	0.94 ± 0.16	—	0.93 ± 0.18	1.19 ± 0.17	0.06 ± 0.04	—	1.52 ± 0.19	2.0 ± 0.6
A04BSL-013-07	1.10 ± 0.18	0.76 ± 0.20	0.6 ± 0.2	1.1 ± 0.3	0.8 ± 0.2	1.2 ± 0.3	0.73 ± 0.20	1.1 ± 0.3	1.2 ± 0.3	3.8 ± 0,5	0.16 ± 0.09	0.1 ± 0.4	4.0 ± 0.5	4.4 ± 0.9
A04BSL-014-07	—	—	—	—	0.9 ± 0.2	0.9 ± 0.2	1.0 ± 0.2	—	1.0 ± 0.2	0.64 ± 0.18	0.05 ± 0.06	—	0.84 ± 0.20	1.0 ± 0.6
A04BSL-015-06	1.3 ± 0.3	—	0.9 ± 0.4	—	1.2 ± 0.3	1.9 ± 0.4	1.2 ± 0.3	—	0.93 ± 0.16	0.80 ± 0.20	0.06 ± 0.06	—	1.0 ± 0.2	1.2 ± 0.6
A04BSL-015-07	—	—	—	—	1.0 ± 0.2	1.2 ± 0.2	0.84 ± 0.20	—	1.00 ± 0.20	0.58 ± 0.17	0.05 ± 0.05	—	0.77 ± 0.19	0.6 ± 0.5
A04BSL-016-03	—	—	—	—	0.9 ± 0.2	0.9 ± 0.2	0.69 ± 0.18	—	0.91 ± 0.14	1.0 ± 0.2	0.03 ± 0.04	—	0.94 ± 0.20	1.5 ± 0.6
A04BSL-017-02	—	—	—	—	—	—	—	—	0.24 ± 0.11	—	—	—	—	1.0 ± 0.4
A04BSL-018-01	—	—	—	—	—	—	—	—	0.12 ± 0.12	—	—	—	—	0.3 ± 0.3
A04BSL-018-06	1.4 ± 0.3	1.0 ± 0.2	0.8 ± 0.3	0.9 ± 0.3	1.3 ± 0.3	1.4 ± 0.3	1.1 ± 0.2	0.9 ± 0.3	1.5 ± 0.3	0.90 ± 0.20	0.02 ± 0.04	0.2 ± 0.3	1.0 ± 0.2	1.8 ± 0.6
A04BSL-018-07	—	—	—	—	1.1 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	—	0.93 ± 0.18	0.62 ± 0.17	0.04 ± 0.05	—	0.9 ± 0.2	0.9 ± 1.0
A04BSL-019-02	0.59 ± 0.17	—	0.8 ± 0.4	—	0.53 ± 0.16	0.71 ± 0.19	0.44 ± 0.15	—	0.45 ± 0.13	2.4 ± 0.4	0.12 ± 0.08	—	2.4 ± 0.4	2.7 ± 0.7
A04BSL-020-01	—	—	—	—	—	—	—	—	0.12 ± 0.09	—	—	—	—	0.3 ± 0.2
A04BSL-020-06	—	—	—	—	0.73 ± 0.19	1.0 ± 0.2	0.71 ± 0.18	—	0.47 ± 0.18	0.48 ± 0.14	0.01 ± 0.03	—	0.58 ± 0.16	0.6 ± 0.6
A04BSL-022-03	—	—	—	—	—	—	—	—	0.47 ± 0.14	—	—	—	—	1.3 ± 0.6

TABLE 4-105
COPC CONCENTRATIONS IN IA04B SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a,b]	Concentration [c] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04BSL-023-01	—	—	—	—	—	—	—	—	0.06 ± 0.15	—	—	—	—	0.6 ± 0.5
A04BSL-023-02	—	—	—	—	—	—	—	—	0.18 ± 0.12	—	—	—	—	0.8 ± 0.4
A04BSL-024-06	—	—	—	—	—	—	—	—	0.77 ± 0.16	—	—	—	—	1.8 ± 0.5
A04BSL-025-03	1.1 ± 0.2	—	0.6 ± 0.3	—	0.9 ± 0.2	0.76 ± 0.19	0.60 ± 0.17	—	0.48 ± 0.14	9.1 ± 1.0	0.59 ± 0.19	—	9.4 ± 1.0	8.4 ± 1.3
A04BSL-026-01	1.2 ± 0.3	—	0.4 ± 0.3	—	0.73 ± 0.18	0.84 ± 0.20	0.9 ± 0.2	—	0.54 ± 0.20	0.55 ± 0.16	0.05 ± 0.05	—	0.81 ± 0.19	0.5 ± 0.5
A04BSL-026-06	—	—	—	—	—	—	—	—	0.15 ± 0.11	—	—	—	—	0.3 ± 0.4
A04BSL-029-03	—	—	—	—	—	—	—	—	0.17 ± 0.10	—	—	—	—	0.8 ± 0.4
A04BSL-030-02	—	—	—	—	—	—	—	—	0.45 ± 0.12	—	—	—	—	2.0 ± 0.5
A04BSL-031-06	—	—	—	—	1.15 ± 0.17	1.41 ± 0.19	1.24 ± 0.18	—	0.94 ± 0.19	0.91 ± 0.15	0.04 ± 0.04	—	0.99 ± 0.16	2.2 ± 0.9
A04BSL-031-07	—	—	—	—	1.0 ± 0.2	1.1 ± 0.2	1.0 ± 0.2	—	0.85 ± 0.20	0.77 ± 0.19	0.08 ± 0.07	—	0.82 ± 0.20	1.7 ± 0.7
A04BSL-032-06	1.2 ± 0.2	—	0.7 ± 0.3	—	1.0 ± 0.2	1.4 ± 0.3	1.2 ± 0.2	—	1.04 ± 0.17	1.1 ± 0.2	0.05 ± 0.05	—	0.9 ± 0.2	1.2 ± 0.5
A04BSL-032-07	1.4 ± 0.2	—	0.9 ± 0.3	—	1.3 ± 0.3	1.3 ± 0.3	1.1 ± 0.2	—	0.9 ± 0.3	0.79 ± 0.19	0.05 ± 0.05	—	1.1 ± 0.2	1.9 ± 0.7
A04BSL-033-06	—	—	—	—	—	—	—	—	0.47 ± 0.18	—	—	—	—	1.0 ± 0.5
A04BSL-034-01	—	—	—	—	—	—	—	—	0.12 ± 0.11	—	—	—	—	0.2 ± 0.3
A04BSL-034-05	—	—	—	—	—	—	—	—	0.49 ± 0.16	—	—	—	—	0.7 ± 0.6
A04BSL-035-01	—	—	—	—	—	—	—	—	0.10 ± 0.11	—	—	—	—	0.4 ± 0.4
A04BSL-035-06	—	—	—	—	—	—	—	—	0.68 ± 0.17	—	—	—	—	0.8 ± 0.6
A04BSL-036-05	0.90 ± 0.16	—	0.7 ± 0.2	—	1.2 ± 0.3	1.2 ± 0.3	1.1 ± 0.2	—	0.49 ± 0.18	3.5 ± 0.5	0.20 ± 0.10	—	3.5 ± 0.5	2.4 ± 0.8
A04BSL-037-01	—	—	—	—	—	—	—	—	0.05 ± 0.08	—	—	—	—	0.2 ± 0.4
A04BSL-037-05	—	—	—	—	—	—	—	—	0.59 ± 0.17	—	—	—	—	2.5 ± 0.7
A04BSL-038-07	—	—	—	—	0.9 ± 0.2	1.1 ± 0.2	0.9 ± 0.2	—	0.86 ± 0.17	1.1 ± 0.2	0.08 ± 0.07	—	1.1 ± 0.2	1.7 ± 0.7
A04BSL-040-03	—	—	—	—	1.7 ± 0.3	1.6 ± 0.3	1.7 ± 0.3	—	0.86 ± 0.18	3.4 ± 0.5	0.15 ± 0.09	—	3.4 ± 0.5	2.2 ± 0.7
A04BSL-041-01	—	—	—	—	—	—	—	—	0.10 ± 0.11	—	—	—	—	0.4 ± 0.4
A04BSL-041-05	0.9 ± 0.2	—	0.8 ± 0.4	—	0.82 ± 0.20	0.77 ± 0.19	0.68 ± 0.17	—	0.62 ± 0.15	14.8 ± 1.5	0.8 ± 0.2	—	14.5 ± 1.4	12.2 ± 1.5

TABLE 4-105
COPC CONCENTRATIONS IN IA04B SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a,b]	Concentration [c] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04BSL-042-02	1.0 ± 0.3	1.00 ± 0.19	1.1 ± 0.4	0.6 ± 0.3	1.0 ± 0.2	1.3 ± 0.3	0.9 ± 0.2	0.6 ± 0.3	0.9 ± 0.2	1.0 ± 0.3	0.05 ± 0.05	0.1 ± 0.2	1.2 ± 0.2	2.3 ± 0.7
A04BSL-043-02	—	—	—	—	0.84 ± 0.20	1.0 ± 0.2	0.70 ± 0.18	—	0.7 ± 0.2	2.3 ± 0.4	0.13 ± 0.08	—	2.4 ± 0.4	3.4 ± 0.8
A04BSL-219-03	1.3 ± 0.3	—	1.0 ± 0.4	—	0.82 ± 0.20	1.2 ± 0.3	0.80 ± 0.20	—	1.0 ± 0.2	2.3 ± 0.4	0.09 ± 0.07	—	2.2 ± 0.4	2.8 ± 0.8
A04BSL-301-01	—	0.19 ± 0.10	—	0.09 ± 0.16	—	—	—	0.09 ± 0.16	0.22 ± 0.09	—	—	0.02 ± 0.12	—	0.3 ± 0.3
A04BSL-301-11	—	—	—	—	—	—	—	—	0.60 ± 0.15	—	—	—	—	0.6 ± 0.4
A04BSL-302-01	—	—	—	—	—	—	—	—	0.27 ± 0.09	—	—	—	—	0.5 ± 0.3
A04BSL-302-06	—	—	—	—	1.3 ± 0.3	1.0 ± 0.2	1.4 ± 0.3	—	0.93 ± 0.20	1.0 ± 0.4	0.05 ± 0.05	—	0.84 ± 0.20	1.4 ± 0.7
A04BSL-303-01	—	—	—	—	0.33 ± 0.14	0.38 ± 0.15	0.13 ± 0.08	—	0.2 ± 0.3	0.30 ± 0.11	0.000 ± 0.012	—	0.26 ± 0.11	0.6 ± 1.0
A04BSL-303-06	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.6 ± 0.7
A04BSL-303-07	—	—	—	—	—	—	—	—	0.53 ± 0.17	—	—	—	—	1.4 ± 0.6
A04BSL-304-01	—	—	—	—	—	—	—	—	0.27 ± 0.15	—	—	—	—	0.6 ± 0.5
A04BSL-304-02	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.4 ± 0.8
A04BSL-304-03	1.11 ± 0.19	—	1.11 ± 0.19	—	1.1 ± 0.2	1.2 ± 0.3	0.75 ± 0.19	—	0.81 ± 0.17	2.1 ± 0.3	0.10 ± 0.07	—	2.3 ± 0.4	2.3 ± 0.8
A04BSL-305-01	—	—	—	—	—	—	—	—	0.09 ± 0.07	—	—	—	—	0.01 ± 0.02
A04BSL-305-06	—	—	—	—	0.82 ± 0.20	0.83 ± 0.20	0.72 ± 0.18	—	0.45 ± 0.14	0.85 ± 0.20	-0.005 ± 0.007	—	0.84 ± 0.20	1.0 ± 0.4
A04BSL-306-01	—	—	—	—	—	—	—	—	0.24 ± 0.10	—	—	—	—	0.4 ± 0.3
A04BSL-306-03	0.60 ± 0.20	—	0.9 ± 0.3	—	0.58 ± 0.17	0.81 ± 0.20	0.79 ± 0.20	—	1.06 ± 0.18	3.7 ± 0.5	0.20 ± 0.10	—	3.5 ± 0.5	9.7 ± 1.4
A04BSL-307-01	0.6 ± 0.2	—	0.7 ± 0.3	—	0.60 ± 0.17	0.48 ± 0.15	0.66 ± 0.18	—	0.37 ± 0.16	1.0 ± 0.2	0.06 ± 0.06	—	1.0 ± 0.2	1.3 ± 0.7
A04BSL-307-02	—	—	—	—	—	—	—	—	0.44 ± 0.16	—	—	—	—	0.7 ± 0.5
A04BSL-308-01	—	—	—	—	0.45 ± 0.14	0.70 ± 0.18	0.49 ± 0.15	—	0.72 ± 0.20	1.3 ± 0.3	0.08 ± 0.07	—	1.3 ± 0.3	1.7 ± 0.7
A04BSL-308-02	—	—	—	—	0.9 ± 0.2	0.80 ± 0.20	1.0 ± 0.2	—	0.85 ± 0.18	4.8 ± 0.6	0.33 ± 0.12	—	5.0 ± 0.6	4.4 ± 1.2
A04BSL-309-03	—	—	—	—	—	—	—	—	0.12 ± 0.15	—	—	—	—	0.2 ± 0.7
A04BSL-310-06	0.9 ± 0.2	—	0.9 ± 0.4	—	1.0 ± 0.2	1.1 ± 0.3	1.0 ± 0.2	—	1.7 ± 0.3	2.3 ± 0.4	0.06 ± 0.06	—	2.1 ± 0.0.3	2.8 ± 1.1
A04BSL-310-07	—	—	—	—	1.10 ± 0.17	1.28 ± 0.18	0.92 ± 0.15	—	0.9 ± 0.2	0.80 ± 0.14	0.04 ± 0.03	—	0.99 ± 0.16	1.3 ± 0.8

TABLE 4-105
COPC CONCENTRATIONS IN IA04B SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a] [b]	Concentration [c] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04BSL-311-05	—	—	—	—	—	—	—	—	0.38 ± .20	—	—	—	—	2.5 ± 0.8
A04BSL-312-02	—	—	—	—	—	—	—	—	1.3 ± 0.3	—	—	—	—	0.8 ± 0.5

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.

[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-106
SOR FOR IA04B SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
A04BSL-001-05	—	0
A04BSL-002-05	—	0
A04BSL-003-01	0	0
A04BSL-003-03	—	0
A04BSL-004-02	—	0
A04BSL-005-02	—	0
A04BSL-006-06	—	0
A04BSL-007-06	0.9 ± 0.4	1.2 ± 0.4
A04BSL-008-03	0.11 ± 0.13	0.5 ± 0.4
A04BSL-009-06	—	0
A04BSL-012-06	0.30 ± 0.18	0.6 ± 0.4
A04BSL-013-07	0.66 ± 0.16	1.7 ± 0.5
A04BSL-014-07	0.2 ± 0.2	0.8 ± 0.4
A04BSL-015-06	1.0 ± 0.3	0.6 ± 0.3
A04BSL-015-07	0.17 ± 014	0.8 ± 0.4
A04BSL-016-03	0	0.6 ± 0.3
A04BSL-017-02	—	0
A04BSL-018-01	—	0
A04BSL-018-06	0.5 ± 0.3	1.8 ± 0.6
A04BSL-018-07	0.4 ± 0.3	0.6 ± 0.4
A04BSL-019-02	0.26 ± 0.04	0.29 ± 0.12
A04BSL-020-01	—	0
A04BSL-020-06	0	0
A04BSL-022-03	—	0
A04BSL-023-01	—	0
A04BSL-023-02	—	0
A04BSL-024-06	—	0.3 ± 0.3
A04BSL-025-03	1.28 ± 0.10	1.17 ± 0.20
A04BSL-026-01	0.12 ± 0.20	0
A04BSL-026-06	—	0
A04BSL-029-03	—	0
A04BSL-030-02	—	0
A04BSL-031-06	0.69 ± 0.2	0.7 ± 0.4
A04BSL-031-07	0.3 ± 0.2	0.5 ± 0.4
A04BSL-032-06	0.6 ± 0.3	0.8 ± 0.3
A04BSL-032-07	0.5 ± 0.3	0.5 ± 0.5
A04BSL-033-06	—	0
A04BSL-034-01	—	0
A04BSL-034-05	—	0
A04BSL-035-01	—	0
A04BSL-035-06	—	0
A04BSL-036-05	0.8 ± 0.3	0.25 ± 0.12
A04BSL-037-01	—	0
A04BSL-037-05	—	0.26 ± 0.10
A04BSL-038-07	0.2 ± 0.2	0.5 ± 0.3
A04BSL-040-03	1.7 ± 0.3	0.7 ± 0.4
A04BSL-041-01	—	0
A04BSL-041-05	2.08 ± 0.15	1.8 ± 0.2
A04BSL-042-02	0.24 ± 0.15	0.7 ± 0.5
A04BSL-043-02	0.25 ± 0.04	0.40 ± 0.12
A04BSL-219-03	0.42 ± 0.15	1.0 ± 0.5
A04BSL-301-01	—	0
A04BSL-301-11	—	0
A04BSL-302-01	—	0
A04BSL-302-06	0.5 ± 0.3	0.6 ± 0.4
A04BSL-303-01	0	0
A04BSL-303-06	—	0
A04BSL-303-07	—	0
A04BSL-304-01	—	0
A04BSL-304-02	—	0
A04BSL-304-03	0.41 ± 0.15	0.6 ± 0.4
A04BSL-305-01	—	0
A04BSL-305-06	0	0
A04BSL-306-01	—	0
A04BSL-306-03	0.44 ± 0.05	2.3 ± 0.4
A04BSL-307-01	0	0
A04BSL-307-02	—	0
A04BSL-308-01	0	0
A04BSL-308-02	0.8 ± 0.2	1.0 ± 0.4
A04BSL-309-03	—	0
A04BSL-310-06	0.6 ± 0.3	2.4 ± 0.6
A04BSL-310-07	0.23 ± 0.11	0.5 ± 0.5
A04BSL-311-05	—	0.26 ± 0.13
A04BSL-312-02	—	1.4 ± 0.6

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-107
COPC CONCENTRATIONS IN IA04B GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a,b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A04BMW18-F	0.18 ± 0.10	0.1 ± 0.3	0.02 ± 0.04	0.21 ± 0.10	0.01 ± 0.04	42 ± 4	1.8 ± 0.4	43 ± 4
A04BMW18-U	0.23 ± 0.11	0.3 ± 0.3	0.00 ± 0.05	0.08 ± 0.07	0.00 ± 0.04	41 ± 4	1.8 ± 0.4	41 ± 4
A04BMW19-F	0.14 ± 0.10	0.2 ± 0.3	0.01 ± 0.05	0.09 ± 0.06	0.01 ± 0.04	2.3 ± 0.4	0.07 ± 0.06	2.1 ± 0.3
A04BMW19-U	0.06 ± 0.09	0.2 ± 0.3	0.06 ± 0.08	0.17 ± 0.10	-0.01 ± 0.04	2.3 ± 0.4	0.11 ± 0.08	2.2 ± 0.4
A04BMW26-F	0.20 ± 0.11	0.4 ± 0.2	0.05 ± 0.08	0.08 ± 0.07	0.01 ± 0.04	69 ± 6	3.3 ± 0.5	66 ± 6
A04BMW26-U	0.17 ± 0.11	0.4 ± 0.2	0.00 ± 0.05	0.15 ± 0.09	0.00 ± 0.04	72 ± 7	3.5 ± 0.6	71 ± 7
A04BMW605D-F	0.28 ± 0.10	0.2 ± 0.3	0.08 ± 0.08	0.11 ± 0.08	0.02 ± 0.04	69 ± 7	3.4 ± 0.7	64 ± 6
A04BMW605D-U	0.27 ± 0.10	0.4 ± 0.3	0.05 ± 0.06	0.25 ± 0.09	0.00 ± 0.03	69 ± 6	3.4 ± 0.6	66 ± 6

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-108
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS IN IA04B GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration[a,b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A04BMW18-F	0.2 ± 0.3	128 ± 12
A04BMW18-U	0.5 ± 0.3	123 ± 11
A04BMW19-F	0.3 ± 0.3	6.2 ± 1.0
A04BMW19-U	0.3 ± 0.3	6.7 ± 1.1
A04BMW26-F	0.6 ± 0.3	198 ± 18
A04BMW26-U	0.5 ± 0.3	212 ± 19
A04BMW605D-F	0.5 ± 0.4	192 ± 19
A04BMW605D-U	0.7 ± 0.3	197 ± 17

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-109
COPC CONCENTRATIONS IN IA04C SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04CSL-001-01	1.16 ± 0.18	—	1.1 ± 0.3	—	0.91 ± 0.14	1.06 ± 0.16	1.01 ± 0.15	—	0.9 ± 0.2	0.74 ± 0.14	-0.002 ± 0.019	—	0.81 ± 0.14	1.0 ± 0.6
A04CSL-002-01	1.2 ± 0.3	—	0.9 ± 0.4	—	1.2 ± 0.2	1.5 ± 0.3	1.1 ± 0.2	—	1.1 ± 0.2	0.75 ± 0.20	0.03 ± 0.05	—	0.9 ± 0.2	1.6 ± 0.6
A04CSL-003-01	1.1 ± 0.3	—	0.8 ± 0.4	—	0.90 ± 0.20	1.0 ± 0.2	1.0 ± 0.2	—	0.86 ± 0.19	0.9 ± 0.2	0.06 ± 0.05	—	0.82 ± 0.20	1.4 ± 0.5
A04CSL-005-01	—	—	—	—	0.88 ± 0.15	0.84 ± 0.15	0.76 ± 0.14	—	0.86 ± 0.16	0.52 ± 0.12	0.04 ± 0.03	—	0.49 ± 0.11	1.5 ± 0.6
A04CSL-006-01	—	—	—	—	0.83 ± 0.19	1.2 ± 0.2	1.0 ± 0.2	—	0.88 ± 0.19	1.0 ± 0.2	0.09 ± 0.07	—	1.2 ± 0.3	1.1 ± 0.8
A04CSL-007-01	—	—	—	—	0.79 ± 0.18	0.85 ± 0.19	0.71 ± 0.17	—	0.63 ± 0.18	0.67 ± 0.18	0.01 ± 0.03	—	0.59 ± 0.17	0.9 ± 0.5
A04CSL-008-01	—	—	—	—	0.75 ± 0.18	0.80 ± 0.19	0.51 ± 0.14	—	0.74 ± 0.20	0.53 ± 0.16	0.02 ± 0.04	—	0.74 ± 0.19	0.9 ± 0.5
A04CSL-009-01	—	—	—	—	1.2 ± 0.2	1.1 ± 0.2	1.0 ± 0.2	—	1.5 ± 0.3	1.1 ± 0.3	0.06 ± 0.06	—	1.1 ± 0.3	1.7 ± 0.6
A04CSL-010-01	—	—	—	—	—	—	—	—	0.39 ± 0.16	—	—	—	—	0.8 ± 0.5
A04CSL-011-01	—	—	—	—	1.1 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	—	1.02 ± 0.19	1.0 ± 0.2	0.06 ± 0.06	—	1.2 ± 0.3	1.5 ± 0.5
A04CSL-012-01	—	—	—	—	0.86 ± 0.20	1.1 ± 0.2	0.84 ± 0.19	—	1.4 ± 0.3	1.2 ± 0.3	0.07 ± 0.07	—	1.2 ± 0.5	1.9 ± 0.7
A04CSL-013-01	1.0 ± 0.3	—	0.7 ± 0.4	—	0.70 ± 0.17	1.0 ± 0.2	0.73 ± 0.18	—	0.74 ± 0.19	2.3 ± 0.4	0.09 ± 0.07	—	2.1 ± 0.4	2.2 ± 0.7
A04CSL-014-01	0.60 ± 0.20	—	0.8 ± 0.4	—	0.41 ± 0.13	0.55 ± 0.15	0.39 ± 0.12	—	0.37 ± 0.20	0.49 ± 0.15	0.03 ± 0.04	—	0.38 ± 0.13	0.6 ± 0.7
A04CSL-015-01	0.9 ± 0.2	—	-0.3 ± 0.4	—	0.58 ± 0.16	0.54 ± 0.15	0.61 ± 0.16	—	0.36 ± 0.12	0.9 ± 0.2	0.03 ± 0.05	—	1.1 ± 0.3	1.5 ± 0.5
A04CSL-301-01	—	—	—	—	0.73 ± 0.20	1.1 ± 0.3	0.59 ± 0.18	—	0.86 ± 0.17	5.3 ± 0.7	0.28 ± 0.13	—	4.9 ± 0.6	5.8 ± 1.2
A04CSL-302-01	—	—	—	—	—	—	—	—	0.67 ± 0.16	—	—	—	—	2.0 ± 0.6
A04CSL-303-01	—	—	—	—	—	—	—	—	0.23 ± 0.11	—	—	—	—	0.24 ± 0.20
A04CSL-304-01	—	—	—	—	—	—	—	—	0.21 ± 0.13	—	—	—	—	0 ± 4
A04CSL-305-01	—	—	—	—	0.80 ± 0.14	0.94 ± 0.15	0.85 ± 014	—	1.1 ± 0.3	2.0 ± 0.3	0.10 ± 0.08	—	1.7 ± 0.3	3.1 ± 1.1
A04CSL-306-01	—	—	—	—	—	—	—	—	0.8 ± 0.4	—	—	—	—	2.1 ± 0.9
A04CSL-307-01	—	—	—	—	0.8 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	—	0.9 ± 0.3	1.8 ± 0.3	0.07 ± 0.06	—	1.8 ± 0.3	2.9 ± 1.5
A04CSL-308-01	—	—	—	—	1.2 ± 0.3	1.2 ± 0.3	1.0 ± 0.2	—	0.9 ± 0.3	0.82 ± 0.20	0.05 ± 0.05	—	0.76 ± 0.19	1.7 ± 1.1
A04CSL-309-01	—	—	—	—	1.7 ± 0.4	2.0 ± 0.5	1.5 ± 0.4	—	1.6 ± 0.4	2.0 ± 0.5	0.18 ± 0.14	—	2.2 ± 0.5	4.0 ± 1.4
A04CSL-310-01	—	—	—	—	1.0 ± 0.2	1.2 ± 0.3	1.0 ± 0.2	—	0.6 ± 0.3	2.8 ± 0.4	0.25 ± 0.12	—	2.6 ± 0.4	3.4 ± 1.4
A04CSL-311-01	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	2.3 ± 0.7
A04CSL-312-01	—	—	—	—	0.8 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	—	0.27 ± 0.18	1.7 ± 0.3	0.05 ± 0.05	—	1.8 ± 0.3	2.3 ± 0.9
A04CSL-313-01	—	0.07 ± 0.06	—	0.07 ± 0.10	—	—	—	0.07 ± 0.10	0.05 ± 0.09	—	—	0.10 ± 0.11	—	0.4 ± 0.6

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-110
SOR FOR IA04C SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha[d]	Onsite Gamma[e]
A04CSL-001-01	0.4 ± 0.3	0.5 ± 0.4
A04CSL-002-01	0.9 ± 0.5	1.0 ± 0.4
A04CSL-003-01	0.3 ± 0.4	0.4 ± 0.4
A04CSL-005-01	0	0.4 ± 0.3
A04CSL-006-01	0.5 ± 0.4	0.5 ± 0.4
A04CSL-007-01	0	0
A04CSL-008-01	0	0
A04CSL-009-01	0.5 ± 0.4	1.7 ± 0.5
A04CSL-010-01	—	0
A04CSL-011-01	0.6 ± 0.4	0.8 ± 0.4
A04CSL-012-01	0.12 ± 0.13	1.5 ± 0.6
A04CSL-013-01	0.12 ± 0.03	0
A04CSL-014-01	0	0
A04CSL-015-01	0	0
A04CSL-301-01	0.75 ± 0.16	1.2 ± 0.4
A04CSL-302-01	—	0
A04CSL-303-01	—	0
A04CSL-304-01	—	0
A04CSL-305-01	0	1.3 ± 0.7
A04CSL-306-01	—	0.2 ± 0.7
A04CSL-307-01	0.2 ± 0.4	0.8 ± 0.6
A04CSL-308-01	0.5 ± 0.5	0.5 ± 0.5
A04CSL-309-01	2.1 ± 0.8	2.5 ± 0.8
A04CSL-310-01	0.8 ± 0.5	0.4 ± 0.2
A04CSL-311-01	—	0.22 ± 0.11
A04CSL-312-01	0	0.23 ± 0.14
A04CSL-313-01	—	0

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 ⇒ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-111
COPC CONCENTRATIONS IN IA04C SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04CSL-003-02	1.3 ± 0.3	—	0.5 ± 0.4	—	1.2 ± 0.2	1.1 ± 0.2	1.0 ± 0.2	—	0.86 ± 0.20	0.8 ± 0.2	0.04 ± 0.05	—	1.0 ± 0.2	1.2 ± 0.7
A04CSL-004-02	1.7 ± 0.3	—	1.3 ± 0.5	—	1.4 ± 0.3	1.4 ± 0.3	1.2 ± 0.2	—	1.4 ± 0.2	0.9 ± 0.2	0.07 ± 0.06	—	0.9 ± 0.2	0.9 ± 0.6
A04CSL-006-02	1.7 ± 0.3	—	1.3 ± 0.5	—	1.3 ± 0.3	1.4 ± 0.3	1.2 ± 0.2	—	1.2 ± 0.2	1.0 ± 0.2	0.03 ± 0.04	—	1.0 ± 0.2	2.8 ± 0.8
A04CSL-006-03	1.7 ± 0.3	—	1.4 ± 0.4	—	1.2 ± 0.2	1.4 ± 0.3	1.2 ± 0.2	—	1.37 ± 0.20	0.80 ± 0.19	0.02 ± 0.04	—	0.82 ± 0.20	1.5 ± 0.6
A04CSL-011-03	1.17 ± 0.15	—	1.17 ± 0.15	—	1.1 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	—	1.0 ± 0.2	1.1 ± 0.3	0.12 ± 0.08	—	1.0 ± 0.2	2.2 ± 1.0
A04CSL-011-04	—	—	—	—	1.1 ± 0.2	1.3 ± 0.3	1.1 ± 0.52	—	1.4 ± 0.3	1.2 ± 0.3	0.09 ± 0.07	—	1.5 ± 0.3	1.9 ± 0.6
A04CSL-013-02	1.3 ± 0.3	1.05 ± 0.12	1.3 ± 0.4	0.89 ± 0.15	1.1 ± 0.2	1.2 ± 0.2	0.90 ± 0.20	0.89 ± 0.15	1.6 ± 0.3	3.4 ± 0.6	0.13 ± 0.09	0.20 ± 0.20	3.8 ± 0.6	4.2 ± 0.9
A04CSL-302-05	—	—	—	—	1.7 ± 0.3	1.6 ± 0.3	1.5 ± 0.3	—	1.6 ± 0.2	2.3 ± 0.4	0.08 ± 0.07	—	2.0 ± 0.3	4.0 ± 1.0
A04CSL-303-05	—	—	—	—	—	—	—	—	0.16 ± 0.13	—	—	—	—	0.8 ± 0.4
A04CSL-304-03	—	—	—	—	—	—	—	—	0.60 ± 0.20	—	—	—	—	1.4 ± 0.6
A04CSL-304-13	—	—	—	—	—	—	—	—	-0.01 ± .01	—	—	—	—	0.09±0.11
A04CSL-305-06	—	—	—	—	—	—	—	—	0.67 ± 0.20	—	—	—	—	0.7 ± 0.7
A04CSL-306-06	—	—	—	—	—	—	—	—	0.50 ± 0.16	—	—	—	—	0.9 ± 0.7
A04CSL-307-02	—	—	—	—	1.1 ± 0.3	1.2 ± 0.3	1.3 ± 0.3	—	1.2 ± 0.3	1.4 ± 0.3	0.07 ± 0.06	—	1.4 ± 0.3	2.7 ± 1.0
A04CSL-308-02	—	—	—	—	1.2 ± 0.3	1.0 ± 0.2	0.74 ± 0.19	—	0.9 ± 0.3	0.73 ± 0.19	0.06 ± 0.06	—	0.64 ± 0.18	1.5 ± 0.8
A04CSL-309-02	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	1.5 ± 0.7
A04CSL-309-05	—	—	—	—	0.63 ± 0.17	0.9 ± 0.2	0.67 ± 0.18	—	0.9 ± 0.3	0.60 ± 0.17	0.06 ± 0.06	—	0.49 ± 0.15	2.2 ± 0.9
A04CSL-310-02	—	—	—	—	1.1 ± 0.3	1.3 ± 0.3	1.0 ± 0.2	—	0.7 ± 0.3	3.1 ± 0.5	0.19 ± 0.10	—	3.3 ± 0.5	4.7 ± 1.3
A04CSL-311-02	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	2.8 ± 0.9
A04CSL-312-02	—	—	—	—	1.0 ± 0.2	1.2 ± 0.3	1.0 ± 0.2	—	0.8 ± 0.3	2.4 ± 0.4	0.11 ± 0.07	—	2.1 ± 0.3	3.0 ± 1.1
A04CSL-313-03	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	2.0 ± 0.9

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Spectroscopy.

TABLE 4-112
SOR FOR IA04C SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
A04CSL-003-02	0.3 ± 0.2	0.5 ± 0.4
A04CSL-004-02	0.8 ± 0.3	1.7 ± 0.5
A04CSL-006-02	0.7 ± 0.3	1.4 ± 0.5
A04CSL-006-03	0.6 ± 03	1.5 ± 0.4
A04CSL-011-03	0.5 ± 0.3	0.7 ± 0.4
A04CSL-011-04	0.5 ± 0.3	1.6 ± 0.5
A04CSL-013-02	0.61 ± 0.15	2.4 ± 0.7
A04CSL-302-05	1.4 ± 0.3	2.5 ± 0.5
A04CSL-303-05	—	0
A04CSL-304-03	—	0
A04CSL-304-13	—	0
A04CSL-305-06	—	0
A04CSL-306-06	—	0
A04CSL-307-02	0.6 ± 0.3	1.4 ± 0.6
A04CSL-308-02	0	0.5 ± 0.6
A04CSL-309-02	—	0.3 ± 0.5
A04CSL-309-05	0	0.6 ± 0.6
A04CSL-310-02	0.7 ± 0.3	0.61 ± 0.20
A04CSL-311-02	—	0.31 ± 0.13
A04CSL-312-02	0.6 ± 0.3	0.7 ± 0.6
A04CSL-313-03	—	0.3 ± 0.5

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-113
COPC CONCENTRATIONS IN IA04C NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A08-A01-SD-004	0.8 ± 0.2	0.5 ± 0.3	1.0 ± 0.6	0.5 ± 0.4	0.6 ± 0.3	0.5 ± 0.3	0.5 ± 0.3	0.5 ± 0.4	—	10.3 ± 1.7	0.7 ± 0.3	0.3 ± 0.5	10.7 ± 1.8	—
A08-A01-SD-012	0.55 ± 0.18	0.58 ± 0.16	0.2 ± 0.3	0.13 ± 0.19	0.21 ± 0.10	0.9 ± 0.2	0.26 ± 0.11	0.13 ± 0.19	—	6.0 ± 0.9	0.23 ± 0.11	0.2 ± 0.3	5.5 ± 0.8	—

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-114
SOR FOR IA04C NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b]
A08-A01-SD-004	1.45 ± 0.18
A08-A01-SD-012	0.76 ± 0.09

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. Only alpha laboratory data are available to calculate SORs for sediments.
[b] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-115
COPC CONCENTRATIONS IN IA04D SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04DSL-001-01	—	—	—	—	—	—	—	—	0.57 ± 0.16	—	—	—	—	0.7 ± 0.5
A04DSL-002-01	—	—	—	—	—	—	—	—	0.14 ± 0.11	—	—	—	—	0.7 ± 0.3
A04DSL-003-01	—	—	—	—	—	—	—	—	0.43 ± 0.16	—	—	—	—	2.0 ± 0.5
A04DSL-004-01	—	—	—	—	—	—	—	—	0.16 ± 0.13	—	—	—	—	0.0 ± 0.6
A04DSL-005-01	—	—	—	—	—	—	—	—	0.08 ± 0.05	—	—	—	—	0.02 ± 0.03
A04DSL-007-01	—	—	—	—	—	—	—	—	0.65 ± 0.15	—	—	—	—	1.1 ± 0.5
A04DSL-009-01	—	—	—	—	—	—	—	—	0.22 ± 0.15	—	—	—	—	-0.04 ± 0.04
A04DSL-010-01	—	—	—	—	—	—	—	—	0.37 ± 0.16	—	—	—	—	0.7 ± 0.6
A04DSL-012-01	—	—	—	—	—	—	—	—	1.00 ± 0.20	—	—	—	—	1.7 ± 0.7
A04DSL-013-01	—	—	—	—	—	—	—	—	0.44 ± 0.19	—	—	—	—	1.6 ± 0.7
A04DSL-015-01	—	—	—	—	1.0 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	—	1.23 ± 0.18	0.85 ± 0.19	0.05 ± 0.05	—	1.1 ± 0.2	1.6 ± 0.6
A04DSL-016-01	—	—	—	—	—	—	—	—	0.39 ± 0.17	—	—	—	—	0.3 ± 0.4
A04DSL-017-01	—	—	—	—	—	—	—	—	0.62 ± 0.16	—	—	—	—	2.1 ± 0.6
A04DSL-018-01	—	—	—	—	—	—	—	—	0.62 ± 0.15	—	—	—	—	0.8 ± 0.6
A04DSL-019-01	—	—	—	—	—	—	—	—	0.5 ± 0.3	—	—	—	—	1.3 ± 0.8
A04DSL-020-01	0.7 ± 0.2	—	0.7 ± 0.2	—	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	—	0.62 ± 0.17	8.5 ± 0.9	0.41 ± 0.14	—	9.9 ± 1.0	4.9 ± 1.2
A04DSL-021-01	—	1.11 ± 0.12	—	1.32 ± 0.15	1.3 ± 0.2	1.2 ± 0.2	1.2 ± 0.2	1.32 ± 0.15	1.6 ± 0.3	1.6 ± 0.3	0.02 ± 0.04	0.14 ± 0.17	1.5 ± 0.3	1.9 ± 0.7
A04DSL-022-01	—	—	—	—	—	—	—	—	1.18 ± 0.19	—	—	—	—	1.2 ± 0.8

TABLE 4-115
COPC CONCENTRATIONS IN IA04D SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04DSL-023-01	1.6 ± 0.3	—	1.2 ± 0.3	—	1.0 ± 0.2	1.1 ± 0.2	0.9 ± 0.2	—	0.97 ± 0.18	2.3 ± 0.4	0.17 ± 0.10	—	2.3 ± 0.4	2.9 ± 0.7
A04DSL-024-01	0.80 ± 0.20	—	0.7 ± 0.2	—	0.9 ± 0.2	0.9 ± 0.2	0.67 ± 0.19	—	1.09 ± 0.18	1.5 ± 0.3	0.02 ± 0.04	—	1.4 ± 0.3	1.9 ± 0.6
A04DSL-025-01	—	—	—	—	—	—	—	—	0.98 ± 0.19	—	—	—	—	2.1 ± 0.6
A04DSL-026-01	1.16 ± 0.17	1.6 ± 0.3	0.65 ± 0.17	1.0 ± 0.3	0.9 ± 0.3	1.5 ± 0.4	1.2 ± 0.4	1.0 ± 0.3	1.3 ± 0.2	2.8 ± 0.4	0.18 ± 0.10	0.3 ± 0.4	3.1 ± 0.4	3.3 ± 0.8
A04DSL-028-01	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	1.0 ± 0.6
A04DSL-029-01	—	1.2 ± 0.3	—	1.2 ± 0.3	1.2 ± 0.4	1.0 ± 0.3	1.2 ± 0.4	1.2 ± 0.3	1.2 ± 0.2	1.1 ± 0.2	0.04 ± 0.05	0.0 ± 1.3	1.6 ± 0.3	1.6 ± 0.6
A04DSL-030-01	—	—	—	—	—	—	—	—	0.51 ± 0.16	—	—	—	—	1.2 ± 0.5
A04DSL-031-01	—	—	—	—	—	—	—	—	0.61 ± 0.16	—	—	—	—	1.5 ± 0.7
A04DSL-032-01	—	—	—	—	—	—	—	—	0.56 ± 0.15	—	—	—	—	1.0 ± 0.5
A04DSL-201-01	—	—	—	—	—	—	—	—	0.40 ± 0.14	—	—	—	—	1.0 ± 0.6
A04DSL-203-01	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	2.4 ± 0.7
A04DSL-204-01	0.48 ± 0.12	—	0.2 ± 0.3	—	—	—	—	—	0.17 ± 0.10	—	—	—	—	0.5 ± 0.4
A04DSL-209-01	—	—	—	—	—	—	—	—	0.19 ± 0.12	—	—	—	—	0.5 ± 0.4
A04DSL-210-01	—	—	—	—	—	—	—	—	0.25 ± 0.13	—	—	—	—	0.9 ± 0.5
A04DSL-212-01	—	—	—	—	—	—	—	—	0.76 ± 0.18	—	—	—	—	1.4 ± 0.6
A04DSL-213-01	—	—	—	—	—	—	—	—	0.70 ± 0.18	—	—	—	—	1.2 ± 0.4
A04DSL-220-01	—	—	—	—	0.61 ± 0.18	0.53 ± 0.16	0.62 ± 0.17	—	0.28 ± 0.17	14.1 ± 1.0	0.71 ± 0.15	—	15.2 ± 1.1	8.2 ± 1.1
A04DSL-223-01	—	—	—	—	—	—	—	—	0.79 ± 0.20	—	—	—	—	3.0 ± 0.8

TABLE 4-115
COPC CONCENTRATIONS IN IA04D SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04DSL-225-01	—	—	—	—	—	—	—	—	0.62 ± 0.16	—	—	—	—	1.9 ± 0.6
A04DSL-226-01	—	—	—	—	—	—	—	—	0.40 ± 0.13	—	—	—	—	1.2 ± 0.5
A04DSL-228-01	—	—	—	—	—	—	—	—	0.81 ± 0.19	—	—	—	—	1.9 ± 0.7
A04DSL-301-01	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	1.5 ± 0.5
A04DSL-302-01	—	—	—	—	—	—	—	—	0.85 ± 0.19	—	—	—	—	2.4 ± 1.2
A04DSL-303-01	—	—	—	—	—	—	—	—	0.32 ± 0.15	—	—	—	—	1.0 ± 0.5
A04DSL-304-01	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	1.6 ± 0.7
A04DSL-305-01	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	1.2 ± 0.8
A04DSL-306-01	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	2.0 ± 0.8
A04DSL-307-01	1.3 ± 0.3	1.05 ± 0.17	1.3 ± 0.3	1.5 ± 0.2	1.1 ± 0.3	1.5 ± 0.3	1.3 ± 0.3	1.5 ± 0.2	1.6 ± 0.3	1.3 ± 0.3	0.03 ± 0.05	0.06 ± 0.18	1.2 ± 0.3	2.1 ± 0.8
A04DSL-308-01	—	1.04 ± 0.14	—	0.98 ± 0.18	1.2 ± 0.3	1.1 ± 0.3	1.0 ± 0.2	0.98 ± 0.18	1.0 ± 0.3	4.3 ± 0.6	0.19 ± 0.10	0.1 ± 0.2	4.1 ± 0.5	5.9 ± 1.3
A04DSL-309-01	—	—	—	—	—	—	—	—	0.19 ± 0.15	—	—	—	—	0.4 ± 0.5
A04DSL-310-01	—	—	—	—	—	—	—	—	0.8 ± 0.3	—	—	—	—	2.4 ± 1.1
A04DSL-311-01	—	—	—	—	—	—	—	—	0.7 ± 0.3	—	—	—	—	2.3 ± 1.1
A04DSL-312-01	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	1.6 ± 0.8
A04DSL-313-01	—	—	—	—	—	—	—	—	0.1 ± 0.2	—	—	—	—	0.2 ± 0.3
A04DSL-314-01	—	—	—	—	—	—	—	—	0.7 ± 0.3	—	—	—	—	1.7 ± 0.9
A04DSL-315-01	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	2.3 ± 0.9
A04DSL-316-01	—	—	—	—	—	—	—	—	0.68 ± 0.20	—	—	—	—	2.1 ± 0.8

TABLE 4-115
COPC CONCENTRATIONS IN IA04D SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A04DSL-317-01	—	—	—	—	1.0 ± 0.5	1.2 ± 0.3	0.8 ± 0.2	—	1.0 ± 0.2	1.4 ± 0.3	0.05 ± 0.05	—	1.6 ± 0.3	2.2 ± 0.9
A04DSL-318-01	—	—	—	—	—	—	—	—	0.60 ± 0.19	—	—	—	—	2.3 ± 0.7
A04DSL-319-01	—	—	—	—	—	—	—	—	0.13 ± 0.17	—	—	—	—	1.0 ± 0.7
A04DSL-320-01	—	—	—	—	—	—	—	—	0.20 ± 0.17	—	—	—	—	0.6 ± 0.5
A04DSL-321-01	—	—	—	—	—	—	—	—	0.58 ± 0.17	—	—	—	—	2.1 ± 0.7
A04DSL-326-01	—	1.1 ± 0.2	—	3.6 ± 0.4	2.4 ± 0.8	1.2 ± 0.3	1.9 ± 0.3	3.6 ± 0.4	0.17 ± 0.15	1.8 ± 0.3	0.16 ± 0.08	0.4 ± 0.8	8.4 ± 0.9	6.8 ± 1.1

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-116
SOR FOR IA04D SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[a]	Sum of Ratios[a b c]	
	Alpha[d]	Onsite Gamma[e]
A04DSL-001-01	—	0
A04DSL-002-01	—	0
A04DSL-003-01	—	0
A04DSL-004-01	—	0
A04DSL-005-01	—	0
A04DSL-007-01	—	0
A04DSL-009-01	—	0
A04DSL-010-01	—	0
A04DSL-012-01	—	0.7 ± 0.4
A04DSL-013-01	—	0
A04DSL-015-01	0.6 ± 0.4	1.2 ± 0.4
A04DSL-016-01	—	0
A04DSL-017-01	—	0
A04DSL-018-01	—	0
A04DSL-019-01	—	0
A04DSL-020-01	1.25 ± 0.10	0.62 ± 0.18
A04DSL-021-01	0.9 ± 0.4	1.9 ± 0.5
A04DSL-022-01	—	1.1 ± 0.4
A04DSL-023-01	0.22 ± 0.04	1.0 ± 0.4
A04DSL-024-01	0	0.9 ± 0.4
A04DSL-025-01	—	0.7 ± 0.4
A04DSL-026-01	1.4 ± 0.7	1.8 ± 0.4
A04DSL-028-01	—	0.6 ± 0.5
A04DSL-029-01	0.8 ± 0.6	1.2 ± 0.4
A04DSL-030-01	—	0
A04DSL-031-01	—	0
A04DSL-032-01	—	0
A04DSL-201-01	—	0
A04DSL-203-01	—	0.25 ± 0.11
A04DSL-204-01	—	0
A04DSL-209-01	—	0
A04DSL-210-01	—	0
A04DSL-212-01	—	0.2 ± 0.4
A04DSL-213-01	—	0
A04DSL-220-01	2.05 ± 0.11	1.14 ± 0.16
A04DSL-223-01	—	0.6 ± 0.4
A04DSL-225-01	—	0
A04DSL-226-01	—	0
A04DSL-228-01	—	0.3 ± 0.4
A04DSL-301-01	—	0.6 ± 0.5
A04DSL-302-01	—	0.6 ± 0.4
A04DSL-303-01	—	0
A04DSL-304-01	—	0
A04DSL-305-01	—	0
A04DSL-306-01	—	0.6 ± 0.5
A04DSL-307-01	1.2 ± 0.5	1.9 ± 0.6
A04DSL-308-01	1.1 ± 0.0.5	1.6 ± 0.6
A04DSL-309-01	—	0

Sample ID[a]	Sum of Ratios[a b c]	
	Alpha[d]	Onsite Gamma[e]
A04DSL-310-01	—	0.6 ± 0.6
A04DSL-311-01	—	0.23 ± 0.17
A04DSL-312-01	—	0.6 ± 0.4
A04DSL-313-01	—	0
A04DSL-314-01	—	0
A04DSL-315-01	—	0.5 ± 0.5
A04DSL-316-01	—	0
A04DSL-317-01	0.19 ± 0.15	0.7 ± 0.5
A04DSL-318-01	—	0.23 ± 0.11
A04DSL-319-01	—	0
A04DSL-320-01	—	0
A04DSL-321-01	—	0
A04DSL-326-01	3.1 ± 0.6	0.91 ± 0.17

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-117
COPC CONCENTRATIONS IN IA04D SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[ab]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A04DSL-002-05	—	—	—	—	—	—	—	—	0.55 ± 0.16	—	—	—	—	1.4 ± 0.6
A04DSL-003-02	—	—	—	—	—	—	—	—	0.54 ± 0.17	—	—	—	—	1.6 ± 0.6
A04DSL-005-02	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	2.3 ± 0.7
A04DSL-005-03	—	—	—	—	—	—	—	—	1.3 ± 0.2	—	—	—	—	1.2 ± 0.8
A04DSL-006-01	—	—	—	—	—	—	—	—	0.43 ± 0.16	—	—	—	—	1.3 ± 0.4
A04DSL-006-02	—	—	—	—	—	—	—	—	0.79 ± 0.17	—	—	—	—	1.8 ± 0.7
A04DSL-006-03	—	—	—	—	—	—	—	—	0.38 ± 0.19	—	—	—	—	0.8 ± 0.6
A04DSL-007-02	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	1.9 ± 0.8
A04DSL-007-03	—	—	—	—	—	—	—	—	0.89 ± 0.18	—	—	—	—	1.1 ± 0.5
A04DSL-008-01	—	—	—	—	—	—	—	—	0.22 ± 0.14	—	—	—	—	0.19 ± 0.20
A04DSL-008-05	—	—	—	—	1.9 ± 0.3	1.8 ± 0.3	1.5 ± 0.3	—	2.0 ± 0.3	1.1 ± 0.2	0.05 ± 0.05	—	1.1 ± 0.2	2.0 ± 0.7
A04DSL-008-06	—	—	—	—	—	—	—	—	0.66 ± 0.14	—	—	—	—	0.6 ± 0.5
A04DSL-010-02	—	—	—	—	—	—	—	—	0.95 ± 0.19	—	—	—	—	1.5 ± 0.7
A04DSL-011-01	—	—	—	—	—	—	—	—	0.0 ± 0.4	—	—	—	—	1.7 ± 0.8
A04DSL-011-03	—	—	—	—	—	—	—	—	1.10 ± 0.20	—	—	—	—	1.3 ± 0.6
A04DSL-011-04	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	1.1 ± 1.0
A04DSL-013-02	—	—	—	—	—	—	—	—	0.71 ± 0.17	—	—	—	—	2.6 ± 0.7
A04DSL-014-01	—	0.26 ± 0.11	—	0.07 ± 0.17	—	—	—	0.07 ± 0.17	0.09 ± 0.10	—	—	0.08 ± 0.13	—	0.2 ± 0.2

TABLE 4-117
COPC CONCENTRATIONS IN IA04D SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[ab]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A04DSL-014-02	—	—	—	—	—	—	—	—	1.12 ± 0.16	—	—	—	—	2.9 ± 0.9
A04DSL-015-02	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	1.7 ± 0.6
A04DSL-015-03	—	—	—	—	—	—	—	—	0.92 ± 0.18	—	—	—	—	1.5 ± 0.6
A04DSL-016-02	—	—	—	—	—	—	—	—	0.68 ± 0.16	—	—	—	—	1.1 ± 0.6
A04DSL-017-02	—	—	—	—	—	—	—	—	1.2 ± 0.3	—	—	—	—	1.8 ± 0.7
A04DSL-018-03	—	—	—	—	—	—	—	—	1.39 ± 0.20	—	—	—	—	1.1 ± 0.7
A04DSL-018-04	—	—	—	—	—	—	—	—	1.05 ± 0.19	—	—	—	—	1.5 ± 0.6
A04DSL-019-06	—	—	—	—	—	—	—	—	1.11 ± 0.18	—	—	—	—	1.0 ± 0.6
A04DSL-019-07	—	—	—	—	—	—	—	—	0.76 ± 0.17	—	—	—	—	1.2 ± 0.6
A04DSL-021-02	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	1.9 ± 0.7
A04DSL-021-03	—	—	—	—	—	—	—	—	1.45 ± 0.20	—	—	—	—	1.6 ± 0.6
A04DSL-022-06	—	—	—	—	1.3 ± 0.2	1.3 ± 0.3	1.3 ± 0.3	—	1.7 ± 0.2	0.85 ± 0.19	0.01 ± 0.02	—	0.91 ± 0.20	2.1 ± 0.8
A04DSL-022-07	—	—	—	—	—	—	—	—	0.87 ± 0.18	—	—	—	—	1.2 ± 0.6
A04DSL-023-03	1.7 ± 0.3	—	1.2 ± 0.3	—	1.3 ± 0.2	1.8 ± 0.3	1.5 ± 0.2	—	1.7 ± 0.3	3.2 ± 0.3	0.16 ± 0.07	—	3.0 ± 0.3	3.3 ± 0.8
A04DSL-023-04	—	—	—	—	—	—	—	—	0.99 ± 0.18	—	—	—	—	3.0 ± 1.0
A04DSL-024-02	—	—	—	—	—	—	—	—	1.4 ± 0.2	—	—	—	—	1.9 ± 0.7
A04DSL-024-03	—	—	—	—	—	—	—	—	1.43 ± 0.19	—	—	—	—	2.0 ± 0.6
A04DSL-024-04	—	—	—	—	—	—	—	—	1.3 ± 0.3	—	—	—	—	1.8 ± 0.9

TABLE 4-117
COPC CONCENTRATIONS IN IA04D SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[ab]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A04DSL-026-02	—	—	—	—	—	—	—	—	0.95 ± 0.17	—	—	—	—	1.5 ± 0.6
A04DSL-027-01	—	—	—	—	—	—	—	—	0.89 ± 0.17	—	—	—	—	2.7 ± 0.7
A04DSL-027-02	—	—	—	—	—	—	—	—	0.49 ± 0.14	—	—	—	—	1.0 ± 0.4
A04DSL-028-02	—	1.3 ± 0.3	—	1.0 ± 0.3	—	—	—	1.0 ± 0.3	1.5 ± 0.2	—	—	0.2 ± 0.3	—	2.2 ± 0.7
A04DSL-029-02	—	—	—	—	—	—	—	—	0.71 ± 0.19	—	—	—	—	0.8 ± 0.6
A04DSL-030-02	—	—	—	—	—	—	—	—	1.1 ± 0.2	—	—	—	—	2.8 ± 0.7
A04DSL-030-05	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	1.7 ± 0.6
A04DSL-031-03	2.2 ± 0.4	—	1.0 ± 0.3	—	1.6 ± 0.4	2.3 ± 0.5	1.7 ± 0.4	—	2.1 ± 0.3	3.2 ± 0.3	0.15 ± 0.09	—	3.4 ± 0.5	3.8 ± 0.8
A04DSL-031-04	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	1.6 ± 0.7
A04DSL-032-02	—	—	—	—	—	—	—	—	0.55 ± 0.16	—	—	—	—	0.8 ± 0.4
A04DSL-201-02	—	—	—	—	—	—	—	—	0.54 ± 0.20	—	—	—	—	1.7 ± 0.6
A04DSL-203-06	—	—	—	—	—	—	—	—	1.4 ± 0.2	—	—	—	—	0.9 ± 0.5
A04DSL-204-03	—	—	—	—	—	—	—	—	0.32 ± 0.12	—	—	—	—	0.6 ± 0.4
A04DSL-209-06	—	—	—	—	—	—	—	—	0.37 ± 0.14	—	—	—	—	1.0 ± 0.6
A04DSL-210-02	1.2 ± 0.3	1.2 ± 0.2	0.6 ± 0.2	1.0 ± 0.2	1.0 ± 0.4	1.4 ± 0.4	1.0 ± 0.4	1.0 ± 0.2	1.5 ± 0.3	2.6 ± 0.4	0.12 ± 0.08	0.2 ± 0.3	2.4 ± 0.4	1.9 ± 1.0
A04DSL-212-02	—	—	—	—	—	—	—	—	1.10 ± 0.18	—	—	—	—	2.1 ± 0.6
A04DSL-213-02	—	—	—	—	—	—	—	—	0.37 ± 0.13	—	—	—	—	0.9 ± 0.5
A04DSL-214-01	—	—	—	—	—	—	—	—	0.15 ± 0.13	—	—	—	—	0.5 ± 0.6
A04DSL-214-02	—	0.92 ± 0.19	—	0.9 ± 0.2	—	—	—	0.9 ± 0.2	1.4 ± 0.2	—	—	0.3 ± 0.4	—	3.3 ± 0.7

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COPC CONCENTRATIONS IN IA04D SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[ab]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A04DSL-223-02	—	1.1 ± 0.2	—	1.1 ± 0.3	—	—	—	1.1 ± 0.3	1.3 ± 0.2	—	—	0.3 ± 0.3	—	3.5 ± 0.8
A04DSL-225-05	—	—	—	—	—	—	—	—	0.82 ± 0.20	—	—	—	—	3.6 ± 0.8
A04DSL-226-02	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	1.8 ± 0.8
A04DSL-228-02	—	—	—	—	—	—	—	—	1.30 ± 0.20	—	—	—	—	2.4 ± 0.8
A04DSL-301-02	—	—	—	—	—	—	—	—	0.57 ± 0.17	—	—	—	—	0.7 ± 0.4
A04DSL-301-05	—	—	—	—	—	—	—	—	0.25 ± 0.15	—	—	—	—	0.7 ± 0.6
A04DSL-303-06	—	—	—	—	—	—	—	—	0.62 ± 0.16	—	—	—	—	1.0 ± 0.5
A04DSL-304-03	—	—	—	—	1.2 ± 0.3	2.2 ± 0.4	1.2 ± 0.3	—	2.0 ± 0.4	1.5 ± 0.4	0.05 ± 0.05	—	1.3 ± 0.3	2.4 ± 0.8
A04DSL-304-05	—	—	—	—	—	—	—	—	0.86 ± 0.19	—	—	—	—	0.8 ± 0.7
A04DSL-305-02	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	2.2 ± 0.8
A04DSL-306-02	—	—	—	—	1.27 ± 0.20	1.4 ± 0.2	1.4 ± 0.2	—	1.7 ± 0.3	1.2 ± 0.2	0.10 ± 0.07	—	1.3 ± 0.2	2.5 ± 0.8
A04DSL-306-03	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	1.3 ± 1.0
A04DSL-307-02	—	—	—	—	1.2 ± 0.3	1.3 ± 0.3	1.6 ± 0.3	—	1.7 ± 0.4	1.1 ± 0.2	0.03 ± 0.04	—	1.1 ± 0.2	1.9 ± 0.9
A04DSL-307-03	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	0.4 ± 1.0
A04DSL-308-02	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	2.3 ± 0.8
A04DSL-309-02	—	—	—	—	—	—	—	—	1.1 ± 0.3	—	—	—	—	3.5 ± 1.0
A04DSL-311-02	1.5 ± 0.3	—	1.1 ± 0.3	—	1.1 ± 0.2	1.2 ± 0.3	0.79 ± 0.20	—	1.6 ± 0.3	1.9 ± 0.3	0.03 ± 0.04	—	1.7 ± 0.3	4.0 ± 1.2
A04DSL-311-03	—	—	—	—	—	—	—	—	0.9 ± 0.2	—	—	—	—	2.0 ± 0.7
A04DSL-312-02	—	—	—	—	—	—	—	—	1.0 ± 0.3	—	—	—	—	3.5 ± 1.2

TABLE 4-117
COPC CONCENTRATIONS IN IA04D SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[ab]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A04DSL-313-02	—	—	—	—	—	—	—	—	0.9 ± 0.3	—	—	—	—	2.5 ± 1.3
A04DSL-314-02	—	1.4 ± 0.3	—	1.2 ± 0.4	—	—	—	1.2 ± 0.4	1.3 ± 0.3	—	—	0.2 ± 0.4	—	3.1 ± 1.1
A04DSL-315-02	—	1.6 ± 0.3	—	1.2 ± 0.3	—	—	—	1.2 ± 0.3	1.4 ± 0.3	—	—	0.0 ± 0.4	—	2.9 ± 1.0
A04DSL-316-02	—	—	—	—	—	—	—	—	1.0 ± 0.2	—	—	—	—	3.0 ± 1.1
A04DSL-317-03	—	—	—	—	—	—	—	—	0.9 ± 0.3	—	—	—	—	3.0 ± 1.1
A04DSL-317-05	—	—	—	—	—	—	—	—	0.8 ± 0.3	—	—	—	—	2.1 ± 1.1
A04DSL-318-02	—	1.2 ± 0.2	—	1.2 ± 0.3	—	—	—	1.2 ± 0.3	1.3 ± 0.3	—	—	0.2 ± 0.3	—	2.8 ± 1.1
A04DSL-319-06	—	—	—	—	—	—	—	—	0.06 ± 0.06	—	—	—	—	0.3 ± 0.2
A04DSL-320-05	2.1 ± 0.4	—	1.9 ± 0.4	—	1.6 ± 0.3	2.1 ± 0.4	1.6 ± 0.3	—	1.4 ± 0.4	2.0 ± 0.3	0.11 ± 0.08	—	1.8 ± 0.3	3.5 ± 1.1
A04DSL-321-02	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	3.6 ± 1.2
A04DSL-322-01	—	—	—	—	—	—	—	—	0.16 ± 0.20	—	—	—	—	0.6 ± 0.4
A04DSL-322-06	—	—	—	—	—	—	—	—	0.48 ± 0.19	—	—	—	—	0.3 ± 0.9
A04DSL-323-01	—	—	—	—	—	—	—	—	0.9 ± 0.3	—	—	—	—	1.8 ± 1.3
A04DSL-323-06	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.0 ± 0.7
A04DSL-324-01	—	—	—	—	—	—	—	—	0.2 ± 0.2	—	—	—	—	0.2 ± 0.7
A04DSL-324-03	1.2 ± 0.3	—	1.1 ± 0.3	—	1.3 ± 0.3	1.2 ± 0.3	1.0 ± 0.2	—	2.6 ± 0.5	1.0 ± 0.2	0.02 ± 0.04	—	0.86 ± 0.20	5.0 ± 1.5
A04DSL-324-04	—	—	—	—	1.8 ± 0.4	1.9 ± 0.4	2.0 ± 0.4	—	1.5 ± 0.5	1.8 ± 0.3	0.07 ± 0.06	—	1.9 ± 0.3	3.6 ± 1.7
A04DSL-325-01	—	—	—	—	—	—	—	—	0.5 ± 0.2	—	—	—	—	1.0 ± 0.7

TABLE 4-117
COPC CONCENTRATIONS IN IA04D SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[ab]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A04DSL-325-02	—	—	—	—	—	—	—	—	1.2 ± 0.2	—	—	—	—	1.3 ± 0.8
A04DSL-326-02	—	—	—	—	—	—	—	—	0.68 ± 0.17	—	—	—	—	4.3 ± 0.8
A04DSL-326-03	—	—	—	—	—	—	—	—	0.15 ± 0.10	—	—	—	—	5.6 ± 0.7

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-118
SOR FOR IA04D SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite [f]
A04DSL-002-05	—	0
A04DSL-003-02	—	0
A04DSL-005-02	—	0.23 ± 0.11
A04DSL-005-03	—	1.4 ± 0.5
A04DSL-006-01	—	0
A04DSL-006-02	—	0.3 ± 0.4
A04DSL-006-03	—	0
A04DSL-007-02	—	0.3 ± 0.4
A04DSL-007-03	—	0.6 ± 0.4
A04DSL-008-01	—	0
A04DSL-008-05	1.4 ± 0.3	2.7 ± 0.5
A04DSL-008-06	—	0
A04DSL-010-02	—	0.7 ± 0.4
A04DSL-011-01	—	0
A04DSL-011-03	—	1.0 ± 0.4
A04DSL-011-04	—	0.7 ± 0.5
A04DSL-013-02	—	0.28 ± 0.11
A04DSL-014-01	—	0
A04DSL-014-02	—	1.3 ± 0.4
A04DSL-015-02	—	1.2 ± 0.5
A04DSL-015-03	—	0.6 ± 0.4
A04DSL-016-02	—	0
A04DSL-017-02	—	1.2 ± 0.6
A04DSL-018-03	—	1.6 ± 0.4
A04DSL-018-04	—	0.9 ± 0.4
A04DSL-019-06	—	1.0 ± 0.4
A04DSL-019-07	—	0.3 ± 0.4
A04DSL-021-02	—	0.9 ± 0.5
A04DSL-021-03	—	1.7 ± 0.4
A04DSL-022-06	0.8 ± 0.3	2.2 ± 0.4
A04DSL-022-07	—	0.5 ± 0.4
A04DSL-023-03	1.5 ± 0.3	2.6 ± 0.6
A04DSL-023-04	—	1.1 ± 0.4
A04DSL-024-02	—	1.6 ± 0.5
A04DSL-024-03	—	1.6 ± 0.4
A04DSL-024-04	—	1.4 ± 0.6
A04DSL-026-02	—	0.7 ± 0.4
A04DSL-027-01	—	0.8 ± 0.4
A04DSL-027-02	—	0
A04DSL-028-02	—	2.0 ± 0.5
A04DSL-029-02	—	0
A04DSL-030-02	—	1.3 ± 0.5
A04DSL-030-05	—	0.7 ± 0.5
A04DSL-031-03	2.1 ± 0.5	3.6 ± 0.7
A04DSL-031-04	—	0.7 ± 0.5
A04DSL-032-02	—	0
A04DSL-201-02	—	0
A04DSL-203-06	—	1.5 ± 0.4
A04DSL-204-03	—	0
A04DSL-209-06	—	0
A04DSL-210-02	0.8 ± 0.4	1.9 ± 0.6
A04DSL-212-02	—	1.0 ± 0.4
A04DSL-213-02	—	0

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite [f]
A04DSL-214-01	—	0
A04DSL-214-02	—	1.9 ± 0.5
A04DSL-223-02	—	1.9 ± 0.5
A04DSL-225-05	—	0.8 ± 0.4
A04DSL-226-02	—	0.6 ± 0.5
A04DSL-228-02	—	1.6 ± 0.4
A04DSL-301-02	—	0
A04DSL-301-05	—	0
A04DSL-303-06	—	0
A04DSL-304-03	1.1 ± 0.3	3.0 ± 0.8
A04DSL-304-05	—	0.5 ± 0.4
A04DSL-305-02	—	1.2 ± 0.4
A04DSL-306-02	0.8 ± 0.2	2.4 ± 0.7
A04DSL-306-03	—	0.8 ± 0.5
A04DSL-307-02	1.0 ± 0.3	2.3 ± 0.7
A04DSL-307-03	—	0
A04DSL-308-02	—	1.3 ± 0.5
A04DSL-309-02	—	1.4 ± 0.6
A04DSL-311-02	0.21 ± 0.15	2.5 ± 0.7
A04DSL-311-03	—	0.5 ± 0.5
A04DSL-312-02	—	1.2 ± 0.6
A04DSL-313-02	—	0.9 ± 0.6
A04DSL-314-02	—	1.7 ± 0.6
A04DSL-315-02	—	1.8 ± 0.6
A04DSL-316-02	—	1.2 ± 0.5
A04DSL-317-03	—	0.9 ± 0.6
A04DSL-317-05	—	0.3 ± 0.6
A04DSL-318-02	—	1.7 ± 0.6
A04DSL-319-06	—	0
A04DSL-320-05	1.6 ± 0.4	2.1 ± 0.7
A04DSL-321-02	—	0.8 ± 0.5
A04DSL-322-01	—	0
A04DSL-322-06	—	0
A04DSL-323-01	—	0.6 ± 0.6
A04DSL-323-06	—	0
A04DSL-324-01	—	0
A04DSL-324-03	0.4 ± 0.3	4.7 ± 1.1
A04DSL-324-04	1.8 ± 0.4	2.2 ± 1.0
A04DSL-325-01	—	0
A04DSL-325-02	—	1.1 ± 0.5
A04DSL-326-02	—	0.54 ± 0.12
A04DSL-326-03	—	0.73 ± 0.11

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2
[f] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-119
COPC CONCENTRATIONS IN IA04D NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g) [b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A08-A01-SD-001R	0.31 ± 0.11	0.06 ± 0.08	0.4 ± 0.2	0.07 ± 0.17	0.29 ± 0.09	0.40 ± 0.10	0.23 ± 0.07	0.07 ± 0.17	—	6.2 ± 0.6	0.31 ± 0.09	0.24 ± 0.16	6.7 ± 0.7	—
A08-A01-SD-005	0.31 ± 0.14	0.12 ± 0.11	0.6 ± 0.5	0.18 ± 0.18	0.35 ± 0.14	0.31 ± 0.12	0.26 ± 0.11	0.18 ± 0.18	—	1.8 ± 0.4	0.16 ± 0.10	0.0 ± 0.2	1.8 ± 0.4	—

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-120
SOR FOR IA04D NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-A01-SD-001R	0.85 ± 0.07
A08-A01-SD-005	0

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-121
COPC CONCENTRATIONS IN IA04D GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a,b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A04DMW24-F	0.09 ± 0.10	0.4 ± 0.2	0.04 ± 0.08	0.09 ± 0.07	-0.01 ± 0.04	0.58 ± 0.17	0.16 ± 0.13	0.44 ± 0.16
A04DMW24-U	0.08 ± 0.08	0.4 ± 0.2	0.04 ± 0.06	0.07 ± 0.06	0.01 ± 0.04	0.47 ± 0.15	0.05 ± 0.06	0.43 ± 0.14
A04DMW604D-F	0.14 ± 0.09	0.4 ± 0.2	-0.03 ± 0.03	0.20 ± 0.10	0.06 ± 0.09	28 ± 3	1.7 ± 0.4	30 ± 3
A04DMW604D-U	0.21 ± 0.09	0.4 ± 0.3	0.09 ± 0.09	0.14 ± 0.09	0.03 ± 0.04	29 ± 3	1.4 ± 0.3	29 ± 3

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-122
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS IN IA04D GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration[a,b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A04DMW24-F	0.5 ± 0.3	1.4 ± 0.5
A04DMW24-U	0.5 ± 0.2	1.3 ± 0.3
A04DMW604D-F	0.5 ± 0.2	90 ± 9
A04DMW604D-U	0.6 ± 0.3	86 ± 8

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-123
COPC CONCENTRATIONS IN IA05A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g) [b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A05ASL-001-01	—	—	—	—	—	—	—	—	0.37 ± 0.18	—	—	—	—	1.1 ± 0.6
A05ASL-002-01	—	—	—	—	—	—	—	—	0.17 ± 0.10	—	—	—	—	0.4 ± 0.6
A05ASL-003-01	1.2 ± 0.2	—	0.6 ± 0.2	—	0.91 ± 0.15	1.22 ± 0.18	0.76 ± 0.13	—	0.86 ± 0.19	0.81 ± 0.13	0.04 ± 0.03	—	0.85 ± 0.14	1.1 ± 0.6
A05ASL-004-01	0.89 ± 0.19	0.9 ± 0.2	0.5 ± 0.2	0.8 ± 0.3	1.0 ± 0.2	1.0 ± 0.2	0.63 ± 0.17	0.8 ± 0.3	1.0 ± 0.2	2.7 ± 0.4	0.14 ± 0.09	0.3 ± 0.3	3.1 ± 0.4	3.2 ± 0.7
A05ASL-005-01	—	—	—	—	0.8 ± 0.2	0.69 ± 0.19	0.9 ± 0.2	—	0.93 ± 0.15	1.9 ± 0.3	0.07 ± 0.06	—	2.0 ± 0.3	1.8 ± 0.6
A05ASL-006-01	—	—	—	—	—	—	—	—	0.19 ± 0.12	—	—	—	—	0.6 ± 0.4
A05ASL-007-01	—	—	—	—	0.59 ± 0.15	0.43 ± 0.12	0.49 ± 0.13	—	0.47 ± 0.17	0.43 ± 0.14	0.04 ± 0.05	—	0.35 ± 0.12	1.2 ± 0.6
A05ASL-008-01	—	—	—	—	0.9 ± 0.2	1.0 ± 0.2	1.0 ± 0.2	—	1.0 ± 0.2	0.91 ± 0.20	0.05 ± 0.05	—	1.1 ± 0.2	1.4 ± 0.6
A05ASL-010-01	—	—	—	—	—	—	—	—	0.28 ± 0.13	—	—	—	—	0.7 ± 0.4
A05ASL-011-01	1.1 ± 0.2	—	0.5 ± 0.2	—	1.0 ± 0.2	1.0 ± 0.2	0.60 ± 0.17	—	0.9 ± 0.2	0.79 ± 0.19	0.02 ± 0.04	—	0.9 ± 0.2	1.2 ± 0.6
A05ASL-012-01	1.4 ± 0.2	—	0.6 ± 0.2	—	1.1 ± 0.3	1.3 ± 0.3	1.0 ± 0.3	—	1.1 ± 0.2	1.1 ± 0.2	0.02 ± 0.04	—	1.0 ± 0.2	1.6 ± 0.6
A05ASL-013-01	—	—	—	—	—	—	—	—	0.21 ± 0.11	—	—	—	—	0.2 ± 0.2
A05ASL-014-01	—	—	—	—	—	—	—	—	0.32 ± 0.12	—	—	—	—	0.4 ± 0.4
A05ASL-015-01	—	—	—	—	—	—	—	—	0.39 ± 0.13	—	—	—	—	1.0 ± 0.5
A05ASL-016-01	—	—	—	—	—	—	—	—	0.46 ± 0.17	—	—	—	—	0.5 ± 0.5
A05ASL-017-01	—	—	—	—	0.9 ± 0.2	1.0 ± 0.3	0.67 ± 0.18	—	0.75 ± 0.17	0.9 ± 0.2	0.02 ± 0.04	—	0.8 3± 0.19	1.4 ± 0.6
A05ASL-018-01	0.99 ± 0.16	—	0.99 ± 0.16	—	0.86 ± 0.20	1.1 ± 0.2	0.78 ± 0.19	—	0.72 ± 0.18	1.2 ± 0.2	0.05 ± 0.05	—	1.3 ± 0.3	1.8 ± 0.6
A05ASL-019-01	0.75 ± 0.18	0.99 ± 0.18	1.0 ± 0.3	0.9 ± 0.3	1.0 ± 0.2	1.2 ± 0.3	1.1 ± 0.3	0.9 ± 0.3	0.68 ± 0.20	2.9 ± 0.4	0.25 ± 0.12	0.0 ± 0.3	7.1 ± 0.8	7.1 ± 1.2
A05ASL-020-01	1.0 ± 0.2	—	0.9 ± 0.3	—	0.82 ± 0.16	0.94 ± 0.16	0.86 ± 0.16	—	0.9 ± 0.2	1.9 ± 0.2	0.09 ± 0.05	—	2.2 ± 0.2	2.1 ± 0.6
A05ASL-021-01	—	—	—	—	0.82 ± 0.20	1.0 ± 0.2	0.54 ± 0.15	—	0.55 ± 0.15	0.43 ± 0.13	0.01 ± 0.03	—	0.63 ± 0.316	1.4 ± 0.6
A05ASL-022-01	—	—	—	—	1.2 ± 0.3	1.1 ± 0.3	1.1 ± 0.3	—	0.75 ± 0.17	1.0 ± 0.2	-0.007 ± 0.008	—	1.0 ± 0.2	1.3 ± 0.7

TABLE 4-123
COPC CONCENTRATIONS IN IA05A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g) [b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A05ASL-023-01	—	—	—	—	1.2 ± 0.3	0.9 ± 0.2	0.9 ± 0.2	—	0.89 ± 0.18	1.0 ± 0.2	0.06 ± 0.07	—	0.9 ± 0.2	1.0 ± 0.6
A05ASL-024-01	—	—	—	—	1.0 ± 0.2	1.3 ± 0.3	1.0 ± 0.2	—	0.89 ± 0.16	0.57 ± 0.16	0.08 ± 0.06	—	0.69 ± 0.18	1.6 ± 0.6
A05ASL-025-01	0.84 ± 0.19	—	0.5 ± 0.3	—	1.0 ± 0.2	1.1 ± 0.3	0.71 ± 0.20	—	0.59 ± 0.15	0.77 ± 0.19	0.06 ± 0.06	—	0.9 ± 0.2	1.3 ± 0.6
A05ASL-026-01	—	—	—	—	1.0 ± 0.2	1.2 ± 0.3	0.9 ± 0.2	—	0.83 ± 0.15	0.87 ± 0.20	0.03 ± 0.04	—	0.86 ± 0.20	1.3 ± 0.6
A05ASL-027-01	—	—	—	—	—	—	—	—	0.71 ± 0.15	—	—	—	—	1.0 ± 0.5
A05ASL-028-01	—	—	—	—	—	—	—	—	0.32 ± 0.19	—	—	—	—	0.5 ± 0.4
A05ASL-029-01	—	—	—	—	0.9 ± 0.2	0.9 ± 0.2	0.67 ± 0.19	—	0.60 ± 0.19	0.70 ± 0.17	0.04 ± 0.05	—	0.64 ± 0.17	1.6 ± 0.6
A05ASL-030-01	—	—	—	—	—	—	—	—	0.64 ± 0.17	—	—	—	—	1.2 ± 0.6
A05ASL-031-01	—	—	—	—	—	—	—	—	0.63 ± 0.16	—	—	—	—	1.0 ± 0.5
A05ASL-201-01	—	—	—	—	—	—	—	—	0.41 ± 0.15	—	—	—	—	0.4 ± 0.5
A05ASL-202-01	—	—	—	—	—	—	—	—	0.25 ± 0.13	—	—	—	—	0.2 ± 0.2
A05ASL-210-01	1.1 ± 0.2	—	0.7 ± 0.3	—	0.75 ± 0.20	1.3 ± 0.3	0.66 ± 0.18	—	0.8 ± 0.2	1.0 ± 0.2	0.01 ± 0.03	—	1.1 ± 0.2	1.3 ± 0.5
A05ASL-211-01	1.5 ± 0.3	1.6 ± 0.3	1.1 ± 0.4	1.3 ± 0.3	1.5 ± 0.3	1.5 ± 0.3	1.6 ± 0.3	1.3 ± 0.3	1.4 ± 0.2	1.1 ± 0.2	0.12 ± 0.08	-0.2 ± 0.5	1.1 ± 0.2	2.4 ± 0.8
A05ASL-213-01	—	—	—	—	—	—	—	—	0.26 ± 0.14	—	—	—	—	0.4 ± 0.3
A05ASL-214-01	—	—	—	—	—	—	—	—	0.43 ± 0.15	—	—	—	—	0.8 ± 0.4
A05ASL-215-01	—	—	—	—	—	—	—	—	0.56 ± 0.20	—	—	—	—	1.1 ± 0.7
A05ASL-216-01	—	—	—	—	—	—	—	—	0.43 ± 0.16	—	—	—	—	1.1 ± 0.6
A05ASL-219-01	1.5 ± 0.3	—	0.7 ± 0.3	—	1.3 ± 0.3	1.4 ± 0.3	1.1 ± 0.2	—	1.8 ± 0.3	2.3 ± 0.4	0.18 ± 0.10	—	3.5 ± 0.5	4.8 ± 0.9
A05ASL-226-01	—	—	—	—	0.64 ± 0.18	1.0 ± 0.2	0.71 ± 0.19	—	0.52 ± 0.15	1.0 ± 0.2	0.09 ± 0.07	—	0.9 ± 0.2	1.5 ± 0.6
A05ASL-228-01	—	—	—	—	—	—	—	—	0.25 ± 0.15	—	—	—	—	0.5 ± 0.4
A05ASL-301-01	11.3 ± 1.2	1.3 ± 0.6	41 ± 4	48 ± 4	46 ± 4	9.5 ± 1.5	46 ± 4	48 ± 4	60 ± 3	4083 ± 290	216 ± 39	183 ± 12	4357 ± 303	4103 ± 33

TABLE 4-123
COPC CONCENTRATIONS IN IA05A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g) [b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A05ASL-302-01	—	—	—	—	0.75 ± 0.19	1.1 ± 0.2	0.66 ± 0.17	—	0.6 ± 0.2	9.3 ± 1.0	0.48 ± 0.17	—	10.2 ± 1.1	11.5 ± 1.4
A05ASL-303-01	0.74 ± 0.20	—	1.1 ± 0.4	—	1.1 ± 0.3	1.0 ± 0.3	1.1 ± 0.3	—	0.9 ± 0.3	10.7 ± 1.1	0.63 ± 0.18	—	12.0 ± 1.2	12 ± 2
A05ASL-304-01	1.3 ± 0.3	—	1.4 ± 0.4	—	1.4 ± 0.4	1.6 ± 0.4	0.9 ± 0.3	—	1.0 ± 0.3	10.1 ± 1.1	0.49 ± 0.16	—	10.1 ± 1.0	10.5 ± 2.0
A05ASL-305-01	—	—	—	—	1.6 ± 0.4	1.5 ± 0.4	1.5 ± 0.4	—	1.2 ± 0.4	5.0 ± 0.6	0.20 ± 0.10	—	5.5 ± 0.7	6.3 ± 1.2
A05ASL-306-01	—	—	—	—	—	—	—	—	0.2 ± 0.3	—	—	—	—	0.4 ± 0.5
A05ASL-307-01	—	—	—	—	0.8 ± 0.3	0.9 ± 0.3	0.6 ± 0.2	—	0.4 ± 0.2	0.42 ± 0.13	0.01 ± 0.02	—	0.52 ± 0.15	1.4 ± 0.8
A05ASL-308-01	1.5 ± 0.3	1.5 ± 0.3	1.5 ± 0.4	1.3 ± 0.4	1.2 ± 0.3	1.5 ± 0.4	1.3 ± 0.4	1.3 ± 0.4	1.3 ± 0.4	1.0 ± 0.2	0.01 ± 0.03	0.2 ± 0.3	1.3 ± 0.3	2.7 ± 1.0

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-124
SOR FOR IA05A SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b d]	
	Alpha[e]	Onsite Gamma[f]
A05ASL-001-01	—	0
A05ASL-002-01	—	0
A05ASL-003-01	0.19 ± 0.10	0.4 ± 0.4
A05ASL-004-01	0.31 ± 0.04	1.0 ± 0.5
A05ASL-005-01	0.2 ± 0.4	0.6 ± 0.3
A05ASL-006-01	—	0
A05ASL-007-01	0	0
A05ASL-008-01	0.3 ± 0.4	0.8 ± 0.5
A05ASL-010-01	—	0
A05ASL-011-01	0	0.6 ± 0.5
A05ASL-012-01	0.5 ± 0.5	1.0 ± 0.5
A05ASL-013-01	—	0
A05ASL-014-01	—	0
A05ASL-015-01	—	0
A05ASL-016-01	—	0
A05ASL-017-01	0	0
A05ASL-018-01	0.12 ± 0.13	0
A05ASL-019-01	1.4 ± 0.5	0.96 ± 0.19
A05ASL-020-01	0.100 ± 0.018	0.6 ± 0.5
A05ASL-021-01	0	0
A05ASL-022-01	0.6 ± 0.5	0
A05ASL-023-01	0	0.5 ± 0.4
A05ASL-024-01	0.6 ± 0.5	0.5 ± 0.3
A05ASL-025-01	0.14 ± 0.14	0
A05ASL-026-01	0.17 ± 0.14	0.4 ± 0.3
A05ASL-027-01	—	0
A05ASL-028-01	—	0
A05ASL-029-01	0	0
A05ASL-030-01	—	0
A05ASL-031-01	—	0
A05ASL-201-01	—	0
A05ASL-202-01	—	0
A05ASL-210-01	0.23 ± 0.15	0.2 ± 0.5
A05ASL-211-01	1.9 ± 0.6	1.8 ± 0.5
A05ASL-213-01	—	0
A05ASL-214-01	—	0
A05ASL-215-01	—	0
A05ASL-216-01	—	0
A05ASL-219-01	1.2 ± 0.5	2.9 ± 0.6
A05ASL-226-01	0	0
A05ASL-228-01	—	0
A05ASL-301-01[c]	707 ± 31	752 ± 7
A05ASL-302-01	1.35 ± 0.11	1.6 ± 0.2
A05ASL-303-01	2.0 ± 0.5	2.1 ± 0.7
A05ASL-304-01	1.9 ± 0.3	2.3 ± 0.7
A05ASL-305-01	2.4 ± 0.8	2.0 ± 0.8
A05ASL-306-01	—	0
A05ASL-307-01	0	0
A05ASL-308-01	1.3 ± 0.7	1.7 ± 0.9

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 ⇒ all COPC terms are less than 0.1.
[c] The SORs for Sample ID A05ASL-301-01 were calculated with assumptions that the ^{226}Ra (both SORs) and ^{230}Th (onsite-gamma SOR) concentrations above background were zero. GFPC results show that these assumptions are faulty for these Sample IDs. See footnote to Section 4.9.1 for discussion of this discrepancy.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-125
ICP-MS RESULTS FOR URANIUM ISOTOPES IN IA05A SURFACE SOIL SAMPLE
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Mass Concentration (µg U/g soil) [a]						Relative Mass Abundance [b]				
	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U	Total	^{233}U	^{234}U	^{235}U	^{236}U	^{238}U
Natural uranium [c]							—	0.0054%	0.7204%	—	99.2742%
Low enrichment [c]							—	0.0290%	3.4989%	—	96.4722%
Depleted uranium [c]							—	0.0010%	0.1991%	0.0003%	99.7996%
Recycled uranium [c]							—	0.0082%	0.9700%	0.0680%	98.9500%
A05ASL-301-01	[0.005]	0.74	92	0.021	15500	15592	ND	0.0047%	0.59%	0.0001%	99.4%

Notes:
[a] Bracketed numbers are the laboratory reporting limits.
[b] Relative mass abundances were calculated using uranium isotopic data in Table 3-30. "ND" represents samples for which the isotope was not detected above the laboratory reporting limit; these values are assigned a zero value in the calculations.
[c] Traub, RJ. 2006. *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium*. Battelle-TBD-6001 rev. F0, Battelle, Richland, Washington.

TABLE 4-126
COPC CONCENTRATIONS IN IA05A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A05ASL-003-02	—	—	—	—	—	—	—	—	0.78 ± 0.19	—	—	—	—	1.0 ± 0.7
A05ASL-003-03	—	—	—	—	—	—	—	—	0.59 ± 0.17	—	—	—	—	0.1 ± 0.2
A05ASL-004-02	0.80 ± 0.18	—	0.3 ± 0.2	—	1.1 ± 0.2	0.8 ± 0.2	0.69 ± 0.19	—	1.1 ± 0.2	0.67 ± 0.17	0.02 ± 0.03	—	0.76 ± 0.18	1.6 ± 0.6
A05ASL-004-03	—	—	—	—	—	—	—	—	0.8 ± 0.2	—	—	—	—	0.9 ± 0.6
A05ASL-006-06	—	—	—	—	—	—	—	—	0.49 ± 0.18	—	—	—	—	0.9 ± 0.4
A05ASL-007-03	1.1 ± 0.2	—	0.7 ± 0.2	—	1.2 ± 0.3	1.3 ± 0.3	1.0 ± 0.2	—	1.2 ± 0.3	0.84 ± 0.19	0.10 ± 0.07	—	0.75 ± 0.18	2.3 ± 0.6
A05ASL-008-06	—	—	—	—	—	—	—	—	0.01 ± 0.00	—	—	—	—	0.01 ± 0.01
A05ASL-008-07	1.1 ± 0.2	—	0.8 ± 0.3	—	0.9 ± 0.2	1.0 ± 0.2	1.0 ± 0.2	—	1.1 ± 0.2	1.0 ± 0.2	0.04 ± 0.04	—	0.86 ± 0.20	2.0 ± 0.9
A05ASL-008-08	—	—	—	—	—	—	—	—	0.65 ± 0.19	—	—	—	—	1.2 ± 0.8
A05ASL-009-01	—	—	—	—	0.60 ± 0.17	0.82 ± 0.20	0.67 ± 0.18	—	0.67 ± 0.19	0.91 ± 0.20	0.06 ± 0.05	—	1.0 ± 0.2	1.6 ± 0.6
A05ASL-009-07	—	—	—	—	1.1 ± 0.2	1.0 ± 0.2	1.1 ± 0.2	—	0.9 ± 0.2	0.58 ± 0.16	0.03 ± 0.04	—	0.77 ± 0.19	0.9 ± 0.7
A05ASL-009-12	—	—	—	—	—	—	—	—	0.40 ± 0.18	—	—	—	—	0.7 ± 0.6
A05ASL-009-16	—	—	—	—	—	—	—	—	0.51 ± 0.17	—	—	—	—	1.3 ± 0.6
A05ASL-010-07	—	—	—	—	1.2 ± 0.3	1.0 ± 0.2	1.0 ± 0.2	—	1.4 ± 0.3	0.52 ± 0.15	0.07 ± 0.06	—	0.71 ± 0.18	1.0 ± 0.7
A05ASL-010-08	—	—	—	—	1.2 ± 0.3	1.0 ± 0.2	0.82 ± 0.20	—	1.0 ± 0.2	0.73 ± 0.18	0.04 ± 0.04	—	0.64 ± 0.17	1.0 ± 0.6
A05ASL-010-09	—	—	—	—	—	—	—	—	0.28 ± 0.12	—	—	—	—	0.6 ± 0.4
A05ASL-011-06	—	—	—	—	0.9 ± 0.2	1.1 ± 0.2	1.1 ± 0.3	—	1.20 ± 0.20	0.54 ± 0.15	0.01 ± 0.03	—	0.62 ± 0.16	1.1 ± 0.6
A05ASL-011-12	—	—	—	—	—	—	—	—	0.67 ± 0.06	—	—	—	—	0.70 ± 0.13
A05ASL-012-06	—	—	—	—	1.2 ± 0.3	1.1 ± 0.2	1.1 ± 0.2	—	1.2 ± 0.2	0.67 ± 0.17	0.05 ± 0.05	—	0.82 ± 0.19	1.5 ± 0.7
A05ASL-012-07	—	—	—	—	1.0 ± 0.2	0.79 ± 0.20	0.9 ± 0.2	—	0.85 ± 0.19	0.61 ± 0.16	0.04 ± 0.04	—	0.57 ± 0.16	1.3 ± 1.0
A05ASL-015-02	—	—	—	—	—	—	—	—	0.77 ± 0.16	—	—	—	—	1.7 ± 0.5
A05ASL-017-03	—	—	—	—	1.1 ± 0.2	1.1 ± 0.2	0.78 ± 0.20	—	0.8 ± 0.2	0.9 ± 0.2	0.08 ± 0.07	—	0.72 ± 0.19	1.6 ± 0.8
A05ASL-018-02	—	—	—	—	1.3 0± 0.20	1.5 ± 0.2	1.25 ± 0.19	—	1.1 ± 0.3	0.83 ± 0.14	0.04 ± 0.03	—	0.94 ± 0.16	0.9 ± 0.6
A05ASL-018-03	—	—	—	—	—	—	—	—	0.88 ± 0.17	—	—	—	—	0.7 ± 0.5
A05ASL-021-06	—	—	—	—	—	—	—	—	0.77 ± 0.17	—	—	—	—	1.0 ± 0.5
A05ASL-022-02	—	—	—	—	—	—	—	—	0.69 ± 0.18	—	—	—	—	1.1 ± 0.5
A05ASL-022-03	—	—	—	—	1.2 ± 0.3	1.1 ± 0.3	0.9 ± 0.2	—	0.83 ± 0.20	0.79 ± 0.19	0.01 ± 0.03	—	0.58 ± 0.16	0.9 ± 0.7
A05ASL-023-03	—	—	—	—	1.3 ± 0.3	1.4 ± 0.3	1.1 ± 0.3	—	1.1 ± 0.2	1.2 ± 0.3	0.05 ± 0.05	—	0.9 ± 0.2	1.0 ± 0.6
A05ASL-024-02	—	—	—	—	1.0 ± 0.2	1.2 ± 0.3	1.0 ± 0.2	—	1.2 ± 0.2	0.86 ± 0.20	0.03 ± 0.04	—	0.69 ± 0.18	1.4 ± 0.6
A05ASL-025-02	—	—	—	—	—	—	—	—	0.63 ± 0.15	—	—	—	—	0.8 ± 0.6
A05ASL-027-03	0.89 ± 0.20	—	0.6 ± 0.3	—	0.9 ± 0.2	0.9 ± 0.2	0.63 ± 0.18	—	1.0 ± 0.2	0.68 ± 0.18	0.02 ± 0.04	—	0.9 ± 0.2	1.3 ± 0.5

TABLE 4-126
COPC CONCENTRATIONS IN IA05A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A05ASL-029-03	—	—	—	—	1.0 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	—	1.0 ± 0.2	0.46 ± 0.15	0.02 ± 0.04	—	0.60 ± 0.17	1.2 ± 0.6
A05ASL-029-04	—	—	—	—	—	—	—	—	0.57 ± 0.20	—	—	—	—	0.9 ± 0.6
A05ASL-031-03	—	—	—	—	1.04 ± 0.17	0.96 ± 0.16	0.90 ± 0.16	—	0.91 ± 0.20	0.63 ± 0.12	0.05 ± 0.04	—	0.57 ± 0.12	1.4 ± 0.6
A05ASL-201-06	—	—	—	—	—	—	—	—	0.67 ± 0.18	—	—	—	—	1.8 ± 0.8
A05ASL-201-15	—	—	—	—	—	—	—	—	0.57 ± 0.18	—	—	—	—	0.7 ± 0.6
A05ASL-202-14	—	—	—	—	—	—	—	—	0.79 ± 0.17	—	—	—	—	1.4 ± 0.6
A05ASL-209-01	—	—	—	—	—	—	—	—	0.6 ± 0.2	—	—	—	—	1.1 ± 0.8
A05ASL-209-14	—	—	—	—	—	—	—	—	0.48 ± 0.14	—	—	—	—	1.0 ± 0.6
A05ASL-209-25	—	—	—	—	0.9 ± 0.3	1.3 ± 0.3	0.8 ± 0.2	—	1.2 ± 0.3	0.44 ± 0.14	0.04 ± 0.05	—	0.52 ± 0.15	0.7 ± 0.7
A05ASL-210-11	—	—	—	—	—	—	—	—	0.53 ± 0.17	—	—	—	—	0.5 ± 0.4
A05ASL-210-15	—	—	—	—	—	—	—	—	0.50 ± 0.18	—	—	—	—	0.9 ± 0.6
A05ASL-211-07	—	—	—	—	—	—	—	—	0.51 ± 0.20	—	—	—	—	0.9 ± 0.7
A05ASL-211-11	—	—	—	—	—	—	—	—	0.73 ± 0.17	—	—	—	—	1.4 ± 0.6
A05ASL-213-06	—	—	—	—	—	—	—	—	0.76 ± 0.18	—	—	—	—	1.1 ± 0.8
A05ASL-213-17	—	—	—	—	—	—	—	—	0.35 ± 0.15	—	—	—	—	0.9 ± 0.5
A05ASL-214-06	—	—	—	—	—	—	—	—	0.65 ± 0.19	—	—	—	—	1.5 ± 0.7
A05ASL-214-09	—	—	—	—	—	—	—	—	0.47 ± 0.16	—	—	—	—	0.7 ± 0.5
A05ASL-216-06	—	—	—	—	—	—	—	—	0.77 ± 0.18	—	—	—	—	1.1 ± 0.6
A05ASL-216-10	—	—	—	—	—	—	—	—	0.55 ± 0.20	—	—	—	—	1.0 ± 0.9
A05ASL-219-02	1.0 ± 0.2	0.68 ± 0.19	0.8 ± 0.3	1.2 ± 0.4	1.04 ± 0.17	1.04 ± 0.17	0.84 ± 0.15	1.2 ± 0.4	1.06 ± 0.19	5.1 ± 0.4	0.27 ± 0.09	0.4 ± 0.4	5.6 ± 0.5	4.9 ± 1.1
A05ASL-226-02	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.4 ± 0.6
A05ASL-228-23	—	—	—	—	—	—	—	—	0.45 ± 0.12	—	—	—	—	0.8 ± 0.5
A05ASL-301-02	2.8 ± 0.4	0.7 ± 0.5	13.5 ± 1.4	16.1 ± 1.4	18.3 ± 1.8	4.3 ± 0.6	17.1 ± 1.7	16.1 ± 1.4	18.3 ± 1.4	1746 ± 120	99 ± 17	79 ± 6	1871 ± 127	1820 ± 18
A05ASL-301-06	1.11 ± 0.17	0.6 ± 0.2	2.9 ± 0.3	3.7 ± 0.5	2.8 ± 0.4	1.2 ± 0.3	2.7 ± 0.4	3.7 ± 0.5	2.5 ± 0.4	212 ± 25	10 ± 5	15.2 ± 1.7	224 ± 26	256 ± 8
A05ASL-302-10	—	—	—	—	—	—	—	—	0.62 ± 0.18	—	—	—	—	1.6 ± 0.6
A05ASL-302-13	—	—	—	—	—	—	—	—	0.6 ± 0.3	—	—	—	—	0 ± 18
A05ASL-302-14	—	—	—	—	—	—	—	—	0.11 ± 0.13	—	—	—	—	1.4 ± 0.8
A05ASL-303-13	1.0 ± 0.2	—	0.7 ± 0.3	—	1.0 ± 0.3	1.9 ± 0.4	1.1 ± 0.3	—	0.73 ± 0.20	0.9 ± 0.2	0.04 ± 0.05	—	1.1 ± 0.2	2.6 ± 1.0
A05ASL-303-14	2.0 ± 0.3	—	1.1 ± 0.3	—	1.3 ± 0.3	1.9 ± 0.3	1.1 ± 0.2	—	0.8 ± 0.2	1.23 ± 0.17	0.05 ± 0.04	—	1.6 ± 0.2	2.2 ± 0.9
A05ASL-304-02	1.2 ± 0.3	—	1.2 ± 0.4	—	0.8 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	—	1.0 ± 0.3	6.8 ± 0.8	0.28 ± 0.11	—	7.5 ± 0.8	8.5 ± 1.5
A05ASL-304-13	0.75 ± 0.15	—	0.9 ± 0.3	—	0.6 ± 0.5	0.8 ± 0.5	0.5 ± 0.4	—	0.4 ± 0.3	3.1 ± 0.5	0.20 ± 0.11	—	3.3 ± 0.5	3.0 ± 1.5

TABLE 4-126
COPC CONCENTRATIONS IN IA05A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration [b] (pCi/g)													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	Onsite	Alpha	Alpha	Gamma	Alpha	Onsite
A05ASL-304-14	1.0 ± 0.2	—	1.0 ± 0.4	—	0.8 ± 0.3	0.9 ± 0.3	0.8 ± 0.3	—	0.5 ± 0.3	2.0 ± 0.3	0.12 ± 0.08	—	1.8 ± 0.3	3.3 ± 0.9
A05ASL-305-02	1.2 ± 0.3	—	1.1 ± 0.3	—	1.2 ± 0.4	0.6 ± 0.3	1.0 ± 0.4	—	1.5 ± 0.3	2.9 ± 0.4	0.15 ± 0.09	—	4.3 ± 0.6	4.8 ± 1.2
A05ASL-305-03	1.0 ± 0.2	0.66 ± 0.09	1.1 ± 0.3	1.11 ± 0.14	1.1 ± 0.3	1.6 ± 0.4	0.7 ± 0.3	1.11 ± 0.14	0.8 ± 0.4	2.7 ± 0.4	0.15 ± 0.09	0.14 ± 0.17	3.8 ± 0.5	5.6 ± 1.5
A05ASL-305-13	—	—	—	—	0.8 ± 0.3	1.0 ± 0.3	1.0 ± 0.3	—	0.9 ± 0.4	0.67 ± 0.18	0.01 ± 0.03	—	0.80 ± 0.20	2.6 ± 1.1
A05ASL-305-14	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	1.3 ± 0.8
A05ASL-306-03	1.2 ± 0.3	—	1.0 ± 0.4	—	0.9 ± 0.3	1.1 ± 0.3	1.2 ± 0.3	—	1.0 ± 0.3	1.0 ± 0.2	0.04 ± 0.05	—	1.0 ± 0.2	1.5 ± 0.9
A05ASL-308-04	—	—	—	—	—	—	—	—	0.76 ± 0.20	—	—	—	—	0.8 ± 0.7

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes Onsite Gamma Spectroscopy.

TABLE 4-127
SOR FOR IA05A SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[a b]	Sum of Ratios[a c d]	
	Alpha[e]	Onsite Gamma[f]
A05ASL-003-02	—	0.3 ± 0.4
A05ASL-003-03	—	0
A05ASL-004-02	0	1.0 ± 0.4
A05ASL-004-03	—	0.3 ± 0.5
A05ASL-006-06	—	0
A05ASL-007-03	0.4 ± 0.3	1.5 ± 0.6
A05ASL-008-06	—	0
A05ASL-008-07	0.1 ± 0.2	0.9 ± 0.5
A05ASL-008-08	—	0
A05ASL-009-01	0	0
A05ASL-009-07	0.3 ± 0.2	0.6 ± 0.5
A05ASL-009-12	—	0
A05ASL-009-16	—	0
A05ASL-010-07	0.2 ± 0.2	1.5 ± 0.5
A05ASL-010-08	0	0.8 ± 0.5
A05ASL-010-09	—	0
A05ASL-011-06	0.4 ± 0.3	1.2 ± 0.4
A05ASL-011-12	—	0
A05ASL-012-06	0.3 ± 0.3	1.2 ± 0.5
A05ASL-012-07	0	0.5 ± 0.4
A05ASL-015-02	—	0.3 ± 0.3
A05ASL-017-03	0.11 ± 0.14	0.5 ± 0.5
A05ASL-018-02	0.7 ± 0.2	1.0 ± 0.5
A05ASL-018-03	—	0.5 ± 0.4
A05ASL-021-06	—	0.3 ± 0.3
A05ASL-022-02	—	0
A05ASL-022-03	0.11 ± 0.14	0.4 ± 0.4
A05ASL-023-03	0.6 ± 0.3	1.0 ± 0.4
A05ASL-024-02	0.3 ± 0.3	1.2 ± 0.4
A05ASL-025-02	—	0
A05ASL-027-03	0	0.8 ± 0.4
A05ASL-029-03	0	0.8 ± 0.5
A05ASL-029-04	—	0
A05ASL-031-03	0	0.6 ± 0.4
A05ASL-201-06	—	0
A05ASL-201-15	—	0
A05ASL-202-14	—	0.3 ± 0.3
A05ASL-209-01	—	0
A05ASL-209-14	—	0
A05ASL-209-25	0.25 ± 0.19	1.2 ± 0.6
A05ASL-210-11	—	0
A05ASL-210-15	—	0
A05ASL-211-07	—	0
A05ASL-211-11	—	0
A05ASL-213-06	—	0.3 ± 0.4
A05ASL-213-17	—	0
A05ASL-214-06	—	0
A05ASL-214-09	—	0
A05ASL-216-06	—	0.3 ± 0.4
A05ASL-216-10	—	0
A05ASL-219-02	0.71 ± 0.05	1.5 ± 0.4
A05ASL-226-02	—	0
A05ASL-228-23	—	0
A05ASL-301-02[f]	301 ± 13	316 ± 4
A05ASL-301-06[f]	36 ± 3	43.2 ± 1.6
A05ASL-302-10	—	0
A05ASL-302-13	—	0
A05ASL-302-14	—	0
A05ASL-303-13	0.8 ± 0.3	0.5 ± 0.4
A05ASL-303-14	0.8 ± 0.3	0.3 ± 0.5
A05ASL-304-02	0.97 ± 0.08	2.0 ± 0.6
A05ASL-304-13	0.39 ± 0.05	0.3 ± 0.2
A05ASL-304-14	0.10 ± 0.03	0.39 ± 0.13
A05ASL-305-02	0.6 ± 0.2	2.4 ± 0.6
A05ASL-305-03	0.8 ± 0.2	1.2 ± 0.8
A05ASL-305-13	0.1 ± 0.3	0.9 ± 0.9
A05ASL-305-14	—	0
A05ASL-306-03	0.4 ± 0.4	0.7 ± 0.7
A05ASL-308-04	—	0.3 ± 0.4

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy
[f] The SORs for Sample ID A05ASL-301-02 and Sample ID A05ASL-301-06 were calculated with assumptions that the ^{226}Ra (both SORs) and ^{230}Th (onsite-gamma SOR) concentrations above background were zero. GFPC results show that these assumptions are faulty for these sample IDs. See footnote to Section 4.9.2 for discussion of this discrepancy.

TABLE 4-128
COPC CONCENTRATIONS IN IA05B SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A05BSL-001-01	1.1 ± 0.2	—	1.0 ± 0.3	—	0.8 ± 0.2	0.71 ± 0.20	0.8 ± 0.2	—	0.82 ± 0.19	0.76 ± 0.20	0.08 ± 0.07	—	0.74 ± 0.20	1.5 ± 0.6
A05BSL-002-01	—	—	—	—	—	—	—	—	0.79 ± 0.16	—	—	—	—	1.6 ± 0.6
A05BSL-003-01	—	—	—	—	0.7 ± 0.2	0.9 ± 0.3	1.0 ± 0.3	—	0.8 ± 0.2	0.8 ± 0.2	0.05 ± 0.06	—	0.8 ± 0.2	1.3 ± 0.9
A05BSL-004-01	1.0 ± 0.2	—	0.9 ± 0.3	—	1.0 ± 0.2	0.9 ± 0.3	1.2 ± 0.3	—	0.81 ± 0.17	0.8 ± 0.2	0.03 ± 0.05	—	0.62 ± 0.20	1.3 ± 0.7
A05BSL-005-01	1.1 ± 0.2	1.0 ± 0.2	1.1 ± 0.3	0.6 ± 0.3	1.0 ± 0.2	1.1 ± 0.3	0.9 ± 0.2	0.6 ± 0.3	1.5 ± 0.2	0.84 ± 0.20	0.03 ± 0.04	0.2 ± 0.4	0.55 ± 0.15	1.4 ± 0.6
A05BSL-006-01	—	—	—	—	0.9 ± 0.2	1.0 ± 0.2	0.62 ± 0.18	—	0.96 ± 0.19	0.89 ± 0.20	0.07 ± 0.06	—	0.76 ± 0.19	1.2 ± 0.6
A05BSL-007-01	1.2 ± 0.3	—	0.8 ± 0.3	—	0.8 ± 0.2	0.8 ± 0.3	0.8 ± 0.2	—	0.87 ± 0.20	0.8 ± 0.2	0.05 ± 0.06	—	0.7 ± 0.2	1.4 ± 0.7
A05BSL-008-01	—	—	—	—	0.8 ± 0.3	0.9 ± 0.3	0.7 ± 0.3	—	0.58 ± 0.17	0.8 ± 0.2	0.08 ± 0.08	—	0.7 ± 0.2	-1 ± 6
A05BSL-009-01	1.13 ± 0.18	—	1.13 ± 0.18	—	1.2 ± 0.3	1.1 ± 0.3	1.1 ± 0.3	—	0.9 ± 0.3	0.8 ± 0.2	0.07 ± 0.07	—	0.7 ± 0.2	1.9 ± 0.8
A05BSL-010-01	—	—	—	—	0.8 ± 0.3	0.8 ± 0.2	0.6 ± 0.2	—	0.68 ± 0.16	0.7 ± 0.2	0.03 ± 0.05	—	0.59 ± 0.20	0.9 ± 0.6
A05BSL-011-01	1.0 ± 0.2	0.82 ± 0.20	0.9 ± 0.6	0.6 ± 0.2	0.7 ± 0.2	0.61 ± 0.20	0.7 ± 0.2	0.6 ± 0.2	1.03 ± 0.18	0.7 ± 0.2	0.08 ± 0.08	0.1 ± 0.3	0.8 ± 0.2	1.1 ± 0.5

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-129
SOR FOR IA05B SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[a]	Sum of Ratios[a b c]	
	Alpha[d]	Onsite Gamma[e]
A05BSL-001-01	0	0.4 ± 0.4
A05BSL-002-01	—	0.3 ± 0.3
A05BSL-003-01	0.3 ± 0.5	0.2 ± 0.5
A05BSL-004-01	0.7 ± 0.6	0.3 ± 0.4
A05BSL-005-01	0.13 ± 0.15	1.6 ± 0.4
A05BSL-006-01	0	0.6 ± 0.4
A05BSL-007-01	0	0.5 ± 0.4
A05BSL-008-01	0	0
A05BSL-009-01	0.6 ± 0.5	0.4 ± 0.5
A05BSL-010-01	0	0
A05BSL-011-01	0	0.8 ± 0.4

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-130
COPC CONCENTRATIONS IN IA05B SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A05BSL-001-03	—	0.82 ± 0.19	—	—	—	—	—	—	—	—	—	—	—	—
A05BSL-001-11	—	—	—	—	—	—	—	—	0.55 ± 0.17	—	—	—	—	0.8 ± 0.5
A05BSL-001-12	—	—	—	—	0.58 ± 0.17	0.8 ± 0.2	0.8 ± 0.2	—	0.60 ± 0.16	0.35 ± 0.12	0.06 ± 0.05	—	0.52 ± 0.15	1.3 ± 0.6
A05BSL-001-13	0.82 ± 0.20	—	0.9 ± 0.3	0.6 ± 0.2	1.1 ± 0.3	0.9 ± 0.2	0.9 ± 0.2	0.6 ± 0.2	0.66 ± 0.16	0.58 ± 0.16	0.02 ± 0.04	0.1 ± 0.3	0.66 ± 0.18	1.5 ± 0.8
A05BSL-002-10	—	—	—	—	—	—	—	—	0.62 ± 0.16	—	—	—	—	1.2 ± 0.4
A05BSL-002-11	—	0.87 ± 0.14	—	0.80 ± 0.17	1.0 ± 0.3	1.3 ± 0.4	1.1 ± 0.3	0.80 ± 0.17	0.95 ± 0.19	0.7 ± 0.2	0.04 ± 0.06	0.1 ± 0.2	0.7 ± 0.2	0.8 ± 0.6
A05BSL-003-03	—	—	—	—	0.9 ± 0.3	1.1 ± 0.3	1.0 ± 0.3	—	1.2 ± 0.2	0.7 ± 0.2	0.04 ± 0.06	—	0.8 ± 0.2	0.8 ± 0.6
A05BSL-003-06	—	—	—	—	—	—	—	—	0.57 ± 0.17	—	—	—	—	1.2 ± 0.6
A05BSL-003-08	—	—	—	—	—	—	—	—	0.49 ± 0.17	—	—	—	—	0.7 ± 0.5
A05BSL-004-03	1.0 ± 0.2	—	1.2 ± 0.3	—	1.12 ± 0.18	0.90 ± 0.15	1.02 ± 0.16	—	0.96 ± 0.19	0.73 ± 0.13	0.03 ± 0.03	—	0.91 ± 0.15	1.5 ± 0.6
A05BSL-004-04	—	—	—	—	—	—	—	—	0.60 ± 0.16	—	—	—	—	0.9 ± 0.6
A05BSL-005-03	1.0 ± 0.2	—	1.4 ± 0.3	—	1.1 ± 0.2	1.2 ± 0.2	1.1 ± 0.2	—	0.6 ± 0.3	0.79 ± 0.19	0.03 ± 0.04	—	0.58 ± 0.16	1.3 ± 0.7
A05BSL-005-04	—	—	—	—	—	—	—	—	0.68 ± 0.19	—	—	—	—	0.8 ± 0.6
A05BSL-005-06	—	—	—	—	—	—	—	—	0.51 ± 0.17	—	—	—	—	0.8 ± 0.6
A05BSL-006-11	—	—	—	—	0.76 ± 0.16	0.88 ± 0.17	0.9 1± 0.18	—	0.86 ± 0.19	0.69 ± 0.16	-0.003 ± 0.010	—	0.59 ± 0.14	1.0 ± 0.5
A05BSL-006-13	—	—	—	—	—	—	—	—	0.73 ± 0.16	—	—	—	—	1.3 ± 0.6
A05BSL-007-03	1.0 ± 0.2	—	0.8 ± 0.3	—	0.9 ± 0.3	1.1 ± 0.3	0.9 ± 0.3	—	0.96 ± 0.18	0.8 ± 0.2	0.03 ± 0.05	—	0.73 ± 0.20	1.6 ± 0.6
A05BSL-007-10	—	—	—	—	0.59 ± 0.17	0.71 ± 0.19	0.70 ± 0.18	—	0.9 ± 0.2	0.70 ± 0.18	0.06 ± 0.06	—	0.46 ± 0.14	0.9 ± 0.6

TABLE 4-130
COPC CONCENTRATIONS IN IA05B SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID[a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A05BSL-008-02	—	—	—	—	0.8 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	—	—	0.9 ± 0.3	0.05 ± 0.06	—	0.9 ± 0.3	—
A05BSL-008-03	—	—	—	—	—	—	—	—	0.88 ± 0.19	—	—	—	—	0.8 ± 0.5
A05BSL-008-06	—	—	—	—	—	—	—	—	0.7 ± 0.2	—	—	—	—	0.8 ± 0.5
A05BSL-008-07	—	—	—	—	—	—	—	—	0.56 ± 0.16	—	—	—	—	0.7 ± 0.4
A05BSL-009-03	—	—	—	—	—	—	—	—	0.72 ± 0.19	—	—	—	—	0.6 ± 0.6
A05BSL-009-04	—	—	—	—	—	—	—	—	0.41 ± 0.17	—	—	—	—	0.7 ± 0.7
A05BSL-010-03	—	—	—	—	1.0 ± 0.3	0.9 ± 0.3	0.9 ± 0.3	—	1.00 ± 0.18	0.7 ± 0.2	0.03 ± 0.05	—	0.8 ± 0.2	1.2 ± 0.6
A05BSL-010-04	—	—	—	—	1.0 ± 0.3	0.8 ± 0.2	0.9 ± 0.2	—	0.74 ± 0.15	0.64 ± 0.19	0.08 ± 0.08	—	0.8 ± 0.2	1.9 ± 0.6
A05BSL-011-03	1.1 ± 0.2	—	1.3 ± 0.3	—	1.2 ± 0.3	1.1 ± 0.3	1.0 ± 0.3	—	1.01 ± 0.16	0.65 ± 0.20	0.04 ± 0.05	—	0.7 ± 0.2	1.6 ± 0.6
A05BSL-011-04	—	—	—	—	—	—	—	—	0.74 ± 0.19	—	—	—	—	0.9 ± 0.7

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-131
SOR FOR IA05B SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]	
	Alpha [d]	Onsite Gamma [e]
A05BSL-001-03	—	—
A05BSL-001-11	—	0
A05BSL-001-12	0	0
A05BSL-001-13	0	0
A05BSL-002-10	—	0
A05BSL-002-11	0.4 ± 0.4	0.7 ± 0.4
A05BSL-003-03	0.3 ± 0.3	1.1 ± 0.4
A05BSL-003-06	—	0
A05BSL-003-08	—	0
A05BSL-004-03	0.19 ± 0.16	0.7 ± 0.4
A05BSL-004-04	—	0
A05BSL-005-03	0.4 ± 0.3	0
A05BSL-005-04	—	0
A05BSL-005-06	—	0
A05BSL-006-11	0	0.5 ± 0.4
A05BSL-006-13	—	0.2 ± 0.3
A05BSL-007-03	0.2 ± 0.3	0.7 ± 0.4
A05BSL-007-10	0	0.5 ± 0.5
A05BSL-008-02	0	—
A05BSL-008-03	—	0.5 ± 0.4
A05BSL-008-06	—	0
A05BSL-008-07	—	0
A05BSL-009-03	—	0
A05BSL-009-04	—	0
A05BSL-010-03	0	0.8 ± 0.4
A05BSL-010-04	0	0.2 ± 0.3
A05BSL-011-03	0.3 ± 0.3	0.8 ± 0.3
A05BSL-011-04	—	0.2 ± 0.4

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] 0 ⇒ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[d] Alpha Spectroscopy
[e] Gamma Spectroscopy

TABLE 4-132
COPC CONCENTRATIONS IN IA05B GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a,b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A05BMW600D-F	1.4 ± 0.2	2.4 ± 0.4	0.02 ± 0.05	0.25 ± 0.12	0.01 ± 0.04	1.2 ± 0.3	0.07 ± 0.07	1.2 ± 0.3
A05BMW600D-U	1.26 ± 0.20	2.0 ± 0.4	0.12 ± 0.10	0.14 ± 0.09	0.00 ± 0.04	0.81 ± 0.20	0.08 ± 0.12	0.67 ± 0.18

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-133
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS IN IA05B GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration[a,b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A05BMW600D-F	3.7 ± 0.5	3.7 ± 0.8
A05BMW600D-U	3.2 ± 0.4	2.0 ± 0.5

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-134
COPC CONCENTRATIONS IN GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a,b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A02MW06-F	0.07 ± 0.08	0.3 ± 0.3	0.02 ± 0.06	0.30 ± 0.12	-0.01 ± 0.03	1.7 ± 0.3	0.07 ± 0.07	1.5 ± 0.3
A02MW06-U	0.09 ± 0.08	0.2 ± 0.3	0.03 ± 0.07	0.07 ± 0.06	0.01 ± 0.04	2.1 ± 0.4	0.06 ± 0.07	1.7 ± 0.3
A02MW08-F	0.24 ± 0.11	0.0 ± 0.2	-0.01 ± 0.05	0.18 ± 0.09	-0.01 ± 0.03	0.29 ± 0.11	0.01 ± 0.04	0.12 ± 0.08
A02MW08-U	0.23 ± 0.11	0.1 ± 0.2	0.02 ± 0.06	0.18 ± 0.10	0.01 ± 0.04	0.45 ± 0.15	—	0.26 ± 0.11
A02MW09-F	0.09 ± 0.09	0.0 ± 0.3	-0.01 ± 0.05	0.25 ± 0.11	0.02 ± 0.04	4.3 ± 0.6	0.18 ± 0.10	4.5 ± 0.6
A02MW09-U	0.09 ± 0.08	-0.4 ± 0.3	0.02 ± 0.05	0.21 ± 0.11	0.01 ± 0.03	4.2 ± 0.6	0.25 ± 0.12	4.7 ± 0.6
A02MW11-F	0.36 ± 0.13	0.2 ± 0.2	-0.02 ± 0.08	0.19 ± 0.10	0.00 ± 0.04	2.3 ± 0.4	0.17 ± 0.10	2.0 ± 0.4
A02MW11-U	0.24 ± 0.11	0.3 ± 0.2	0.01 ± 0.07	0.09 ± 0.07	0.02 ± 0.05	2.6 ± 0.4	0.20 ± 0.11	2.6 ± 0.4
A02MW1-F	0.21 ± 0.08	0.6 ± 0.2	0.02 ± 0.06	0.22 ± 0.08	0.04 ± 0.05	1.10 ± 0.19	0.02 ± 0.05	1.07 ± 0.19
A02MW1-U	0.25 ± 0.09	1.0 ± 0.2	-0.01 ± 0.05	0.29 ± 0.11	0.00 ± 0.04	1.2 ± 0.2	0.02 ± 0.04	0.90 ± 0.17
A02MW2-F	0.15 ± 0.09	0.0 ± 0.4	0.02 ± 0.04	0.20 ± 0.10	-0.01 ± 0.03	6.0 ± 0.7	0.31 ± 0.13	6.8 ± 0.8
A02MW2-U	0.17 ± 0.09	0.3 ± 0.3	0.02 ± 0.04	0.22 ± 0.11	0.00 ± 0.06	6.2 ± 0.7	0.27 ± 0.12	7.2 ± 0.8
A02MW3-F	0.20 ± 0.12	0.0 ± 0.3	0.05 ± 0.11	0.10 ± 0.07	-0.01 ± 0.04	1.9 ± 0.3	0.08 ± 0.07	1.9 ± 0.3
A02MW3-U	0.20 ± 0.11	0.07 ± 0.19	0.00 ± 0.05	0.22 ± 0.10	0.00 ± 0.04	2.1 ± 0.3	0.02 ± 0.06	1.7 ± 0.3
A02MW4-F	0.15 ± 0.08	0.09 ± 0.20	0.05 ± 0.06	0.23 ± 0.09	0.00 ± 0.04	17.9 ± 1.4	0.73 ± 0.16	16.1 ± 1.3
A02MW4-U	0.38 ± 0.10	0.27 ± 0.17	0.13 ± 0.08	0.21 ± 0.10	0.01 ± 0.05	17.9 ± 1.4	0.75 ± 0.17	16.2 ± 1.3
A02MW5-F	0.19 ± 0.11	0.1 ± 0.2	0.02 ± 0.06	0.30 ± 0.13	-0.01 ± 0.04	2.6 ± 0.4	0.19 ± 0.10	2.2 ± 0.4
A02MW5-U	0.12 ± 0.10	0.2 ± 0.2	0.06 ± 0.09	0.27 ± 0.12	-0.01 ± 0.04	2.5 ± 0.4	0.07 ± 0.07	2.3 ± 0.4
A03MW13D-F	0.25 ± 0.10	0.0 ± 0.3	0.05 ± 0.07	0.23 ± 0.11	0.00 ± 0.01	20.9 ± 2.0	1.0 ± 0.2	22 ± 2
A03MW13D-U	0.21 ± 0.10	0.0 ± 0.3	0.04 ± 0.07	0.24 ± 0.11	0.07 ± 0.06	19.9 ± 1.9	0.9 ± 0.2	22 ± 2
A03MW14-F	0.29 ± 0.12	0.2 ± 0.3	0.15 ± 0.12	0.18 ± 0.09	0.00 ± 0.04	0.9 ± 0.2	0.04 ± 0.06	0.9 ± 0.2
A03MW14-U	0.27 ± 0.10	0.0 ± 0.2	0.15 ± 0.10	0.17 ± 0.08	0.00 ± 0.03	1.1 ± 0.2	0.04 ± 0.05	1.0 ± 0.2
A03MW15-F	0.13 ± 0.10	-0.4 ± 0.2	0.11 ± 0.10	0.28 ± 0.12	0.00 ± 0.04	0.19 ± 0.11	0.02 ± 0.06	0.12 ± 0.09
A03MW15-U	0.05 ± 0.09	0.0 ± 0.2	0.01 ± 0.06	0.21 ± 0.11	0.03 ± 0.05	0.30 ± 0.14	0.13 ± 0.10	0.21 ± 0.12
A03MW16-F	0.16 ± 0.09	0.2 ± 0.3	0.04 ± 0.08	0.21 ± 0.10	0.00 ± 0.03	6.7 ± 0.8	0.36 ± 0.14	7.4 ± 0.8
A03MW16-U	0.20 ± 0.11	0.1 ± 0.2	0.10 ± 0.09	0.18 ± 0.10	0.00 ± 0.04	6.6 ± 0.8	0.36 ± 0.14	7.3 ± 0.8

TABLE 4-134
COPC CONCENTRATIONS IN GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a,b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A03MW17-F	0.33 ± 0.10	0.0 ± 0.2	0.13 ± 0.06	0.27 ± 0.08	0.00 ± 0.02	0.66 ± 0.13	0.04 ± 0.04	0.68 ± 0.13
A03MW17-U	0.39 ± 0.11	0.1 ± 0.3	0.04 ± 0.05	0.14 ± 0.08	-0.01 ± 0.03	0.64 ± 0.17	0.03 ± 0.05	0.60 ± 0.17
A03MW606D-RF	0.17 ± 0.15	0.2 ± 0.4	0.07 ± 0.16	0.12 ± 0.12	0.01 ± 0.06	2.5 ± 0.6	0.20 ± 0.17	2.4 ± 0.6
A03MW606D-RU	0.23 ± 0.15	0.2 ± 0.4	0.05 ± 0.08	0.13 ± 0.11	-0.01 ± 0.02	2.7 ± 0.6	0.16 ± 0.14	2.9 ± 0.6
A03MW607D-F	0.21 ± 0.12	-0.1 ± 0.2	0.03 ± 0.07	0.13 ± 0.09	0.02 ± 0.04	0.09 ± 0.07	0.01 ± 0.04	0.02 ± 0.04
A03MW607D-U	0.20 ± 0.10	0.2 ± 0.3	0.13 ± 0.08	0.17 ± 0.09	0.02 ± 0.03	0.03 ± 0.04	-0.01 ± 0.04	0.01 ± 0.04
A04AMW20-F	0.05 ± 0.06	0.3 ± 0.2	0.01 ± 0.06	0.22 ± 0.10	0.00 ± 0.04	3.8 ± 0.4	0.16 ± 0.09	3.6 ± 0.5
A04AMW20-U	0.08 ± 0.06	0.1 ± 0.2	0.01 ± 0.08	0.11 ± 0.06	0.04 ± 0.05	3.8 ± 0.4	0.19 ± 0.11	3.8 ± 0.5
A04AMW21-F	0.25 ± 0.07	0.08 ± 0.17	0.05 ± 0.06	0.10 ± 0.05	0.00 ± 0.03	1.7 ± 0.2	0.07 ± 0.05	1.6 ± 0.2
A04AMW21-U	0.27 ± 0.07	0.10 ± 0.17	0.09 ± 0.08	0.16 ± 0.08	-0.01 ± 0.03	1.7 ± 0.3	0.03 ± 0.05	1.9 ± 0.3
A04AMW22-F	0.28 ± 0.12	0.2 ± 0.2	0.04 ± 0.06	0.14 ± 0.07	0.02 ± 0.03	5.7 ± 0.8	0.31 ± 0.13	5.2 ± 0.7
A04AMW22-U	0.17 ± 0.10	0.0 ± 0.2	0.05 ± 0.07	0.08 ± 0.06	-0.01 ± 0.03	7.6 ± 0.9	0.56 ± 0.16	7.9 ± 0.9
A04AMW23-F	0.18 ± 0.10	0.4 ± 0.3	0.10 ± 0.08	0.13 ± 0.09	0.01 ± 0.04	3.1 ± 0.5	0.10 ± 0.08	2.7 ± 0.4
A04AMW23-U	0.15 ± 0.10	0.2 ± 0.3	0.08 ± 0.10	0.17 ± 0.09	0.01 ± 0.04	2.5 ± 0.4	0.06 ± 0.06	2.5 ± 0.4
A04AMW601D-F	0.15 ± 0.10	0.3 ± 0.3	0.01 ± 0.06	0.20 ± 0.10	-0.01 ± 0.03	6.9 ± 0.8	0.31 ± 0.13	7.2 ± 0.8
A04AMW601D-U	0.18 ± 0.10	0.2 ± 0.3	0.08 ± 0.08	0.25 ± 0.12	0.01 ± 0.04	6.3 ± 0.8	0.42 ± 0.15	5.9 ± 0.7
A04AMW602D-F	0.23 ± 0.11	0.5 ± 0.3	0.01 ± 0.04	0.18 ± 0.08	0.07 ± 0.05	31 ± 2	1.6 ± 0.3	31 ± 2
A04AMW602D-U	0.22 ± 0.10	0.3 ± 0.3	0.01 ± 0.05	0.17 ± 0.09	0.00 ± 0.04	29 ± 3	1.6 ± 0.3	30 ± 3
A04AMW603D-F	0.22 ± 0.11	0.2 ± 0.3	0.10 ± 0.09	0.29 ± 0.12	0.01 ± 0.05	1.7 ± 0.3	0.04 ± 0.06	1.3 ± 0.3
A04AMW603D-U	0.13 ± 0.11	0.1 ± 0.3	0.04 ± 0.10	0.17 ± 0.10	0.00 ± 0.06	4.5 ± 0.6	0.14 ± 0.10	4.0 ± 0.6
A04BMW18-F	0.18 ± 0.10	0.1 ± 0.3	0.02 ± 0.04	0.21 ± 0.10	0.01 ± 0.04	42 ± 4	1.8 ± 0.4	43 ± 4
A04BMW18-U	0.23 ± 0.11	0.3 ± 0.3	0.00 ± 0.05	0.08 ± 0.07	0.00 ± 0.04	41 ± 4	1.8 ± 0.4	41 ± 4
A04BMW19-F	0.14 ± 0.10	0.2 ± 0.3	0.01 ± 0.05	0.09 ± 0.06	0.01 ± 0.04	2.3 ± 0.4	0.07 ± 0.06	2.1 ± 0.3
A04BMW19-U	0.06 ± 0.09	0.2 ± 0.3	0.06 ± 0.08	0.17 ± 0.10	-0.01 ± 0.04	2.3 ± 0.4	0.11 ± 0.08	2.2 ± 0.4
A04BMW26-F	0.20 ± 0.11	0.4 ± 0.2	0.05 ± 0.08	0.08 ± 0.07	0.01 ± 0.04	69 ± 6	3.3 ± 0.5	66 ± 6
A04BMW26-U	0.17 ± 0.11	0.4 ± 0.2	0.00 ± 0.05	0.15 ± 0.09	0.00 ± 0.04	72 ± 7	3.5 ± 0.6	71 ± 7

TABLE 4-134
COPC CONCENTRATIONS IN GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration (pCi/L)[a,b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A04BMW605D-F	0.28 ± 0.10	0.2 ± 0.3	0.08 ± 0.08	0.11 ± 0.08	0.02 ± 0.04	69 ± 7	3.4 ± 0.7	64 ± 6
A04BMW605D-U	0.27 ± 0.10	0.4 ± 0.3	0.05 ± 0.06	0.25 ± 0.09	0.00 ± 0.03	69 ± 6	3.4 ± 0.6	66 ± 6
A04DMW24-F	0.09 ± 0.10	0.4 ± 0.2	0.04 ± 0.08	0.09 ± 0.07	-0.01 ± 0.04	0.58 ± 0.17	0.16 ± 0.13	0.44 ± 0.16
A04DMW24-U	0.08 ± 0.08	0.4 ± 0.2	0.04 ± 0.06	0.07 ± 0.06	0.01 ± 0.04	0.47 ± 0.15	0.05 ± 0.06	0.43 ± 0.14
A04DMW604D-F	0.14 ± 0.09	0.4 ± 0.2	-0.03 ± 0.03	0.20 ± 0.10	0.06 ± 0.09	28 ± 3	1.7 ± 0.4	30 ± 3
A04DMW604D-U	0.21 ± 0.09	0.4 ± 0.3	0.09 ± 0.09	0.14 ± 0.09	0.03 ± 0.04	29 ± 3	1.4 ± 0.3	29 ± 3
A05BMW600D-F	1.4 ± 0.2	2.4 ± 0.4	0.02 ± 0.05	0.25 ± 0.12	0.01 ± 0.04	1.2 ± 0.3	0.07 ± 0.07	1.2 ± 0.3
A05BMW600D-U	1.26 ± 0.20	2.0 ± 0.4	0.12 ± 0.10	0.14 ± 0.09	0.00 ± 0.04	0.81 ± 0.20	0.08 ± 0.12	0.67 ± 0.18

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-135
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS IN GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration[a,b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A02MW06-F	0.4 ± 0.3	4.4 ± 0.8
A02MW06-U	0.3 ± 0.3	5.2 ± 1.0
A02MW08-F	0.3 ± 0.3	0.4 ± 0.2
A02MW08-U	0.4 ± 0.3	0.8 ± 0.3
A02MW09-F	0.1 ± 0.3	13.6 ± 1.7
A02MW09-U	-0.3 ± 0.3	14.2 ± 1.8
A02MW11-F	0.5 ± 0.3	6.1 ± 1.1
A02MW11-U	0.5 ± 0.3	8.0 ± 1.3
A02MW1-F	0.8 ± 0.2	3.2 ± 0.6
A02MW1-U	1.2 ± 0.3	2.7 ± 0.5
A02MW2-F	0.1 ± 0.4	20.3 ± 2.4
A02MW2-U	0.4 ± 0.3	21.4 ± 2.4
A02MW3-F	0.2 ± 0.3	5.7 ± 1.0
A02MW3-U	0.3 ± 0.2	5.0 ± 0.9
A02MW4-F	0.2 ± 0.2	48 ± 4
A02MW4-U	0.66 ± 0.20	49 ± 4
A02MW5-F	0.3 ± 0.3	6.6 ± 1.0
A02MW5-U	0.3 ± 0.3	6.8 ± 1.1
A03MW13D-F	0.3 ± 0.3	65 ± 6
A03MW13D-U	0.2 ± 0.3	65 ± 6
A03MW14-F	0.5 ± 0.3	2.8 ± 0.7
A03MW14-U	0.3 ± 0.3	2.9 ± 0.6
A03MW15-F	-0.3 ± 0.2	0.4 ± 0.3
A03MW15-U	0.0 ± 0.2	0.7 ± 0.4
A03MW16-F	0.4 ± 0.3	22 ± 2
A03MW16-U	0.3 ± 0.3	22 ± 2
A03MW17-F	0.3 ± 0.3	2.0 ± 0.4
A03MW17-U	0.5 ± 0.3	1.8 ± 0.5
A03MW606D-RF	0.4 ± 0.5	7.2 ± 1.7
A03MW606D-RU	0.4 ± 0.4	8.7 ± 1.8
A03MW607D-F	0.1 ± 0.3	0.05 ± 0.12
A03MW607D-U	0.4 ± 0.3	0.01 ± 0.12
A04AMW20-F	0.3 ± 0.2	10.9 ± 1.5
A04AMW20-U	0.2 ± 0.2	11.3 ± 1.5
A04AMW21-F	0.33 ± 0.18	4.8 ± 0.7
A04AMW21-U	0.36 ± 0.19	5.8 ± 1.0
A04AMW22-F	0.5 ± 0.3	16 ± 2
A04AMW22-U	0.2 ± 0.2	24 ± 3
A04AMW23-F	0.5 ± 0.3	8.2 ± 1.3

TABLE 4-135
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS IN GROUNDWATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID	Concentration[a,b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A04AMW23-U	0.3 ± 0.3	7.4 ± 1.2
A04AMW601D-F	0.5 ± 0.3	22 ± 2
A04AMW601D-U	0.4 ± 0.3	18 ± 2
A04AMW602D-F	0.8 ± 0.3	92 ± 7
A04AMW602D-U	0.5 ± 0.3	90 ± 8
A04AMW603D-F	0.4 ± 0.3	4.0 ± 0.9
A04AMW603D-U	0.2 ± 0.3	12.1 ± 1.7
A04BMW18-F	0.2 ± 0.3	128 ± 12
A04BMW18-U	0.5 ± 0.3	123 ± 11
A04BMW19-F	0.3 ± 0.3	6.2 ± 1.0
A04BMW19-U	0.3 ± 0.3	6.7 ± 1.1
A04BMW26-F	0.6 ± 0.3	198 ± 18
A04BMW26-U	0.5 ± 0.3	212 ± 19
A04BMW605D-F	0.5 ± 0.4	192 ± 19
A04BMW605D-U	0.7 ± 0.3	197 ± 17
A04DMW24-F	0.5 ± 0.3	1.4 ± 0.5
A04DMW24-U	0.5 ± 0.2	1.3 ± 0.4
A04DMW604D-F	0.5 ± 0.2	90 ± 9
A04DMW604D-U	0.6 ± 0.3	86 ± 8
A05BMW600D-F	3.7 ± 0.5	3.7 ± 0.8
A05BMW600D-U	3.2 ± 0.4	2.0 ± 0.5

Notes:
[a] Concentrations represent laboratory duplicate, field duplicate, and two rounds of groundwater sample results combined using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-136
COMPARISON OF FIELD PARAMETERS FROM SAMPLING EVENTS
GUTERL GROUNDWATER WELLS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Well ID	Collect Date	pH (std. unit)	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (C)	ORP (mV)	Depth to Water
MW-1	Aug-07	7.08	1.903	1.2	0.23	16.32	-6	7.2
MW-1	Nov-07	6.93	1.81	1.18	0.41	13.53	-23.4	6.98
MW-1	Jun-08	7.15	3.86	-0.53	0.08	11.3	-20	6.3
MW-2	Aug-07	8.95	0.55	0.24	0.29	15.56	-19.9	8.68
MW-2	Nov-07	7.44	0.57	0.81	0.43	14.53	-203.5	8.65
MW-2	Mar-08	7.06	1.32	4.6	0.00	6.63	-42	8.10
MW-2	Jun-08	7.25	0.67	1.26	2.24	12.6	-165	8.49
MW-3	Aug-07	8.14	0.731	clear	0.17	13.95	16.2	6.3
MW-3	Nov-07	6.86	0.747	6.9	0.16	13.55	-91.2	5.85
MW-3	Jun-08	7.11	1.27	15.1	1.11	10.70	-89	5.00
MW-4	Aug-07	7.56	0.58	0.58	0.18	16.71	49.6	5.78
MW-4	Nov-07	7.3	0.65	0.69	0.31	13.24	19.3	5.95
MW-4	Mar-08	note 1	0.56	1.1	0.42	5.99	77	4.30
MW-4	Jun-08	7.32	0.64	0.72	0.00	12.1	86	4.85
MW-5	Aug-07	7.32	0.745	0.33	0.17	12.84	-57.7	5.73
MW-5	Nov-07	6.95	0.7	2.31	0.17	12.47	-94.4	5.74
MW-5	Jun-08	6.78	0.745	1.32	0.00	8.9	-121	4.94
MW-6	Aug-07	7.08	0.921	1.4	0.23	15.3	19.8	7.75
MW-6	Nov-07	6.85	1.042	3.4	0.45	13.35	-19.7	7.40
MW-6	Jun-08	7.12	1.29	-0.45	1.57	12.5	55	6.51
MW-07	Jun-08	6.97	0.9	2.07	1.68	14.7	-83	16.94
MW-08	Aug-07	7.1	1.47	1.06	0.26	14.29	-70.6	9.45
MW-08	Nov-07	6.89	1.56	1.15	0.17	13.7	-157.2	9.04
MW-08	Mar-08	6.80	1.72	4.8	0.00	7.30	-24	8.10
MW-08	Jun-08	7.13	3.26	-1.93	0.93	11.8	-94	8.74
MW-09	Aug-07	8.42	0.595	1.3	0.2	15.71	-143.1	8.78
MW-09	Nov-07	7.06	0.69	4.6	0.2	13.07	-157.6	8.77
MW-09	Jun-08	6.97	0.802	0	0	11.7	-135	8.55
MW-10	Jun-08	6.93	0.91	4.29	1.73	13.4	-59	7.5
MW-11	Aug-07	7.38	1.121	1.37	0.29	16.04	-94.7	9.63
MW-11	Nov-07	6.89	1.255	1.51	0.17	14.64	-94.8	9.55
MW-11	Jun-08	6.87	1.19	0.53	0	13.4	-101	9.42
MW-12	Jun-08	7.23	0.753	1.39	0	10.9	-77	5.89
MW-13D	Aug-07	7.43	1.332	0.5	0.23	16.89	-34.9	8.68
MW-13D	Nov-07	7.28	1.25	1.33	0.39	12.06	-32	9.15
MW-13D	Jun-08	7.25	1.33	-2.66	0.23	12.6	165	5.40
MW-14	Aug-07	7.39	1.188	2	0.29	16.95	-70.3	8.28
MW-14	Nov-07	7.19	1.392	3.5	0.48	13.31	-68.3	8.44
MW-14	Jun-08	7.11	1.71	1.44	0.08	13.2	-108	5.46
MW-15	Aug-07	11.01	0.707	5.02	1.26	15.69	-152.2	12.5
MW-15	Nov-07	8.67	1.337	44	0.5	12.73	-142.3	13.15
MW-15	Jun-08	9.61	1.08	1.75	1.08	12.9	-135	8.91
MW-16	Aug-07	7.39	1.12	1.26	0.29	16.04	-94.9	10.08
MW-16	Nov-07	7.01	1.49	0.98	0.49	13.64	-3.6	9.60
MW-16	Mar-08	7.19	1.33	17.8	0.00	3.66	135	5.86
MW-16	Jun-08	7.71	1.71	-0.67	0.89	12.6	8	6.39
MW-17	Jul-07	7.31	2.163	5	0.45	19.43	-35.7	9.6
MW-17	Nov-07	7.17	2.515	9.8	0.89	13.49	-72.9	10.02
MW-17	Jun-08	7.4	2.62	4.03	1.09	12.9	-71	6.23
MW-18	Aug-07	7.44	1.324	0.35	0.18	16.59	51.3	8.39
MW-18	Nov-07	7	1.094	8.18	0.45	12.74	31.2	8.45
MW-18	Jun-08	7.07	1.23	0.62	4.35	16.6	57	5.61
MW-19	Aug-07	7.2	0.932	0.28	1.83	17.58	-50.7	9.58
MW-19	Nov-07	6.97	0.992	0.45	1.88	14.48	--	10.55
MW-19	Jun-08	7.06	1.11	0.64	2.05	13.8	25	7.21
MW-20	Aug-07	7.16	0.941	1.34	0.98	18.63	-25.7	9.55
MW-20	Nov-07	7.06	0.935	1.74	0.99	13.32	55.6	9.38
MW-20	Jun-08	6.93	0.634	0.3	0.96	13.6	16	8.39

TABLE 4-136
COMPARISON OF FIELD PARAMETERS FROM SAMPLING EVENTS
GUTERL GROUNDWATER WELLS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Well ID	Collect Date	pH (std. unit)	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (C)	ORP (mV)	Depth to Water
MW-21	Aug-07	7.41	1.849	0.3	0.21	15.63	57.8	13.57
MW-21	Nov-07	7.33	2.064	2.15	0.33	13.76	-114.8	13.77
MW-21	Jun-08	7.32	2.08	-1.75	0.2	10.6	-106	11.09
MW-22	Aug-07	7.27	0.608	0.44	0.2	17.5	16.1	7.55
MW-22	Nov-07	6.89	0.662	1.39	0.2	13.34	-122.5	7.40
MW-22	Jun-08	6.98	0.772	1.21	0.01	13.2	-142	6.52
MW-23	Aug-07	7.14	0.619	0.92	0.3	16.72	-15.5	6.52
MW-23	Nov-07	7	0.612	1.39	0.42	13.04	-8.9	6.40
MW-23	Jun-08	6.96	0.694	0.31	0	12.6	-70	5.44
MW-24	Aug-07	7.31	0.486	0.68	0.37	20.27	-143.7	3.85
MW-24	Nov-07	7.2	0.628	0.61	0.24	15.01	-159.2	4.17
MW-24	Jun-08	6.92	1.24	2.63	0	11.7	-78	3.61
MW-25	Mar-08	6.97	9.39	1.3	0.00	1.92	192	1.22
MW-25	Jun-08	6.9	6.59	0.73	0.00	13.2	117	2.09
MW-26	Aug-07	7.33	3.545	1.25	0.29	17.32	53.9	3.07
MW-26	Nov-07	7.09	2.418	1.81	0.25	13.58	-26.3	3.80
MW-26	Jun-08	6.96	4.91	0.69	0.00	13.4	-25	2.59
MW-600D	Aug-07	6.99	12.76	1.1	0.19	14.52	116	12.68
MW-600D	Nov-07	6.57	15.87	1.3	0.26	13.15	7.2	11.55
MW-600D	Mar-08	note 1	5.80	3.0	0.28	5.18	64	6.05
MW-600D	May-08	7.08	4.29	0.0	0.16	13.57	81	8.61
MW-601D	Aug-07	8.38	1.24	1.05	0.23	17.43	-29.3	10.95
MW-601D	Nov-07	7.16	1.79	1.64	0.27	13.67	-158.1	10.80
MW-601D	Mar-08	note 1	1.65	3.4	0.25	9.92	-201	8.38
MW-601D	May-08	~7.0	1.29	0.0	0.11	11.68	-285	9.52
MW-601D	Jun-08	6.99	1.75	1.94	3.06	15.8	-160	9.49
MW-602D	Aug-07	7.56	1.92	0.67	0.17	16.73	-14.3	10.16
MW-602D	Nov-07	7.03	1.56	5.14	0.24	13.64	-43.4	9.95
MW-602D	Mar-08	6.97	0.59	16.6	5.37	14.65	149	8.02
MW-602D	Jun-08	6.99	1.1	0.6	0.03	14	-70	8.89
MW-603D	Aug-07	7.66	1.34	0.94	0.17	15.83	41.4	7.46
MW-603D	Nov-07	7.05	1.07	4.02	0.25	13.64	-14.4	7.14
MW-603D	Mar-08	note 1	0.80	21	0.34	6.17	7	5.01
MW-603D	May-08	6.79	0.84	0.1	0.20	14.40	-29	6.65
MW-603D	Jun-08	7.12	1.12	1.92	1.51	13.6	-70	6.54
MW-604D	Aug-07	7.36	1.30	0.45	0.18	17.1	30.3	5.81
MW-604D	Nov-07	7.15	1.60	1.39	0.28	13.89	37.9	7.62
MW-604D	Mar-08	6.98	2.04	5.1	1.07	12.34	174	4.63
MW-604D	Jun-08	6.91	3.24	0.78	0.00	12.2	60	5.96
MW-605D	Aug-07	7.31	0.97	0.43	0.27	17.61	0.2	4.03
MW-605D	Nov-07	7.09	1.07	9.55	0.25	14	-15.5	4.12
MW-605D	Mar-08	note 1	1.04	3.0	0.21	10.16	87	1.9
MW-605D	May-08	7.01	0.89	0.5	0.24	15.55	88	2.44
MW-605D	Jun-08	7.0	1.08	4.5	0.00	12	96	2.29
MW-606DR	Nov-07	7.16	2.17	13.2	0.56	11.67	-76.9	8.31
MW-606DR	Jun-08	7.0	2.41	4.77	1.72	15.4	-107	5.14
MW-607D	Aug-07	8.95	1.39	0.42	0.17	15.66	-97.5	8.49
MW-607D	Nov-07	6.91	1.72	9.18	0.21	13.2	-186	7.90
MW-607D	Mar-08	note 1	1.37	380	0.31	3.72	-94	3.39
MW-607D	May-08	6.99	1.26	0.1	0.29	12.95	-97	4.79
MW-607D	Jun-08	6.97	1.42	0.94	0.46	11.9	-1.57	5.24

Notes:

Note 1 - pH sonde used for these readings was acting erroneously; therefore, results are considered invalid.

Readings in 2007 taken by Earth Tech; readings in March and May, 2008, taken by USACE; readings in June, 2008, taken by MACTEC.

pH reading at well MW-601D taken May 2008 using litmus paper due to pH meter malfunction.

TABLE 4-137
GROUNDWATER ANION CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Well ID	Alkalinity as CaCO3	Bromide	Chloride	Fluoride	Nitrate as N	Nitrite as N	Ortho-Phosphate	Specific Conductance	Sulfate	Total Dissolved Solids
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mS/cm)	(mg/L)	(mg/L)
G-MW-016	400	<0.1	160	7.6	0.24	<0.1	<0.1	1.33	82	810
G-MW-025	210	0.32	2800	1.8	0.67	<0.5	<0.1	9.39	120	5100
G-MW-2	290	0.13	400	0.69	<0.1	<0.1	<0.1	1.32	94	950
G-MW-4	210	<0.1	43	1.7	0.55	<0.1	<0.1	0.56	56	340
G-MW-600 D	520	0.38	1600	<0.1	<0.1	<0.1	<0.1	5.80	180	3100
G-MW-601D	300	0.21	260	0.96	0.2	<0.1	<0.1	1.65	150	880
G-MW-602D	250	<0.1	24	3.7	0.62	<0.1	<0.1	0.59	40	280
G-MW-603 D	270	<0.1	33	3.6	<0.1	<0.1	<0.1	0.80	77	500
G-MW-604D	250	<0.1	500	1.4	1	<0.1	<0.1	2.04	59	1300
G-MW-605D	350	0.1	82	2.9	1.4	<0.1	<0.1	1.04	92	630
G-MW-607D	710	0.3	120	6.9	<0.1	<0.1	<0.1	1.37	110	830
G-MW-8	370	0.12	360	0.7	<0.1	<0.1	<0.1	1.72	180	1200

Notes:
Analytical data from March, 2008 USACE sampling event.
< = Analyte was analyzed for but not detected at or above the concentration shown.
mg/L = milligrams per liter

TABLE 4-138
GROUNDWATER METAL CONCENTRATIONS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Well ID	Aluminum	Antimony	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc
	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
G-MW-016	134 J	5.9 J	104 B	0.095 U	0.53 JB	41100	7 B	0.67 U	1.4 UB	1990	1.5 J	57600 B	511	0.044 J	677	6.2 JB	7400 NE	1.7 U	0.47 U	172000 EB	11.5	107
G-MW-016-F	286	5.6 J	91.3 B	0.095 U	0.21 UB	43100	6.5 B	0.67 U	1.4 UB	53.4 J	1.7 J	60500 B	289	0.045 J	719	5.7 JB	7580 NE	4.6 J	0.5 J	180000 EB	6.5 J	83
G-MW-025	26.7 U	3.9 U	190 B	0.095 U	3.5 JB	213000	15.5 B	0.67 U	1.4 UB	72.8 J	2 J	65300 B	669	0.049 J	182	398 B	5770 NE	1.7 U	0.47 U	1440000 ED	0.83 U	173
G-MW-025-F	307	3.9 U	171 B	0.095 U	3.3 JB	202000	15 B	0.67 U	1.4 UB	86.9 J	1.9 J	61700 B	564	0.063 J	170	356 B	5450 NE	1.7 U	0.47 U	1340000 ED	0.83 U	167
G-MW-2	26.7 U	3.9 U	94.2 B	0.095 U	0.21 UB	120000	0.97 JB	0.67 U	1.4 UB	119 J	1.4 J	35900 B	172	0.056 J	15.6	0.87 UB	5390 NE	1.7 U	0.47 U	133000 EB	0.83 U	4.1 J
G-MW-2-F	26.7 U	3.9 U	108 B	0.095 U	0.21 UB	126000	1.2 JB	0.67 U	1.4 UB	98.4 J	1.2 U	34900 B	239	0.062 J	16.2	0.99 JB	5420 NE	1.7 U	0.47 U	169000 EB	0.83 U	5 J
G-MW-4	26.7 U	3.9 U	40 B	0.095 U	0.21 UB	47400	0.72 JB	0.67 U	1.4 UB	15.4 U	2.3 J	19300 B	141	0.041 J	292	2.2 JB	2870 NE	1.7 U	0.47 U	38400 EB	0.83 U	76.9
G-MW-4-F	123 J	3.9 U	33.5 B	0.095 U	0.21 UB	50000	1.2 JB	0.67 U	1.4 UB	44.2 J	1.3 J	20100 B	58.4	0.039 J	309	1.9 JB	3020 NE	1.7 U	0.47 U	38600 EB	0.83 U	59.5
G-MW-600 D	69.9 J	3.9 U	70.7 B	0.095 U	0.8 JB	164000	0.63 UB	0.67 U	1.4 UB	457	7.8 J	67100 B	154	0.053 J	1.3 J	1.9 JB	3200 NE	1.7 U	0.47 U	885000 ED	0.83 U	325
G-MW-600D-F	26.7 U	3.9 U	73.8 B	0.095 U	1 JB	173000	1.4 JB	0.67 U	1.4 UB	51.4 J	3 J	70200 B	164	0.048 J	1.7 J	2.8 JB	3440 NE	1.7 U	0.47 U	899000 ED	0.83 U	350
G-MW-601D	26.7 U	3.9 U	5 B	0.095 U	0.43 J	106000	0.63 UB	0.67 U	1.4 UB	15.4 U	1.2 U	39800 B	12.6	0.054 J	2.1 J	1.9 JB	9210 N	1.7 U	0.47 U	180000	0.83 U	7.3 J
G-MW-601D-F	26.7 U	3.9 U	5.1 B	0.095 U	0.21 U	105000	0.63 UB	0.67 U	1.4 UB	15.4 U	1.2 U	39600 B	11	0.048 J	1.5 J	1.2 JB	9370 N	1.7 U	0.47 U	184000	0.83 U	4.6 J
G-MW-602D	26.7 U	3.9 U	17.8 B	0.095 U	0.21 U	61800	8.3 B	0.67 U	1.4 UB	29.5 J	2.4 J	32300 B	8.3	0.047 J	404	1.7 JB	2400 N	2.7 J	0.47 U	31800	0.83 U	73.3
G-MW-602D-F	26.7 U	3.9 U	18.7 B	0.095 U	0.36 J	61400	8.6 B	0.67 U	1.4 UB	15.4 U	1.2 U	33000 B	3.2 J	0.047 J	434	1.7 JB	2480 N	2 J	0.47 U	31000	0.83 U	73.7
G-MW-603 D	36.1 J	5.4 J	36.8 B	0.095 U	0.21 UB	94200	2.7 JB	1.1 J	1.4 UB	1140	1.2 U	38300 B	131	0.058 J	101	34.9 B	3010 NE	1.8 J	0.47 U	25700 EB	1.6 J	187
G-MW-603 D-F	26.7 U	3.9 U	36.1 B	0.095 U	0.3 JB	93800	1.8 JB	0.67 U	1.4 UB	557	1.2 U	38100 B	87.3	0.051 J	94.6	35 B	2940 NE	1.7 U	0.47 U	25700 EB	0.83 U	164
G-MW-604D	26.7 U	3.9 U	73.1 B	0.095 U	0.7 J	123000	2.2 JB	0.67 U	1.4 UB	15.4 U	1.4 J	34100	7.8	0.05 J	101	2.2 JB	2910 N	1.7 U	0.47 U	249000	0.83 U	137
G-MW-604D-F	26.7 U	3.9 U	79 B	0.095 U	0.62 J	133000	2.3 JB	0.67 U	1.4 UB	15.4 U	1.2 J	36600 B	6.6	0.042 J	108	3 JB	3040 N	3.4 J	0.47 U	263000	0.83 U	144
G-MW-605D	26.7 U	3.9 U	48.5 B	0.095 U	1.2 J	77400	1.4 JB	0.67 U	2.3 JB	25.9 J	1.3 J	36900 B	211	0.051 J	464	26.6 B	4720 N	1.7 U	0.47 U	98000	0.83 U	71.2
G-MW-605D-F	26.7 U	3.9 U	48.6 B	0.095 U	0.21 U	77500	1.3 JB	0.67 U	1.4 UB	15.4 U	2.1 J	36900 B	202	0.052 J	469	22.7 B	4680 N	2.2 J	0.47 U	98300	0.83 U	63.3
G-MW-607D	1840	4.5 J	67.7 B	0.11 J	0.21 UB	107000	2.8 JB	1.8 J	1.4 UB	1950	7.3 J	106000 B	751	0.079 J	1810	9.5 JB	7700 NE	1.7 U	0.47 U	93200 EB	2.7 J	67.4
G-MW-607D-F	99.3 J	3.9 U	49.3 B	0.095 U	0.21 UB	69000	0.63 UB	0.67 U	1.4 UB	207	1.2 U	78400 B	445	0.064 J	1540	3.8 JB	6090 NE	1.7 U	0.47 U	80500 EB	0.83 U	4.7 J
G-MW-8	26.7	3.9 J	43.9 B	0.095 U	0.21 UB	159000	1.6 JB	0.67 U	1.4 UB	393	1.5 J	45100 B	214	0.049 J	5.2	1.2 JB	4980 NE	1.7 U	0.47 U	155000 EB	0.83 U	3.5 J
G-MW-8-F	26.7 U	4.8 J	44.9 B	0.095 U	0.21 UB	161000	0.63 UB	0.67 U	1.4 UB	390	1.4 J	45600 B	216	0.049 J	4.9 J	0.87 UB	4960 NE	1.7 U	0.47 U	157000 EB	0.83 U	4.1 J

Notes:

-F following the well ID indicates the sample was filtered

Arsenic results uniformly reported as 4.2 U; thallium results uniformly reported as 4.1 U;

2. Since practically all of the qualifiers in question occur in the metals analyses, the table for "Inorganic Analytical Data" should be used. However, the "D" flag used is not listed under Inorganics, but I believe it to be the same as the D flag under "Organics".

3. I believe that the "B" and "J" flags that are used in these reports are actually following the "Organic Analytical Data" definitions and not those for Inorganics.

Analytical data from March, 2008 USACE sampling event.

Qualifiers following analytical values indicate the following:

B: The reported value was obtained from a reading that was less than the contract required detection limit but greater than or equal to the instrument detection limit.

D: Compounds identified in an analysis at a secondary dilution factor, indicating possible discrepancies may be due to dilution of the sample or extract.

E: Reported value is estimated because of the presence of interference.

J: Estimated value less than the sample quantitation limit but greater than zero.

N: The spiked sample recovery was not within control limits.

U: Analyte was analyzed for but not detected at or above the concentration shown.

TABLE 4-139
COPC CONCENTRATIONS IN IA08 NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A08-A01-SD-001R	0.31 ± 0.11	0.06 ± 0.08	0.4 ± 0.2	0.07 ± 0.17	0.29 ± 0.09	0.40 ± 0.10	0.23 ± 0.07	0.07 ± 0.17	—	6.2 ± 0.6	0.31 ± 0.09	0.24 ± 0.16	6.7 ± 0.7	—
A08-A01-SD-002	0.76 ± 0.14	0.49 ± 0.14	0.6 ± 0.3	0.3 ± 0.3	0.55 ± 0.16	0.55 ± 0.16	0.38 ± 0.13	0.3 ± 0.3	—	1.6 ± 0.3	0.11 ± 0.08	-0.1 ± 0.4	1.8 ± 0.3	—
A08-A01-SD-003	0.32 ± 0.16	0.17 ± 0.10	0.3 ± 0.4	0.27 ± 0.20	0.46 ± 0.16	0.72 ± 0.20	0.48 ± 0.15	0.27 ± 0.20	—	1.2 ± 0.3	0.01 ± 0.05	0.0 ± 0.9	1.0 ± 0.2	—
A08-A01-SD-004	0.8 ± 0.2	0.5 ± 0.3	1.0 ± 0.6	0.5 ± 0.4	0.6 ± 0.3	0.5 ± 0.3	0.5 ± 0.3	0.5 ± 0.4	—	10.3 ± 1.7	0.7 ± 0.3	0.3 ± 0.5	10.7 ± 1.8	—
A08-A01-SD-005	0.31 ± 0.14	0.12 ± 0.11	0.6 ± 0.5	0.18 ± 0.18	0.35 ± 0.14	0.31 ± 0.12	0.26 ± 0.11	0.18 ± 0.18	—	1.8 ± 0.4	0.16 ± 0.10	0.0 ± 0.2	1.8 ± 0.4	—
A08-A01-SD-006	0.56 ± 0.13	0.06 ± 0.18	0.5 ± 0.3	0.34 ± 0.19	0.57 ± 0.18	0.68 ± 0.19	0.36 ± 0.13	0.34 ± 0.19	—	1.9 ± 0.4	0.06 ± 0.06	0.2 ± 0.3	2.0 ± 0.4	—
A08-A01-SD-007	0.62 ± 0.19	0.14 ± 0.07	0.3 ± 0.4	0.14 ± 0.10	0.26 ± 0.11	0.43 ± 0.15	0.18 ± 0.09	0.14 ± 0.10	—	18 ± 2	0.8 ± 0.2	0.37 ± 0.19	18 ± 2	—
A08-A01-SD-008	0.9 ± 0.2	0.76 ± 0.19	1.1 ± 0.5	0.5 ± 0.2	0.42 ± 0.15	0.59 ± 0.18	0.46 ± 0.15	0.5 ± 0.2	—	20 ± 3	1.0 ± 0.3	0.8 ± 0.3	19 ± 3	—
A08-A01-SD-009	0.54 ± 0.17	0.38 ± 0.11	0.5 ± 0.5	0.27 ± 0.11	0.43 ± 0.16	0.45 ± 0.15	0.30 ± 0.12	0.27 ± 0.11	—	2.1 ± 0.4	0.13 ± 0.09	0.08 ± 0.16	2.2 ± 0.4	—
A08-A01-SD-010	0.45 ± 0.16	0.14 ± 0.12	0.7 ± 0.4	0.3 ± 0.2	0.50 ± 0.16	0.40 ± 0.14	0.37 ± 0.13	0.3 ± 0.2	—	6.4 ± 0.9	0.34 ± 0.14	0.3 ± 0.3	6.6 ± 1.0	—
A08-A01-SD-011	0.50 ± 0.18	0.18 ± 0.16	0.5 ± 0.4	0.3 ± 0.3	0.51 ± 0.17	0.39 ± 0.14	0.40 ± 0.15	0.3 ± 0.3	—	36 ± 5	2.2 ± 0.5	2.6 ± 0.6	41 ± 5	—
A08-A01-SD-012	0.55 ± 0.18	0.58 ± 0.16	0.2 ± 0.3	0.13 ± 0.19	0.21 ± 0.10	0.9 ± 0.2	0.26 ± 0.11	0.13 ± 0.19	—	6.0 ± 0.9	0.23 ± 0.11	0.2 ± 0.3	5.5 ± 0.8	—
A08-A01-SD-013	0.9 ± 0.2	0.47 ± 0.14	0.6 ± 0.4	0.57 ± 0.17	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	0.57 ± 0.17	—	2.6 ± 0.5	0.13 ± 0.09	0.0 ± 0.4	2.5 ± 0.5	—
A08-B04&B09-SD-001	0.43 ± 0.16	0.26 ± 0.11	0.5 ± 0.4	0.22 ± 0.14	0.35 ± 0.09	0.31 ± 0.09	0.25 ± 0.08	0.22 ± 0.14	—	6.9 ± 0.7	0.28 ± 0.09	0.4 ± 0.2	7.3 ± 0.7	—
A08-B04&B09-SD-002	0.56 ± 0.17	0.34 ± 0.12	0.4 ± 0.3	0.11 ± 0.17	0.29 ± 0.09	0.36 ± 0.09	0.23 ± 0.07	0.11 ± 0.17	—	5.7 ± 0.6	0.31 ± 0.09	0.7 ± 0.3	6.5 ± 0.7	—
A08-B04&B09-SD-003	0.47 ± 0.16	0.10 ± 0.16	0.6 ± 0.4	0.2 ± 0.2	0.28 ± 0.13	0.45 ± 0.16	0.19 ± 0.10	0.2 ± 0.2	—	18 ± 2	0.8 ± 0.2	1.2 ± 0.5	21 ± 3	—
A08-B04&B09-SD-004	0.26 ± 0.13	0.11 ± 0.10	0.2 ± 0.4	0.09 ± 0.18	0.22 ± 0.10	0.23 ± 0.10	0.13 ± 0.08	0.09 ± 0.18	—	4.0 ± 0.6	0.22 ± 0.11	0.3 ± 0.2	4.5 ± 0.7	—
A08-B04&B09-SD-005	0.46 ± 0.17	0.05 ± 0.17	0.2 ± 0.4	0.3 ± 0.4	0.16 ± 0.10	0.32 ± 0.13	0.15 ± 0.09	0.3 ± 0.4	—	14.8 ± 1.9	0.8 ± 0.2	1.0 ± 0.4	17 ± 2	—

TABLE 4-139
COPC CONCENTRATIONS IN IA08 NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A08-B1-SD-001	0.42 ± 0.18	0.31 ± 0.10	0.6 ± 0.4	0.20 ± 0.15	0.25 ± 0.11	0.38 ± 0.15	0.24 ± 0.11	0.20 ± 0.15	—	7.5 ± 1.0	0.34 ± 0.13	0.23 ± 0.20	8.4 ± 1.1	—
A08-B1-SD-002	0.30 ± 0.13	0.24 ± 0.09	0.5 ± 0.5	0.25 ± 0.14	0.24 ± 0.14	0.28 ± 0.14	0.18 ± 0.11	0.25 ± 0.14	—	3.0 ± 0.5	0.08 ± 0.07	0.13 ± 0.16	3.6 ± 0.6	—
A08-B1-SD-003	0.27 ± 0.12	0.33 ± 0.17	0.8 ± 0.5	0.3 ± 0.3	0.40 ± 0.14	0.36 ± 0.13	0.35 ± 0.13	0.3 ± 0.3	—	48 ± 7	2.8 ± 1.2	3.2 ± 0.6	52 ± 8	—
A08-B1-SD-004	1.8 ± 0.3	1.5 ± 0.3	1.4 ± 0.5	0.9 ± 0.4	1.2 ± 0.3	0.8 ± 0.2	0.8 ± 0.2	0.9 ± 0.4	—	69 ± 7	3.3 ± 0.9	5.4 ± 1.1	78 ± 8	—
A08-B1-SD-005	0.31 ± 0.14	0.23 ± 0.09	0.3 ± 0.2	0.18 ± 0.14	0.27 ± 0.10	0.36 ± 0.11	0.28 ± 0.10	0.18 ± 0.14	—	23 ± 2	1.2 ± 0.2	0.8 ± 0.2	25 ± 2	—
A08-B1-SD-006	0.53 ± 0.12	0.20 ± 0.12	0.34 ± 0.20	0.32 ± 0.15	0.36 ± 0.14	0.60 ± 0.18	0.41 ± 0.14	0.32 ± 0.15	—	12.3 ± 1.7	0.7 ± 0.2	0.3 ± 0.3	13.8 ± 1.8	—
A08-B1-SL-001	0.22 ± 0.09	14 ± 0.06	–0.08 ± 0.19	0.13 ± 0.10	0.31 ±0.09	0.34 ± 0.10	0.37 ± 0.10	0.13 ± 0.10	—	1.5 ± 0.2	0.09 ± 0.05	0.12 ± 0.16	1.7 ± 0.2	—
A08-B24-SD-001	0.46 ± 0.13	0.19 ± 0.07	0.7 ± 0.3	0.25 ± 0.09	0.46 ± 0.11	0.44 ± 0.11	0.44 ± 0.11	0.25 ± 0.09	—	21.5 ± 1.9	1.18 ± 0.20	0.73 ± 0.16	22.5 ± 2.0	—
A08-B24-SD-002	0.4 ± 0.2	0.32 ± 0.13	0.7 ± 0.5	0.40 ± 0.15	0.31 ± 0.10	0.39 ± 0.11	0.28 ± 0.09	0.40 ± 0.15	—	20 ± 3	0.8 ± 0.2	0.9 ± 0.3	20 ± 3	—
A08-B24-SD-003	0.48 ± 0.16	0.23 ± 0.13	1.0 ± 0.5	0.43 ± 0.15	0.53 ± 0.17	0.61 ± 0.18	0.60 ± 0.18	0.43 ± 0.15	—	17 ± 2	0.8 ± 0.2	0.9 ± 0.3	17 ± 2	—
A08-B24-SD-004	0.50 ± 0.16	0.33 ± 0.13	0.5 ± 0.5	0.08 ± 0.17	0.36 ± 0.15	0.51 ± 0.17	0.38 ± 0.14	0.08 ± 0.17	—	3.1 ± 0.5	0.17 ± 0.10	0.1 ± 0.2	3.2 ± 0.5	—
A08-B24-SD-005	0.14 ± 0.11	0.12 ± 0.06	0.3 ± 0.4	0.04 ± 0.09	0.09 ± 0.09	0.35 ± 0.15	0.03 ± 0.04	0.04 ± 0.09	—	1.6 ± 0.3	0.02 ± 0.04	0.12 ± 0.12	1.8 ± 0.3	—
A08-B24-SD-006	1.4 ± 0.3	1.9 ± 0.3	1.9 ± 0.5	1.8 ± 0.3	2.1 ± 0.5	1.3 ± 0.4	2.1 ± 0.5	1.8 ± 0.3	—	2.1 ± 0.4	0.06 ± 0.06	0.0 ± 0.4	2.8 ± 0.5	—
A08-B24-SD-007	0.51 ± 0.17	0.35 ± 0.12	0.7 ± 0.5	0.52 ± 0.17	0.8 ± 0.2	0.57 ± 0.18	0.8 ± 0.2	0.52 ± 0.17	—	30 ± 4	1.4 ± 0.3	1.9 ± 0.5	31 ± 4	—
A08-B2-SD-001	0.7 ± 0.2	0.65 ± 0.09	1.1 ± 0.4	1.77 ± 0.17	1.5 ± 0.3	0.84 ± 0.19	1.4 ± 0.3	1.77 ± 0.17	—	1.18 ± 0.19	0.04 ± 0.04	0.07 ± 0.18	1.33 ± 0.20	—
A08-B2-SD-002	0.66 ± 0.19	0.25 ± 0.09	0.3 ± 0.4	0.27 ± 0.14	0.5 ± 0.2	0.6 ± 0.2	0.37 ± 0.19	0.27 ± 0.14	—	5.6 ± 0.8	0.24 ± 0.12	0.24 ± 0.17	5.6 ± 0.8	—
A08-B2-SD-003	1.0 ± 0.2	1.09 ± 0.17	0.6 ± 0.4	1.0 ± 0.2	0.54 ± 0.18	0.69 ± 0.20	0.70 ± 0.20	1.0 ± 0.2	—	5.5 ± 0.8	0.22 ± 0.11	0.3 ± 0.3	5.7 ± 0.8	—
A08-B3-SD-002	0.13 ± 0.11	0.04 ± 0.06	0.2 ± 0.4	0.17 ± 0.12	0.28 ± 0.13	0.31 ± 0.13	0.21 ± 0.11	0.17 ± 0.12	—	1.9 ± 0.4	0.14 ± 0.09	0.06 ± 0.11	1.9 ± 0.4	—

TABLE 4-139
COPC CONCENTRATIONS IN IA08 NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A08-B3-SD-003	0.6 ± 0.2	0.36 ± 0.09	0.0 ± 0.4	0.29 ± 0.13	0.7 ± 0.2	0.59 ± 0.19	0.53 ± 0.18	0.29 ± 0.13	—	20 ± 3	1.1 ± 0.3	0.8 ± 0.3	24 ± 3	—
A08-B3-SD-004	0.50 ± 0.19	0.08 ± 0.10	0.4 ± 0.4	0.50 ± 0.17	0.9 ± 0.2	0.52 ± 0.16	0.8 ± 0.2	0.50 ± 0.17	—	30 ± 4	1.3 ± 0.3	0.9 ± 0.3	33 ± 4	—
A08-B3-SD-005	0.25 ± 0.14	0.06 ± 0.10	0.2 ± 0.3	0.13 ± 0.19	0.25 ± 0.12	0.46 ± 0.15	0.20 ± 0.10	0.13 ± 0.19	—	19 ± 2	1.2 ± 0.3	0.8 ± 0.3	20 ± 3	—
A08-B3-SD-006	0.21 ± 0.09	0.15 ± 0.08	0.13 ± 0.15	0.23 ± 0.12	0.29 ± 0.13	0.28 ± 0.12	0.17 ± 0.09	0.23 ± 0.12	—	18 ± 2	1.0 ± 0.3	0.6 ± 0.2	19 ± 3	—
A08-B3-SD-007	0.25 ± 0.13	0.15 ± 0.11	0.1 ± 0.2	0.17 ± 0.17	0.20 ± 0.11	0.33 ± 0.14	0.14 ± 0.09	0.17 ± 0.17	—	5.4 ± 0.8	0.35 ± 0.14	0.3 ± 0.3	6.6 ± 0.9	—
A08-B3-SD-008	0.25 ± 0.09	0.16 ± 0.10	0.39 ± 0.18	0.13 ± 0.14	0.19 ± 0.12	0.46 ± 0.15	0.18 ± 0.09	0.13 ± 0.14	—	278 ± 26	14 ± 3	5.6 ± 0.7	289 ± 27	—
A08-B3-SD-009	0.52 ± 0.13	0.40 ± 0.08	0.3 ± 0.3	0.28 ± 0.09	0.59 ± 0.12	0.62 ± 0.13	0.51 ± 0.11	0.28 ± 0.09	—	9.9 ± 1.0	0.57 ± 0.13	0.38 ± 0.18	10.3 ± 1.0	—
A08-B3-SD-010	1.9 ± 0.4	2.1 ± 0.5	0.7 ± 0.4	0.7 ± 0.6	0.67 ± 0.20	2.4 ± 0.5	0.59 ± 0.18	0.7 ± 0.6	—	10.2 ± 1.4	0.53 ± 0.17	0.8 ± 0.7	10.5 ± 1.4	—
A08-B3-SD-011	0.56 ± 0.13	0.31 ± 0.09	0.7 ± 0.3	0.36 ± 0.13	0.35 ± 0.15	0.23 ± 0.12	0.25 ± 0.12	0.36 ± 0.13	—	3.5 ± 0.6	0.12 ± 0.08	0.24 ± 0.16	3.5 ± 0.6	—
A08-B3-SD-012	0.20 ± 0.09	0.09 ± 0.07	0.4 ± 0.3	0.06 ± 0.11	0.17 ± 0.07	0.15 ± 0.06	0.10 ± 0.05	0.06 ± 0.11	—	8.1 ± 0.8	0.40 ± 0.11	0.44 ± 0.16	7.9 ± 0.8	—
A08-B3-SD-013	2.8 ± 0.5	1.6 ± 0.2	2.0 ± 0.5	2.6 ± 0.4	1.8 ± 0.4	1.1 ± 0.3	1.7 ± 0.4	2.6 ± 0.4	—	3.6 ± 0.6	0.17 ± 0.10	0.0 ± 0.9	4.0 ± 0.6	—
A08-B3-SD-014	2.6 ± 0.5	2.3 ± 0.3	-1.3 ± 1.2	1.5 ± 0.4	2.2 ± 0.4	2.1 ± 0.4	2.2 ± 0.4	1.5 ± 0.4	—	5.6 ± 0.8	0.25 ± 0.12	0.4 ± 0.4	6.1 ± 0.9	—
A08-B3-SD-015	2.6 ± 0.5	2.0 ± 0.3	1.7 ± 0.6	3.0 ± 0.4	1.8 ± 0.4	1.8 ± 0.4	2.0 ± 0.4	3.0 ± 0.4	—	8.6 ± 1.2	0.54 ± 0.18	0.4 ± 0.4	9.0 ± 1.2	—
A08-B3-SW-001	0.02 ± 0.01	0.05 ± 0.08	0.02 ± 0.04	0.05 ± 0.14	—	—	—	0.05 ± 0.14	—	—	—	0.0 ± 0.2	—	—
A08-B6-SD-001	0.68 ± 0.14	0.41 ± 0.13	1.3 ± 0.3	1.7 ± 0.3	2.1 ± 0.3	0.72 ± 0.15	2.0 ± 0.3	1.7 ± 0.3	—	49 ± 5	2.6 ± 0.9	3.0 ± 0.5	51 ± 5	—
A08-B6-SD-002	0.55 ± 0.10	0.21 ± 0.07	0.42 ± 0.16	0.31 ± 0.11	1.1 ± 0.3	0.67 ± 0.20	0.9 ± 0.2	0.31 ± 0.11	—	42 ± 7	2.2 ± 1.1	0.63 ± 0.18	42 ± 6	—
A08-B8-SD-001	0.71 ± 0.14	0.14 ± 0.11	1.1 ± 0.3	1.43 ± 0.19	1.8 ± 0.4	0.64 ± 0.19	1.7 ± 0.4	1.43 ± 0.19	—	92 ± 10	4.2 ± 1.4	5.1 ± 0.6	92 ± 10	—
A08-B8-SD-002	0.57 ± 0.18	0.1 ± 0.2	1.1 ± 0.3	1.5 ± 0.4	2.6 ± 0.5	1.1 ± 0.3	2.6 ± 0.5	1.5 ± 0.4	—	199 ± 29	11 ± 5	11.4 ± 1.8	224 ± 32	—

TABLE 4-139
COPC CONCENTRATIONS IN IA08 NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] "-700-" series sample IDs are "detritus" samples.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-140
SOR FOR IA08 NON-NATIVE SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A08-A01-SD-001R	0.85 ± 0.07
A08-A01-SD-002	0
A08-A01-SD-003	0
A08-A01-SD-004	1.45 ± 0.18
A08-A01-SD-005	0
A08-A01-SD-006	0
A08-A01-SD-007	2.6 ± 0.3
A08-A01-SD-008	2.9 ± 0.53
A08-A01-SD-009	0.22 ± 0.04
A08-A01-SD-010	0.86 ± 0.10
A08-A01-SD-011	5.9 ± 0.6
A08-A01-SD-012	0.76 ± 0.09
A08-A01-SD-013	0.4 ± 0.4
A08-B04&B09-SD-001	0.95 ± 0.08
A08-B04&B09-SD-002	0.80 ± 0.07
A08-B04&B09-SD-003	2.9 ± 0.3
A08-B04&B09-SD-004	0.53 ± 0.07
A08-B04&B09-SD-005	2.3 ± 0.2
A08-B1-SD-001	1.07 ± 0.11
A08-B1-SD-002	0.38 ± 0.06
A08-B1-SD-003	7.7 ± 0.9
A08-B1-SD-004	11.1 ± 0.8
A08-B1-SD-005	3.6 ± 0.3
A08-B1-SD-006	1.83 ± 0.18
A08-B1-SL-001	0
A08-B24-SD-001	3.3 ± 0.3
A08-B24-SD-002	2.9 ± 0.3
A08-B24-SD-003	2.4 ± 0.2
A08-B24-SD-004	0.37 ± 0.05
A08-B24-SD-005	0
A08-B24-SD-006	3.1 ± 1.0
A08-B24-SD-007	4.5 ± 0.5
A08-B2-SD-001	1.2 ± 0.5
A08-B2-SD-002	0.73 ± 0.09
A08-B2-SD-003	0.73 ± 0.09
A08-B3-SD-002	0
A08-B3-SD-003	3.3 ± 0.3
A08-B3-SD-004	4.7 ± 0.5
A08-B3-SD-005	2.9 ± 0.3
A08-B3-SD-006	2.8 ± 0.3
A08-B3-SD-007	0.78 ± 0.09
A08-B3-SD-008	44 ± 3
A08-B3-SD-009	1.39 ± 0.10
A08-B3-SD-010	2.3 ± 0.3
A08-B3-SD-011	0.42 ± 0.06
A08-B3-SD-012	1.08 ± 0.08
A08-B3-SD-013	2.4 ±0.7
A08-B3-SD-014	4.2 ± 0.8
A08-B3-SD-015	4.1 ± 0.8
A08-B6-SD-001	10.0 ± 0.8
A08-B6-SD-002	2.4 ± 0.2
A08-B8-SD-001	15.9 ± 1.3
A08-B8-SD-002	36 ± 3

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha spectroscopy laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-141
COPC CONCENTRATIONS IN IA08 NON-NATIVE SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)[b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A08-A01-SW-001	0.01 ± 0.07	0.5 ± 0.5	0.20 ± 0.09	0.03 ± 0.04	-0.01 ± 0.03	0.15 ± 0.12	0.05 ± 0.09	0.09 ± 0.10
A08-A01-SW-004	0.14 ± 0.11	0.4 ± 0.5	0.15 ± 0.10	0.12 ± 0.08	0.06 ± 0.07	0.5 ± 0.2	0.05 ± 0.09	0.29 ± 0.17
A08-A01-SW-005	0.06 ± 0.09	0.3 ± 0.4	0.12 ± 0.09	0.12 ± 0.06	0.03 ± 0.03	0.03 ± 0.09	0.02 ± 0.06	0.04 ± 0.08
A08-A01-SW-006	0.14 ± 0.09	0.4 ± 0.3	0.13 ± 0.07	0.05 ± 0.03	0.01 ± 0.03	2.7 ± 0.4	0.15 ± 0.10	2.5 ± 0.4
A08-A01-SW-007	0.25 ± 0.15	-0.4 ± 0.6	0.12 ± 0.07	0.19 ± 0.09	-0.01 ± 0.04	33 ± 4	1.6 ± 0.5	33 ± 4
A08-A01-SW-011	0.09 ± 0.11	0.5 ± 0.5	0.05 ± 0.07	0.09 ± 0.05	-0.01 ± 0.03	16 ± 2	0.9 ± 0.3	19 ± 3
A08-A01-SW-012	0.09 ± 0.12	0.4 ± 0.5	0.18 ± 0.09	0.16 ± 0.07	0.03 ± 0.04	0.6 ± 0.2	0.05 ± 0.09	0.5 ± 0.2
A08-B04&B09-SW-001	0.17 ± 0.13	0.3 ± 0.6	0.04 ± 0.06	0.06 ± 0.06	0.02 ± 0.03	0.6 ± 0.2	0.10 ± 0.11	0.43 ± 0.19
A08-B04&B09-SW-002	0.12 ± 0.12	0.6 ± 0.5	0.10 ± 0.06	0.09 ± 0.05	0.05 ± 0.04	2.5 ± 0.5	0.10 ± 0.11	2.7 ± 0.6
A08-B04&B09-SW-003	0.09 ± 0.11	0.2 ± 0.4	0.07 ± 0.08	0.30 ± 0.12	-0.02 ± 0.05	4.8 ± 0.9	0.23 ± 0.16	8.9 ± 1.4
A08-B04&B09-SW-004	0.04 ± 0.14	-0.3 ± 0.9	0.11 ± 0.07	0.05 ± 0.06	-0.01 ± 0.03	0.4 ± 0.2	0.02 ± 0.06	0.6 ± 0.2
A08-B04&B09-SW-005	-0.04 ± 0.09	0.6 ± 0.5	0.09 ± 0.06	0.07 ± 0.05	-0.02 ± 0.04	1.7 ± 0.4	0.12 ± 0.12	1.4 ± 0.4
A08-B1-SW-001	0.09 ± 0.13	0.0 ± 0.3	0.4 ± 0.3	0.4 ± 0.2	-0.01 ± 0.08	11.6 ± 1.8	0.31 ± 0.20	12.4 ± 1.9
A08-B1-SW-002	0.06 ± 0.11	0.3 ± 0.3	0.2 ± 0.2	0.21 ± 0.18	0.02 ± 0.09	11.5 ± 1.7	0.8 ± 0.3	12.6 ± 1.9
A08-B1-SW-003	0.12 ± 0.14	0.6 ± 0.4	0.11 ± 0.18	0.10 ± 0.14	0.02 ± 0.10	16 ± 2	0.8 ± 0.3	18 ± 3
A08-B1-SW-004	0.08 ± 0.10	0.0 ± 0.2	0.4 ± 0.3	0.18 ± 0.16	0.03 ± 0.09	12.7 ± 2.0	0.6 ± 0.3	13.0 ± 2.0
A08-B1-SW-005	0.07 ± 0.10	0.3 ± 0.4	0.04 ± 0.17	0.18 ± 0.18	0.02 ± 0.10	27 ± 4	1.4 ± 0.4	28 ± 4
A08-B1-SW-006	0.00 ± 0.09	0.3 ± 0.3	0.09 ± 0.12	0.7 ± 0.3	0.06 ± 0.10	28 ± 4	1.0 ± 0.4	31 ± 4
A08-B2-SW-001	0.01 ± 0.08	0.4 ± 0.5	0.13 ± 0.06	0.26 ± 0.08	—	4.2 ± 0.8	0.22 ± 0.15	4.7 ± 0.8
A08-B2-SW-003	0.44 ± 0.19	0.5 ± 0.7	1.2 ± 0.3	0.7 ± 0.2	0.61 ± 0.19	105 ± 14	4.5 ± 1.0	105 ± 14
A08-B3-SW-003	0.03 ± 0.13	0.2 ± 0.3	0.03 ± 0.10	0.16 ± 0.15	0.02 ± 0.07	6.6 ± 1.1	0.29 ± 0.18	7.5 ± 1.2
A08-B3-SW-004	0.17 ± 0.15	0.0 ± 0.3	0.05 ± 0.12	0.09 ± 0.14	-0.02 ± 0.09	6.1 ± 1.0	0.26 ± 0.17	6.2 ± 1.1
A08-B3-SW-005	0.02 ± 0.11	0.3 ± 0.4	0.00 ± 0.14	0.13 ± 0.15	0.07 ± 0.12	13.5 ± 2.0	0.5 ± 0.2	13.0 ± 1.9
A08-B3-SW-006	0.17 ± 0.12	0.6 ± 0.3	0.01 ± 0.08	0.43 ± 0.20	0.01 ± 0.06	18.7 ± 1.8	0.9 ± 0.2	19.6 ± 1.9
A08-B3-SW-007	0.03 ± 0.17	0.0 ± 0.3	0.04 ± 0.14	0.3 ± 0.3	0.05 ± 0.13	0.7 ± 0.3	0.07 ± 0.11	0.6 ± 0.3
A08-B3-SW-008	0.14 ± 0.15	0.4 ± 0.4	0.04 ± 0.11	0.06 ± 0.10	-0.01 ± 0.08	1.9 ± 0.5	0.05 ± 0.09	2.0 ± 0.5
A08-B3-SW-009	0.07 ± 0.09	0.07 ± 0.19	0.0 ± 0.2	0.04 ± 0.12	0.12 ± 0.15	2.8 ± 0.6	0.14 ± 0.14	3.2 ± 0.7
A08-B3-SW-011	0.09 ± 0.15	0.2 ± 0.5	0.11 ± 0.14	0.28 ± 0.19	-0.03 ± 0.07	2.2 ± 0.5	0.21 ± 0.16	2.9 ± 0.6
A08-B3-SW-012	0.09 ± 0.11	-0.9 ± 0.6	0.1 ± 0.2	0.06 ± 0.11	-0.01 ± 0.08	3.1 ± 0.6	0.07 ± 0.09	2.8 ± 0.6
A08-B3-SW-013	0.27 ± 0.13	0.8 ± 0.5	0.18 ± 0.14	0.18 ± 0.13	0.05 ± 0.08	24 ± 3	1.3 ± 0.4	26 ± 4

TABLE 4-141
COPC CONCENTRATIONS IN IA08 NON-NATIVE SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)[b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A08-B3-SW-014	0.06 ± 0.12	0.4 ± 0.3	0.13 ± 0.15	0.10 ± 0.11	0.03 ± 0.07	21 ± 3	1.0 ± 0.4	25 ± 3
A08-B3-SW-015	0.22 ± 0.17	0.5 ± 0.3	0.12 ± 0.14	0.32 ± 0.18	0.10 ± 0.11	30 ± 4	1.8 ± 0.5	33 ± 4
A08-B8-SW-001	0.09 ± 0.12	0.7 ± 0.4	0.10 ± 0.15	0.17 ± 0.15	-0.01 ± 0.06	12.9 ± 1.9	0.5 ± 0.2	13.2 ± 1.9
A08-B8-SW-002	0.10 ± 0.12	0.3 ± 0.3	0.07 ± 0.13	0.00 ± 0.07	-0.01 ± 0.06	11.1 ± 1.6	0.6 ± 0.3	11.1 ± 1.6

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-142
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS
IN IA08 NON-NATIVE SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration[b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A08-A01-SW-001	0.5 ± 0.5	0.3 ± 0.3
A08-A01-SW-004	0.5 ± 0.5	0.9 ± 0.5
A08-A01-SW-005	0.3 ± 0.4	0.1 ± 0.3
A08-A01-SW-006	0.5 ± 0.3	7.6 ± 1.1
A08-A01-SW-007	-0.2 ± 0.6	98 ± 13
A08-A01-SW-011	0.5 ± 0.5	56 ± 8
A08-A01-SW-012	0.5 ± 0.5	1.5 ± 0.6
A08-B04&B09-SW-001	0.4 ± 0.6	1.3 ± 0.6
A08-B04&B09-SW-002	0.7 ± 0.5	8.1 ± 1.7
A08-B04&B09-SW-003	0.3 ± 0.4	27 ± 4
A08-B04&B09-SW-004	-0.3 ± 0.9	1.7 ± 0.7
A08-B04&B09-SW-005	0.6 ± 0.5	4.3 ± 1.1
A08-B1-SW-001	0.1 ± 0.3	37 ± 6
A08-B1-SW-002	0.4 ± 0.3	38 ± 6
A08-B1-SW-003	0.7 ± 0.4	55 ± 8
A08-B1-SW-004	0.1 ± 0.2	39 ± 6
A08-B1-SW-005	0.3 ± 0.4	85 ± 11
A08-B1-SW-006	0.3 ± 0.4	91 ± 12
A08-B2-SW-001	0.4 ± 0.5	14 ± 2
A08-B2-SW-003	1.0 ± 0.7	315 ± 42
A08-B3-SW-003	0.2 ± 0.3	22 ± 4
A08-B3-SW-004	0.1 ± 0.3	19 ± 3
A08-B3-SW-005	0.3 ± 0.4	39 ± 6
A08-B3-SW-006	0.7 ± 0.3	59 ± 6
A08-B3-SW-007	0.0 ± 0.4	1.9 ± 0.7
A08-B3-SW-008	0.5 ± 0.4	6.0 ± 1.5
A08-B3-SW-009	0.1 ± 0.2	9.6 ± 2.0
A08-B3-SW-011	0.3 ± 0.5	8.7 ± 1.8
A08-B3-SW-012	-0.8 ± 0.6	8.2 ± 1.7
A08-B3-SW-013	1.1 ± 0.6	78 ± 10
A08-B3-SW-014	0.4 ± 0.3	74 ± 10
A08-B3-SW-015	0.7 ± 0.4	98 ± 13
A08-B8-SW-001	0.8 ± 0.4	40 ± 6
A08-B8-SW-002	0.4 ± 0.3	33 ± 5

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-143
COPC CONCENTRATIONS IN IA09 SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/L)[b]							
	^{226}Ra	^{228}Ra	^{228}Th	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U
A09-SW-001	0.13 ± 0.11	0.4 ± 0.5	0.4 ± 0.3	0.4 ± 0.3	-0.02 ± 0.09	0.14 ± 0.14	—	0.13 ± 0.14
A09-SW-002	0.07 ± 0.13	-0.2 ± 0.5	0.20 ± 0.17	0.13 ± 0.13	0.02 ± 0.07	0.22 ± 0.16	-0.01 ± 0.06	0.21 ± 0.14
A09-SW-003	0.15 ± 0.13	1.1 ± 0.6	0.19 ± 0.17	0.4 ± 0.2	-0.02 ± 0.08	0.02 ± 0.06	-0.01 ± 0.07	0.17 ± 0.13
A09-SW-004	0.17 ± 0.14	0.7 ± 0.6	0.23 ± 0.19	0.13 ± 0.13	0.03 ± 0.08	0.24 ± 0.15	-0.01 ± 0.05	0.25 ± 0.15
A09-SW-005	0.07 ± 0.12	0.8 ± 0.6	0.25 ± 0.18	0.21 ± 0.16	0.07 ± 0.10	0.16 ± 0.13	-0.01 ± 0.06	0.09 ± 0.09
A09-SW-006	0.09 ± 0.15	0.3 ± 0.5	0.14 ± 0.13	0.10 ± 0.11	-0.01 ± 0.05	0.24 ± 0.18	0.00 ± 0.08	0.15 ± 0.14
A09-SW-007	0.10 ± 0.13	0.5 ± 0.6	0.27 ± 0.18	0.09 ± 0.11	-0.01 ± 0.05	0.16 ± 0.14	—	0.17 ± 0.13
A09-SW-008	0.12 ± 0.09	0.5 ± 0.3	0.26 ± 0.12	0.16 ± 0.09	0.03 ± 0.05	0.16 ± 0.09	0.04 ± 0.06	0.14 ± 0.09
A09-SW-009	0.07 ± 0.11	0.4 ± 0.5	0.12 ± 0.12	0.10 ± 0.13	0.01 ± 0.07	0.17 ± 0.14	—	0.13 ± 0.11
A09-SW-010	0.07 ± 0.14	0.3 ± 0.4	0.3 ± 0.2	0.18 ± 0.16	0.05 ± 0.08	0.24 ± 0.15	—	0.09 ± 0.10
A09-SW-011	0.14 ± 0.16	0.4 ± 0.5	0.07 ± 0.11	0.19 ± 0.14	-0.01 ± 0.06	0.09 ± 0.11	0.02 ± 0.07	0.10 ± 0.11
A09-SW-012	0.20 ± 0.17	0.3 ± 0.5	0.17 ± 0.17	0.16 ± 0.17	-0.01 ± 0.07	0.18 ± 0.14	0.06 ± 0.10	0.11 ± 0.11

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.

[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.

TABLE 4-144
COMBINED RADIUM CONCENTRATIONS AND TOTAL URANIUM CONCENTRATIONS IN IA09 SURFACE WATER SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration[b]	
	Combined Ra (pCi/L)[c]	U (µg/L)[d]
A09-SW-001	0.5 ± 0.5	0.4 ± 0.4
A09-SW-002	-0.1 ± 0.5	0.6 ± 0.4
A09-SW-003	1.2 ± 0.6	0.5 ± 0.4
A09-SW-004	0.9 ± 0.6	0.7 ± 0.4
A09-SW-005	0.8 ± 0.6	0.3 ± 0.3
A09-SW-006	0.3 ± 0.5	0.4 ± 0.4
A09-SW-007	0.6 ± 0.6	0.5 ± 0.4
A09-SW-008	0.6 ± 0.3	0.4 ± 0.3
A09-SW-009	0.5 ± 0.5	0.4 ± 0.3
A09-SW-010	0.4 ± 0.5	0.3 ± 0.3
A09-SW-011	0.5 ± 0.5	0.3 ± 0.3
A09-SW-012	0.5 ± 0.6	0.4 ± 0.3

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Uranium and thorium isotopes determined by alpha spectroscopy; radium isotopes determined by gas flow proportional counting.
[c] The EPA drinking water MCL for combined radium is 5 pCi/L (40 CFR 141.66).
[d] The EPA drinking water MCL for uranium is 30 µg/L (40 CFR 141.66). Activity-to-mass conversion calculations used uranium isotope specific activities in Table 3-30.

TABLE 4-145
COPC CONCENTRATIONS IN IA09 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Concentration (pCi/g)[b]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A09-SD-001	1.1 ± 0.3	0.9 ± 0.3	0.6 ± 0.4	0.7 ± 0.3	0.69 ± 0.20	0.67 ± 0.20	0.55 ± 0.18	0.7 ± 0.3	—	0.59 ± 0.17	0.02 ± 0.04	0 ± 14	0.58 ± 0.17	—
A09-SD-002	—	0.9 ± 0.3	—	0.5 ± 0.3	0.54 ± 0.17	0.9 ± 0.2	0.61 ± 0.18	0.5 ± 0.3	—	0.61 ± 0.17	0.02 ± 0.04	0.1 ± 0.4	0.68 ± 0.18	—
A09-SD-003	0.9 ± 0.2	0.33 ± 0.15	0.8 ± 0.4	0.5 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	0.77 ± 0.20	0.5 ± 0.2	—	0.60 ± 0.17	0.09 ± 0.07	0 ± 2	0.74 ± 0.19	—
A09-SD-004	—	0.65 ± 0.20	—	0.6 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	0.7 ± 0.2	0.6 ± 0.2	—	0.72 ± 0.19	0.05 ± 0.06	0.2 ± 0.4	0.56 ± 0.16	—
A09-SD-005	1.0 ± 0.2	0.5 ± 0.2	0.7 ± 0.4	0.7 ± 0.3	0.8 ± 0.2	0.9 ± 0.2	0.68 ± 0.20	0.7 ± 0.3	—	0.65 ± 0.18	0.04 ± 0.05	0.1 ± 0.3	0.54 ± 0.16	—
A09-SD-006	—	0.9 ± 0.2	—	0.7 ± 0.3	0.63 ± 0.19	0.8 ± 0.2	0.63 ± 0.18	0.7 ± 0.3	—	0.52 ± 0.16	—	0 ± 3	0.64 ± 0.18	—
A09-SD-007	1.0 ± 0.3	0.7 ± 0.2	0.7 ± 0.5	0.5 ± 0.3	0.65 ± 0.19	1.0 ± 0.3	0.69 ± 0.19	0.5 ± 0.3	—	0.65 ± 0.18	0.02 ± 0.04	0.2 ± 0.3	0.47 ± 0.15	—
A09-SD-008	0.98 ± 0.17	1.11 ± 0.19	0.9 ± 0.3	0.50 ± 0.18	0.74 ± 0.20	0.60 ± 0.18	0.65 ± 0.19	0.50 ± 0.18	—	0.8 ± 0.2	0.08 ± 0.07	0.1 ± 0.2	0.58 ± 0.18	—
A09-SD-009	—	1.2 ± 0.3	—	0.8 ± 0.3	1.1 ± 0.3	1.0 ± 0.3	1.1 ± 0.3	0.8 ± 0.3	—	0.9 ± 0.2	0.06 ± 0.06	0.1 ± 0.3	0.77 ± 0.20	—
A09-SD-010	—	0.9 ± 0.3	—	0.5 ± 0.3	0.8 ± 0.2	0.7 ± 0.2	0.7 ± 0.2	0.5 ± 0.3	—	0.76 ± 0.20	0.03 ± 0.04	0.1 ± 0.3	0.73 ± 0.19	—
A09-SD-011	1.00 ± 0.18	0.78 ± 0.14	0.6 ± 0.4	0.67 ± 0.16	0.7 ± 0.2	0.9 ± 0.2	0.7 ± 0.2	0.67 ± 0.16	—	0.67 ± 0.19	0.07 ± 0.06	0.14 ± 0.19	0.54 ± 0.16	—
A09-SD-012	—	1.1 ± 0.2	—	0.7 ± 0.3	1.0 ± 0.4	0.8 ± 0.3	0.8 ± 0.3	0.7 ± 0.3	—	0.8 ± 0.3	0.05 ± 0.08	-0.1 ± 1.0	0.7 ± 0.3	—

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-146
SOR FOR IA09 SEDIMENT SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a]	Sum of Ratios [a b c]
A09-SD-001	0
A09-SD-002	0
A09-SD-003	0
A09-SD-004	0
A09-SD-005	0
A09-SD-006	0
A09-SD-007	0
A09-SD-008	0
A09-SD-009	0.5 ± 0.5
A09-SD-010	0
A09-SD-011	0
A09-SD-012	0

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. Only alpha spectroscopy laboratory data are available to calculate SORs for sediments.
[b] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[c] Refer to Section 4.1.2.1 for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.

TABLE 4-147
COPC CONCENTRATIONS IN IA10 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A10SL-302-01	—	0.40 ± 0.11	—	0.17 ± 0.16	—	—	—	0.17 ± 0.16	0.22 ± 0.15	0.7 ± 0.8	—	0.07 ± 0.16	—	0.7 ± 0.8
A10SL-303-01	0.65 ± 0.19	—	0.5 ± 0.3	—	0.55 ± 0.17	0.47 ± 0.16	0.61 ± 0.18	—	0.38 ± 0.20	1.5 ± 0.3	0.11 ± 0.07	—	1.6 ± 0.3	3.8 ± 0.9

Notes:
[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-148
SOR FOR IA10 SURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
A10SL-302-01	—	0
A10SL-303-01	0	0.47 ± 0.14

[a] GREEN ⇒ [(SOR + 2σ) < 1]; BLUE ⇒ [SOR < 1; (SOR + 2σ) > 1]; YELLOW ⇒ [SOR > 1; (SOR – 2σ) < 1]. RED ⇒ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 ⇒ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

TABLE 4-149
COPC CONCENTRATIONS IN IA10 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A10SL-001-01	1.3 ± 0.3	—	1.2 ± 0.3	—	1.0 ± 0.2	0.9 ± 0.2	0.83 ± 0.20	—	0.8 ± 0.2	0.82 ± 0.19	0.02 ± 0.03	—	1.0 ± 0.2	1.8 ± 0.6
A10SL-002-01	—	—	—	—	—	—	—	—	0.27 ± 0.19	—	—	—	—	-0.02 ± 0.03
A10SL-003-01	1.1 ± 0.2	—	1.0 ± 0.3	—	1.3 ± 0.3	1.2 ± 0.3	0.9 ± 0.2	—	1.1 ± 0.2	0.68 ± 0.17	0.03 ± 0.04	—	0.74 ± 0.18	1.5 ± 0.6
A10SL-003-02	—	—	—	—	—	—	—	—	0.49 ± 0.13	—	—	—	—	0.7 ± 0.4
A10SL-004-01	—	—	—	—	0.73 ± 0.20	0.73 ± 0.20	1.0 ± 0.2	—	0.69 ± 0.18	0.62 ± 0.17	0.05 ± 0.05	—	0.61 ± 0.16	1.5 ± 0.8
A10SL-004-02	—	—	—	—	0.9 ± 0.2	1.1 ± 0.3	1.1 ± 0.3	—	0.8 ± 0.2	0.53 ± 0.15	0.03 ± 0.05	—	0.88 ± 0.20	1.6 ± 0.6
A10SL-005-01	—	—	—	—	0.7 ± 0.2	1.4 ± 0.3	0.47 ± 0.17	—	0.29 ± 0.15	1.2 ± 0.2	0.04 ± 0.04	—	1.4 ± 0.3	2.0 ± 0.7
A10SL-006-01	1.4 ± 0.3	—	0.6 ± 0.2	—	0.9 ± 0.2	1.2 ± 0.3	1.0 ± 0.2	—	0.72 ± 0.19	0.71 ± 0.18	0.02 ± 0.04	—	0.89 ± 0.20	1.5 ± 0.6
A10SL-006-06	—	—	—	—	—	—	—	—	0.67 ± 0.18	—	—	—	—	0.8 ± 0.7
A10SL-007-01	—	—	—	—	0.9 ± 0.2	1.6 ± 0.3	0.7 ± 0.2	—	0.86 ± 0.18	1.0 ± 0.2	0.04 ± 0.05	—	1.0 ± 0.2	2.1 ± 0.7
A10SL-007-06	—	—	—	—	—	—	—	—	0.41 ± 0.20	—	—	—	—	1.1 ± 0.6
A10SL-008-01	—	—	—	—	0.9 ± 0.2	1.0 ± 0.2	0.9 ± 0.2	—	1.12 ± 0.17	1.3 ± 0.3	0.06 ± 0.06	—	1.6 ± 0.3	1.9 ± 0.5
A10SL-009-01	—	—	—	—	0.80 ± 0.19	0.57 ± 0.16	0.81 ± 0.20	—	0.79 ± 0.20	0.85 ± 0.20	0.07 ± 0.06	—	0.76 ± 0.19	1.1 ± 0.9
A10SL-009-02	1.1 ± 0.2	—	1.0 ± 0.3	—	0.9 ± 0.2	1.1 ± 0.3	1.1 ± 0.3	—	0.88 ± 0.19	0.69 ± 0.17	0.06 ± 0.06	—	0.84 ± 0.19	1.3 ± 0.6
A10SL-010-01	—	—	—	—	0.72 ± 0.20	1.2 ± 0.3	0.69 ± 0.19	—	0.55 ± 0.16	0.67 ± 0.17	0.07 ± 0.06	—	0.64 ± 0.17	2.0 ± 0.7
A10SL-010-02	0.9 ± 0.2	—	0.7 ± 0.3	—	0.9 ± 0.2	0.9 ± 0.2	0.62 ± 0.18	—	0.66 ± 0.16	0.65 ± 0.17	0.06 ± 0.06	—	0.85 ± 0.20	1.7 ± 0.6
A10SL-011-01	—	—	—	—	—	—	—	—	0.49 ± 0.14	—	—	—	—	0.5 ± 0.5
A10SL-011-02	1.1 ± 0.2	—	0.9 ± 0.3	—	0.40 ± 0.17	0.31 ± 0.15	0.28 ± 0.14	—	0.8 ± 0.2	0.73 ± 0.19	0.05 ± 0.05	—	0.64 ± 0.17	1.2 ± 0.6

TABLE 4-149
COPC CONCENTRATIONS IN IA10 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Concentration (pCi/g)[c]													
	^{226}Ra		^{228}Ra		^{228}Th	^{230}Th	^{232}Th			^{234}U	^{235}U		^{238}U	
	GFPC	Gamma	GFPC	Gamma	Alpha	Alpha	Alpha	Gamma	On-site	Alpha	Alpha	Gamma	Alpha	On-site
A10SL-012-01	—	—	—	—	0.88 ± 0.16	1.04 ± 0.17	0.70 ± 0.14	—	0.90 ± 0.18	0.73 ± 0.14	0.03 ± 0.03	—	0.76 ± 0.14	1.3 ± 0.6
A10SL-012-02	—	—	—	—	—	—	—	—	0.47 ± 0.14	—	—	—	—	0.7 ± 0.5
A10SL-013-01	1.1 ± 0.2	—	1.3 ± 0.3	—	1.5 ± 0.3	1.3 ± 0.3	1.2 ± 0.3	—	3.9 ± 0.4	1.9 ± 0.3	0.05 ± 0.06	—	2.0 ± 0.3	3.1 ± 1.2
A10SL-013-02	1.2 ± 0.3	—	1.7 ± 0.3	—	1.1 ± 0.3	1.2 ± 0.3	1.3 ± 0.3	—	3.9 ± 0.5	4.4 ± 0.6	0.15 ± 0.09	—	4.0 ± 0.5	5.2 ± 1.5
A10SL-301-01	0.9 ± 0.2	0.65 ± 0.17	0.4 ± 0.2	0.7 ± 0.2	0.9 ± 0.2	1.0 ± 0.2	0.81 ± 0.20	0.7 ± 0.2	0.8 ± 0.4	4.0 ± 0.5	0.23 ± 0.11	0.2 ± 0.4	4.3 ± 0.5	5.2 ± 1.2
A10SL-301-02	—	—	—	—	0.75 ± 0.19	0.79 ± 0.20	0.78 ± 0.20	—	0.55 ± 0.18	0.65 ± 0.18	0.03 ± 0.04	—	0.78 ± 0.20	1.4 ± 0.6
A10SL-301-13	—	—	—	—	—	—	—	—	0.08 ± 0.09	—	—	—	—	0.6 ± 0.5
A10SL-302-02	—	—	—	—	0.72 ± 0.20	0.9 ± 0.2	0.70 ± 0.19	—	0.79 ± 0.18	1.9 ± 0.3	0.08 ± 0.07	—	1.9 ± 0.3	2.3 ± 0.8
A10SL-302-13	—	—	—	—	0.9 ± 0.2	1.1 ± 0.3	0.9 ± 0.2	—	0.5 ± 0.2	1.6 ± 0.3	0.09 ± 0.07	—	1.9 ± 0.3	2.7 ± 0.9
A10SL-302-15	—	—	—	—	—	—	—	—	0.42 ± 0.15	—	—	—	—	1.1 ± 0.5
A10SL-303-02	0.92 ± 0.15	—	0.62 ± 0.19	—	0.68 ± 0.13	0.77 ± 0.14	0.62 ± 0.13	—	0.42 ± 0.19	2.4 ± 0.3	0.08 ± 0.05	—	2.4 ± 0.3	2.7 ± 0.8
A10SL-303-13	1.0 ± 0.2	—	0.6 ± 0.2	—	0.8 ± 0.2	1.0 ± 0.2	0.78 ± 0.20	—	0.6 ± 0.2	1.5 ± 0.3	0.09 ± 0.07	—	1.7 ± 0.3	2.9 ± 1.0
A10SL-303-18	—	—	—	—	0.59 ± 0.18	0.76 ± 0.20	0.49 ± 0.16	—	0.28 ± 0.14	0.70 ± 0.18	0.05 ± 0.05	—	0.84 ± 0.20	1.5 ± 0.5
A10SL-303-25	—	—	—	—	—	—	—	—	0.50 ± 0.16	—	—	—	—	0.9 ± 0.6

Notes:

[a] Laboratory duplicate and field duplicate results are combined with original sample results using weighted averaging.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] GFPC denotes Gas Flow Proportional Counting, Gamma denotes Gamma Spectroscopy, Alpha denotes Alpha Spectroscopy, Onsite denotes On Site Gamma Spectroscopy

TABLE 4-150
SOR FOR IA10 SUBSURFACE SOIL SAMPLES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Sample ID [a b]	Sum of Ratios [a c d]	
	Alpha [e]	Onsite Gamma [f]
A10SL-001-01	0	0.3 ± 0.4
A10SL-002-01	—	0
A10SL-003-01	0.3 ± 0.3	0.9 ± 0.4
A10SL-003-02	—	0
A10SL-004-01	0.1 ± 0.2	0
A10SL-004-02	0.4 ± 0.3	0.3 ± 0.4
A10SL-005-01	0.27 ± 0.17	0
A10SL-006-01	0.4 ± 0.3	0
A10SL-006-06	—	0
A10SL-007-01	0.41 ± 0.18	0.5 ± 0.4
A10SL-007-06	—	0
A10SL-008-01	0.1 ± 0.2	1.0 ± 0.4
A10SL-009-01	0	0.3 ± 0.4
A10SL-009-02	0.4 ± 0.3	0.5 ± 0.4
A10SL-010-01	0.20 ± 0.15	0
A10SL-010-02	0	0
A10SL-011-01	—	0
A10SL-011-02	0	0.3 ± 0.4
A10SL-012-01	0	0.6 ± 0.4
A10SL-012-02	—	0
A10SL-013-01	0.8 ± 0.3	7.0 ± 0.9
A10SL-013-02	1.2 ± 0.3	7.3 ± 0.9
A10SL-301-01	0.52 ± 0.06	1.1 ± 0.8
A10SL-301-02	0	0
A10SL-301-13	—	0
A10SL-302-02	0.10 ± 0.03	0.6 ± 0.4
A10SL-302-13	0.13 ± 0.15	0.29 ± 0.14
A10SL-302-15	—	0
A10SL-303-02	0.26 ± 0.03	0.30 ± 0.12
A10SL-303-13	0	0.32 ± 0.15
A10SL-303-18	0	0
A10SL-303-25	—	0

[a] GREEN $\Rightarrow$ [(SOR + 2σ) < 1]; BLUE $\Rightarrow$ [SOR < 1; (SOR + 2σ) > 1]; YELLOW $\Rightarrow$ [SOR > 1; (SOR – 2σ) < 1]. RED $\Rightarrow$ [(SOR – 2σ) > 1]. When the alpha and gamma SOR differ in assigned color, the SOR with the lesser uncertainty takes precedence for the purpose of assigning color to a Sample ID.
[b] Sample IDs ending in "-01" are at locations covered with materials such as concrete or asphalt.
[c] 0 $\Rightarrow$ all COPC terms are less than 0.1.
[d] Refer to Section 4.1.2.1 (Alpha) and Section 4.1.2.3 (Gamma) for explanation of method used to calculate sum of ratios (SOR). Screening levels used in the calculation are provided in Table 4-2.
[e] Alpha Spectroscopy
[f] Gamma Spectroscopy

Table 5-1
Groundwater Indicators of Redox Conditions
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Well	Dissolved Oxygen	Nitrate as N	Total Manganese	Dissolved Manganese	Uranium*	Total Molybdenum	Dissolved Molybdenum	Total Iron	Dissolved Iron	Sulfate	ORP	Alkalinity, Total (as CaCO3)
	mg/L	*mg/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*mg/L*	*mV*	*mg/L*
MW-605D	0.21	1.4	211	202	**191.73**	464	469	25.9 J	<15.4	92	87	350
MW-604D	1.07	1	7.8	6.6	**74.07**	101	108	<15.4	<15.4	59	174	250
MW-602D	5.37	0.62	8.3	3.2 J	**116.82**	404	434	29.5 J	<15.4	40	149	250
MW-4	0.42	0.55	141	58.4	**47.59**	292	309	<15.4	44.2 J	56	77	210
MW-16	0.00	0.24	511	289	19.19	677	719	1990	53.4 J	82	135	400
MW-601D	0.25	0.2	12.6	11	19.42	2.1 J	1.5 J	<15.4	<15.4	150	-201	300
Nitrate Reducing												
MW-2	0.00	<0.1	172	239	19.44	15.6	16.2	119 J	98.4 J	94	-42	290
MW-600D	0.28	<0.1	154	164	9.88	1.3 J	1.7 J	457	51.4 J	180	64	520
MW-603D	0.34	<0.1	131	87.3	2.56	101	94.6	1140	557	77	7	270
MW-607D	0.31	<0.1	751	445	0.09	1810	1540	1950	207	110	-94	710
MW-08	0.00	<0.1	214	216	0.07	5.2	4.9 J	393	390	180	-24	370

Notes:
*Uranium data from July/Aug 2007 sampling; converted to concentration from activity
and combined U-234, U-235/236, and U-238.
Other analytical data from March, 2008 sampling event
ORP - oxidation-reduction potential
CaCO3 - calcuim cabonate
mg/L - milligram/liter
ug/L - microgram/liter
Bold values are indicators of uranium exceedances.

Table 5-2
Soil Input Parameters for SESOIL Modeling
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Parameter	Value	Units	Source
Bulk density of soil	1.31	g/cm^3	Average dry bulk density for soil column as determined from onsite gamma spectroscopy samples
Effective porosity	0.20*	fraction	Based on SESOIL guidance for silty clay soil type due to characteristics of the model
Soil pore disconnected index	10*	NA	Based on SEVIEW guidance based on soil type; average for soil column
Vadose zone thickness	130	cm	Sitewide model; see Table 5-4
Intrinsic permeability	5.5×10^{-10}*	cm^2	Available data, geotechnical evaluation, and calibration to increase recharge; converted from hydraulic conductivity

Notes:

cm = centimeter

% = percent

g/cm3 = grams per cubic centimeters

NA = not applicable

* These values adjusted through calibration

Table 5-3
Chemical Input Parameters for SESOIL Modeling
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Parameter[a]	Value	Units	Source/Notes
Constituent: Uranium	na	na	
Water solubility	150	mg/L	derived from MINEQL (oxidized, elevated anions)
Air diffusion coefficient	0	cm^2/sec	not volatile
Henry's Law constant	0	m^3-atm/mol	not volatile
Molecular weight	238.03	g/mole	
Adsorption coefficient (Kd)	--	--	--
Native soil outside of contaminated area	1356	mL/g	laboratory tests of site material
Native soil underlying contaminated soil	25	mL/g	hydogeologist recommendations and calibration
Contaminated soil/fill	25	mL/g	laboratory tests of site material yielded 39 mL/g; value was adjusted during model calibration
Bedrock	0.22	mL/g	laboratory tests of site material
Water diffusion coefficient	1.10E-06	m^2/hr	Tokunaga and others, 2004.

Notes:

a. Remaining chemical properties set at zero.

Tokunaga and others, 2004, *Hexavalent Uranium Diffusion into Soils from Concentrated Acidic and Alkaline Solutions* in Environmental Science & Technology, vol. 38, no. 11, p. 3056 -3062. Value for neutral to alkaline soils.

cm2/sec = square centimeters per second

g/mole = grams per mole

m^2/hr = sqaure meters per hour

m^3-atm/mol = cubic meter atmospheres per mole

mL/g = milliliters per gram

µg/g = micrograms per gram

µg/mL = micrograms per milliliter

Table 5-4
Application Input Parameters for SESOIL Modeling
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Parameter[a]	Value	Units	Source
Application area Overall Site Model	6.70E+08	cm^2	IA04A area
Upper soil layer thicknesses	100	cm	Contaminated thickness divided into upper two soil layers
Lower soil layer thicknesses	30	cm	Remaining unsaturated soil thickness divided into lower two soil layers
Contaminant concentration(s)	Varies	ug/kg	Varied in modeling; see Table 5-12
Site latitude	43.159	degrees	from http://itouchmap.com/latlong.html and site address

Notes:
Climate data from SEVIEW database
For model, fill and native soil zones are divided into two layers, each 1/2 of thickness indicated above.
Area and layer thicknesses based on generalized model for Guterl Site

Table 5-5
MINEQL+ Model Input
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

SAMPLE_ID	units	G-MW-2-F	G-MW-602D-F	G-MW-605D-F
Barium	mg/L	108	18.7	48.6
Calcium	mg/L	126000	61400	77500
Chloride	mg/L	400	24	82
Alkalinity, Total (as $CaCO_3$)	mg/L	290	250	350
Iron	ug/L	98.4	<15.4	<15.4
Fluoride	ug/L	0.69	3.7	2.9
Potassium	mg/L	5420	2480	4680
Magnesium	mg/L	34900	33000	36900
Manganese	ug/L	239	3	202
Sodium	mg/L	169000	31000	98300
Nitrate as N	mg/L	0.1	0.62	1.4
Sulfate	mg/L	94	40	92
Uranium	ug/L	19.4	116.8	191.7
pH	std. unit	7.06	6.97	7.01
Dissolved Oxygen	mg/L	0.00	5.37	0.21
Temperature	^oC	6.63	14.7	10.2
Field ORP	mV	-42	149	87.0

SAMPLE_ID	units	G-MW-2-F	G-MW-602D-F	G-MW-605D-F
Barium	M	7.86E-07	1.36E-07	3.54E-07
Calcium	M	3.14E-03	1.53E-03	1.93E-03
Chloride	M	1.13E-02	6.77E-04	2.31E-03
CO3	M	1.17E-01	1.01E-01	1.41E-01
Iron	M	1.76E-06	2.76E-07	nd
Fluoride	M	3.63E-05	1.95E-04	1.53E-04
Potassium	M	1.39E-04	6.34E-05	1.20E-04
Magnesium	M	1.44E-03	1.36E-03	1.52E-03
Manganese	M	4.35E-06	5.82E-08	3.68E-06
Sodium	M	7.35E-03	1.35E-03	4.28E-03
NO_3-	M	nd	4.43E-05	1.00E-04
Sulfate	M	9.79E-04	4.16E-04	9.58E-04
UO_2^{2+}	M	9.26E-08	5.56E-07	9.13E-07
pH	std. unit	7.06	6.97	7.01
Dissolved Oxygen	mg/L	0.01	5.37	0.21
Temperature	^oC	6.63	14.7	10.2
pe	--	2.85	6.11	5.11

Notes:
Used 0.01 mg/L for dissolved oxygen of 0.00
Assumed conversion factor from field ORP to Standard Eh of +200 millivolts; converted to pe for use by MINEQL+
^oC = degrees Celsius
M = moles per liter (unit used by MINEQL+ model)
mg/L = milligrams per liter
nd = not detected
µg/L = micrograms per liter

Table 5-6
MINEQL+ Model Output
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Sample Location	Uranium Species	Uranium Modeled	Redox Conditions	Dissolved Uranium[c]	Dissolved Uranium[c]
	Modeled	*milligrams per liter*	*(input to model)*	*Percent of Uranium Modeled*	*milligrams per liter*
Most dissolved oxygen occurring with elevated uranium:					
MW-602D	$UO2^{2+}$ (U^{6+}) & U^{4+}	0.117[a]	DO fixed at 5.37 mg/L[b]	100%	0.117
MW-602D	$UO2^{2+}$ (U^{6+})	2.10E+03	not set	1.7%	36
MW-602D	$UO2^{2+}$ (U^{6+})	2.10E+02	not set	45.1%	95
Most anions occurring with elevated uranium:					
MW-605D	$UO2^{2+}$ (U^{6+})	0.192[a]	not set	100%	0.192
MW-605D	$UO2^{2+}$ (U^{6+})	2.10E+02	not set	68.3%	143
MW-605D	$UO2^{2+}$ (U^{6+})	1.47E+02	not set	100%	147
Reducing conditions with uranium present:					
MW-2	U^{4+}	2.10	pe fixed at 2.85[b]	0%	0
MW-2	U^{4+}	2.10E+02	pe fixed at 2.85[b]	0%	0

Notes:

[a] uranium concentration detected in groundwater sample at this location; more elevated concentrations modeled to determine maximum solubility

[b] Based on ORP measured in groundwater at the site and converting to pe according to the method shown in Table U-3.

[c] Model predicts remainder of uranium precipitates.

DO = dissolved oxygen

Note that wells MW-602D and MW-605D had the most elevated uranium concentrations in groundwater (July/August 2007 sampling).

Modeling assumed a system closed to the atmosphere and pH was fixed at field pH for all model runs.

Table 5-7
Comparison of Uranium-238 Activities in Filtered and Unfiltered Groundwater
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

	July/August 2007 Analytical Data	Relative Percent Differences*
Parameter	**Uranium 238 (pCi/L)**	**Uranium 238**
MW06-F	1.06	
MW06-U	1.29	20%
MW09-F	5.17	
MW09-U	4.99	-4%
MW1-F	1.3	
MW1-U	1.27	-2%
MW2-F	6.5	
MW2-U	7.2	10%
MW3-F	2.31	
MW3-U	1.8	-25%
MW4-F	15.9	
MW4-U	16.2	2%
MW51-F	1.05	
MW51-U	0.87	-19%
MW5-F	2.77	
MW5-U	2.61	-6%
MW13D-F	20.9	
MW13D-U	21	0%
MW15-F	0.082	
MW15-U	0.11	29%
MW607D-F	0.027	
MW607D-U	-0.01	**-435%**
MW21-F	1.32	
MW21-U	1.65	22%
MW22-F	21.8	
MW22-U	22.7	4%
MW601D-F	6.5	
MW601D-U	5.23	-22%
MW602D-F	39	
MW602D-U	37.5	-4%
MW603D-F	0.86	
MW603D-U	3.84	**127%**
MW71-F	1.63	
MW71-U	1.28	-24%
MW18-F	41.4	
MW18-U	43.2	4%
MW19-F	1.9	
MW19-U	2.18	14%
MW26-F	58.7	
MW26-U	65.6	11%
MW605D-F	64	
MW605D-U	63	-2%
MW24-F	0.26	
MW24-U	0.26	0%
MW604D-F	24.7	
MW604D-U	23.7	-4%
MW600D-F	3.3	
MW600D-U	0.69	**-131%**

Notes:
-U indicates unfiltered sample; -F indicates filtered sample
* negative values indicate filtered concentrations greater than unfiltered concentrations

Table 5-8
Input to HELP Model
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Category	Parameter	Value	Units	Note
Weather Data	Evapotranspiration data, precipitation data, temperature data and solar radiation	Weather data for Lockport 2 NE and site latitude (see note 3)	customary or metric	Data provided with SEVIEW database for Lockport 2 NE weather station
Evapotranspiration	Evaporative zone depth	20	cm	Based on model guidance for bare ground and for silt soil
Evapotranspiration	Maximum leaf area index	0.5	inches	Based on model guidance
Evapotranspiration	Growing season	May 6 to October 12	Julian dates	Based on model data for Buffalo, NY
Evapotranspiration	Wind speed	12.1	mph	Based on model data for Buffalo, NY
Evapotranspiration	Average quarterly relative humidity	76, 68, 72, 76	percent	Based on model data for Buffalo, NY
(Model Area) General	Landfill (modeled) area	16.6	acres	Approximate area of IA04A; does not affect infiltration rate in inches/year
(Model Area) General	Percent area where runoff is possible	65 (see note 4)	percent	Project data (e.g., site base map, topographic map, and IA boundaries)
Design Runoff	Runoff Curve Number Information	85.8	NA	Calculated by HELP based on site conditions and NRCS guidance (Input parameters: 1% slope of 600 meters with Silt Loam surface soil and poor standing of grass)
Layer Data	Layer Type	vertical percolation layer for the fill and native till soil	NA	Selection of type based on soil borings
Layer Data	Layer Thickness	See HELP results (Table 5.5.2-8)	NA	Soil Borings
Layer Data	Porosity	0.3	vol/vol	Based on soil boring information, geotechnical evaluation, and RESRAD modeling results
Layer Data	Field Capacity	0.15	vol/vol	Based on soil boring information, geotechnical evaluation, and RESRAD modeling results
Layer Data	Wilting Point	0.12	vol/vol	Based on soil boring information, geotechnical evaluation, and RESRAD modeling results
Layer Data	Effective Saturated Hydraulic Conductivity	1E-05	vol/vol	Based on soil boring information, geotechnical evaluation, and RESRAD modeling results
Model Setting	Output Frequency	Annual	NA	User defined - monthly or annual
Model Setting	Duration	100	years	User defined

Notes:
1. HELP model estimates the intial moisture storage based on steady state conditions.
2. Assumes there is no drainage layer and no geomembrane liner.
3. To match RESRAD modeling, an irrigation rate (0.20 m/yr) was added to the precipitation rate (0.94 m/yr) to obtain an overall precipitation rate of 1.14 m/yr.
4. Percent area where runoff is possible was adjusted from 80 percent to 65 percent to match RESRAD modeling which does not allow irrigation to run off.

cm = centimeter
IA = Investigative Area
mph = miles per hour
m/yr = meters per year
vol/vol = volume per volume

Table 5-9
Results from HELP Modeling
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

GENERALIZED SITE MODEL				
INPUT				OUTPUT
Thickness Layer 1 (cm)	Thickness Layer 2 (cm)	Initial Soil Water Content Layer 1	Initial Soil Water Content Layer 2	Percolation through Layer 2 result (inches/year)
100	30	0.20	0.12	14.46

Note:
1. Additional HELP model runs discussed in Appendix U.
cm = centimeter

Table 5-10
AT123D Input Parameters for Groundwater Modeling
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Parameter	Value	Units	Source
Bulk density of soil	2.61 X 10 ^{3}	kg/m^{3}	LaFarge quarry data
Hydraulic conductivity	1.76E-01	m/hr	Based on geomean of site data (1.54e3 m/yr)
Hydraulic gradient	0.007	m/m	Calculated from water level map
Effective porosity	0.03	fraction	Based on average site-specific information; geologist/hydrologist consulted
Aquifer depth	9	m	Fracture frequency decreases between 15 and 30 ft bgs
Longitudinal dispersivity	9.8	m	Based on formula: Longitudinal dispersivity = 0.83×([(Log10(L)]**2.414) (units of feet), assumed plume length (L) of 600 m.
Horizontal transverse dispersivity	0.98	m	Assumes transverse dispersivity is 10 percent of longitudinal dispersivity.
Vertical transverse dispersivity	0.98	m	Assumes transverse dispersivity is 10 percent of longitudinal dispersivity.

Notes:
Model assumes bedrock properties approximate a homogeneous porous medium.
hr = hours
kg = kilograms
m = meters

Table 5-11
Sensitivity of SESOIL Modeling Parameters
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

INPUT					OUTPUT				
Vadose Zone Thickness	**Intrinsic Permeability**	**Effective Porosity**	**Bulk Density**	**Soil Disconnect-edness Index**	**Evapotrans-piration**	**Ground-water Recharge**	**Soil Moisture**	**Time for Uranium in Vadose Zone Water to Reach Groundwater[b]**	**SESOIL File Name**
cm	*cm^2*	--	*g/cm3*	--	*inches/yr*	*inches/yr*	*percent*	*Years*	**--**
Unsaturated Zone Thickness = 3.9 ft									
120	1.00E-11	0.01	1.31	12.0	0.89	5.3	0.94 - 0.97	350	**BLDG2D**
120	1.00E-11	0.025	1.31	12.0	1.79	6.5	2.4 - 2.5	266	**BLDG2C**
120	1.00E-11	0.20	1.31	11.0	3.26	-0.07	13.0 - 16.7	821	**B2A1**
120	1.00E-11	0.20	1.31	12.0	1.73	0.06	12.4 - 15.0	1448	B2A2
120	1.00E-11	0.20	1.31	10.0	6.92	-2.99	14.4 - 18.0	808	**B2A3**
120	1.00E-11	0.25	1.31	12.0	2.13	0.09	16.0 - 19.5	1661	BLDG2B
120	1.00E-11	0.25	1.31	12.0	2.13	0.09	16.0 - 19.1	1661	BLG2B
120	1.00E-11	0.25	1.31	12.0	2.49	0.2	17.2 - 20.5	1503	BLG2A
120	1.50E-11	0.20	1.31	12.0	2.03	0.17	12.8 - 15.6	1171	B2A6
120	1.50E-11	0.20	1.31	10.0	7.03	-2.07	14.2 - 17.9	582	**B2A7**
120	2.00E-11	0.20	1.31	12.0	2.27	0.3	13.0 - 15.8	993	**B2A5**
Unsaturated Zone Thickness = 4.3 ft									
130	1.00E-10	0.20	1.31	5.0	30.39	-7.01	13.9 - 16.5	126	**SS01**
130	1.00E-10	0.25	1.31	5.0	30.39	-5.44	17.7 - 20.8	194	**SS03**
130	1.00E-10	0.30	1.31	5.0	30.39	-4.22	21.5 - 25.2	182	**SS04**
130	1.00E-10	0.35	1.31	5.0	30.39	-3.18	25.3 - 29.6	172	**SS05**
130	1.00E-10	0.25	1.31	6.0	30.39	-7.43	18.5 - 21.2	218	**SS06**
130	1.00E-10	0.25	1.31	7.0	30.39	-10.08	21.4	260	**SS07**
130	1.00E-10	0.25	1.31	8.0	30.39	-13.24	19.0 - 21.4	303	**SS08**
130	1.00E-10	0.25	1.31	9.0	19.49	-3.38	17.5 - 21.4	331	**SS09**
130	1.00E-10	0.30	1.31	9.0	22.73	-5.61	20.9 - 25.8	319	**SS10**
130	1.00E-10	0.35	1.31	9.0	25.64	-7.83	24.3 - 30.3	314	**SS11**
130	1.00E-10	0.40	1.31	9.0	28.18	-9.8	27.4 - 34.7	308	**SS12**
130	1.00E-10	0.45	1.31	9.0	29.87	-11.14	30.52 -	296	**SS13**
130	1.00E-10	0.20	1.31	4.0	30.39	-6.45	12.8 - 15.8	204	**SS14**
130	1.00E-10	0.20	1.31	5.0	30.39	-7.01	13.9 - 16.5	212	**SS02**
130	1.00E-10	0.20	1.31	7.0	30.39	-11.62	14.9 - 16.9	217	**SS15**
130	1.00E-10	0.20	1.31	9.0	15.92	-1.06	13.9 - 16.9	360	**SS16**
130	1.00E-10	0.25	1.31	10.0	9.77	3.99	16.7 - 21.2	136	**SS17**
130	1.00E-10	0.25	1.31	11.0	6.59	3.95	16.9 - 20.8	na	SS18

Table 5-11
Sensitivity of SESOIL Modeling Parameters
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

INPUT					OUTPUT				
Vadose Zone Thickness	**Intrinsic Permeability**	**Effective Porosity**	**Bulk Density**	**Soil Disconnect-edness Index**	**Evapotrans-piration**	**Ground-water Recharge**	**Soil Moisture**	**Time for Uranium in Vadose Zone Water to Reach Groundwater[b]**	**SESOIL File Name**
cm	*cm ^{2}*	--	*g/cm3*	--	*inches/yr*	*inches/yr*	*percent*	*Years*	**--**
130	1.00E-10	0.25	1.31	12.0	4.46	3.19	17.34 -	na	SS19
130	1.00E-10	0.25	1.31	9.0	19.49	-3.38	17.5 - 21.4	na	SS20
130	1.00E-10	0.20	1.31	10.0	8.52	3.99	13.3 - 16.8	na	SS21
130	1.00E-10	0.35	1.31	10.0	12.03	3.84	23.3 - 30.0	na	SS22
130	1.00E-10	0.20	1.31	10.0	8.52	3.99	13.3 - 16.8	346	**SS23**
130	1.00E-09	0.20	1.31	10.0	11.11	19.99	12.6 - 14.9	90	**SS24**
130	5.00E-10	0.20	1.31	10.0	10.57	14.3	12.9 - 15.5	na	SS25
130	8.00E-10	0.20	1.31	10.0	10.98	18.19	12.7 -	na	SS26
130	2.00E-10	0.20	1.31	10.0	9.44	7.58	13.2 - 16.3	na	SS27
130	4.00E-10	0.20	1.31	10.0	10.33	12.48	13.0 - 15.7	na	SS28
130	6.00E-10	0.20	1.31	10.0	10.76	15.85	12.9 - 15.4	na	SS29
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	na	SS30
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	115	**SS31**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	85	**SS32**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	85	**SS33**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	85	**SS34**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	55	**SS35**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	55	**SS36**
130	5.50E-10	0.20	1.31	10.0	10.68	15.1	12.9 - 15.4	55	**SS37**
Unsaturated Zone Thickness = 6.7 ft									
204	1.00E-11	0.15	1.31	12.0	1.26	0.05	9.0 - 10.6	3971	IA02P
204	1.00E-11	0.25	1.29	10.0	6.30	-0.57	16.7 - 22.4	1477	IA02G
204	1.00E-11	0.25	1.29	11.0	3.78	0.21	16.4 - 21.0	1609	IA02F
204	1.00E-11	0.25	1.29	12.0	2.15	0.11	16.0 - 19.1	2413	IA02B
204	1.00E-11	0.25	1.31	11.0	2.15	0.11	16.0 - 19.1	2451	IA02K
204	1.20E-11	0.20	1.31	10.0	5.49	-0.15	13.2-17.6	828	**IA02X**
204	2.00E-11	0.20	1.31	10.0	6.03	0.5	13.2-17.5	662	**IA02Y**
204	4.00E-11	0.20	1.31	10.0	6.87	1.76	13.1-17.2	487	**IA02Z**
204	5.00E-11	0.15	1.31	12.0	2.58	1.08	10.1 - 12.0	1487	IA02O
204	5.00E-11	0.20	1.31	10.0	7.17	2.3	13.1-17.1	440	**IA02AA**

Table 5-11
Sensitivity of SESOIL Modeling Parameters
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

INPUT					OUTPUT				
Vadose Zone Thickness	**Intrinsic Permeability**	**Effective Porosity**	**Bulk Density**	**Soil Disconnect-edness Index**	**Evapotrans-piration**	**Ground-water Recharge**	**Soil Moisture**	**Time for Uranium in Vadose Zone Water to Reach Groundwater[b]**	**SESOIL File Name**
cm	*cm 2*	--	*g/cm3*	--	*inches/yr*	*inches/yr*	*percent*	*Years*	**--**
204	5.00E-11	0.25	1.31	10.0	8.21	2.44	16.4 - 21.6	661	**IA02M**
204	5.00E-11	0.25	1.31	11.0	5.61	2.02	16.8 - 21.1	880	**IA02L**
204	5.00E-11	0.25	1.31	12.0	3.67	1.39	17.1 - 20.6	1211	IA02J
204	1.00E-10	0.15	1.31	12.0	3.27	2.82	10.4 - 12.1	870	**IA02R**
204	1.00E-10	0.25	1.29	11.0	6.56	3.99	16.9 - 20.8	541	**IA02H**
204	1.00E-10	0.25	1.29	12.0	4.47	3.18	17.4 - 20.5	717	**IA02E**
204	1.00E-10	0.25	1.31	12.0	3.27	2.82	10.4 - 12.1	870	**IA02N**
204	1.00E-10 / 1.00e-11[a]	0.15	1.31	12.0	1.34	0.07	9.1 - 10.7	2284	IA02Q
204	1.00E-10 / 1.00e-11[a]	0.25	1.31	12.0	2.35	0.18	16.2 - 19.5	1373	IA02I
Other Unsaturated Zone Thicknesses									
30	1.00E-11	0.25	1.31	12.0	2.89	-1.29	17.6 - 20.7	2106	IA02S
65	1.00E-11	0.25	1.31	12.0	2.20	-0.5	16.1 - 19.9	1159	IA04EA
65	1.00E-10	0.25	1.31	12.0	3.27	2.81	10.4 - 12.1	184	**IA02V**
65	1.00E-10	0.25	1.31	12.0	3.27	2.81	10.4 - 12.1	247	**IA02W**
77	1.00E-11	0.25	1.31	12.0	2.17	0.01	16.0 - 19.8	1241	BLDG3B
152	5.00E-11	0.25	1.31	10.5	6.89	2.15	16.7 - 21.4	242	**IA04_31D**
154	1.00E-11	0.25	1.31	12.0	2.14	0.11	16.0 - 19.3	1885	IA03SA
154	1.00E-10	0.25	1.31	12.0	3.26	2.82	10.4 - 12.1	671	**IA02T**
165	1.00E-11	0.25	1.31	12.0	2.14	0.11	16.0 - 19.3	2190	IA04WA
240	1.00E-10	0.25	1.31	12.0	3.26	2.81	10.4 - 12.1	913	**IA02U**
305	1.00E-11	0.25	1.31	12.0	2.17	0.11	16.2 - 18.7	3538	IA03A
Worst Case Scenario									
152	5.00E-11	0.25	1.31	10.5	6.9	2.15	16.7 - 21.4	242	**IA04_31D**

Notes:

[a] Indicates intrinsic permeability for upper two zones is different from intrinsic permeability for lower two zones.

[b] na indicates model run for 10 years, which was insufficient for uranium to reach groundwater.

Typical soil moisture about 15 percent.

Bold indicates model runs resulting in uranium reaching groundwater in less than 1000 years.

Table 5-12
Summary of SESOIL/AT123D Modeling Results
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Location	Layer 1 & 2 Thickness Each[a]	Layer 3 & 4 Thickness Each[a]	Soil Uranium Concentration		Maximum Uranium Pore Water Concentration	Time for Uranium in Vadose Zone Water to Reach Groundwater	Maximum Uranium Groundwater Concentration[b]	Time to Reach Maximum Uranium Groundwater Concentration	Dilution Attenuation Factor	SESOIL File Name
	ft	*ft*	*pCi/gm*	*mg/kg*	*mg/L*	*Years*	*mg/L*	*Years*	--	
	Generalized Site Model									
Sitewide	3.3	1.0	0.17	0.5	0.055	55	0.030	66	17	SS37
Sitewide	3.3	1.0	0.92	2.7	0.299	55	0.164	66	17	SS38

Notes:

[a] Model consisted of two upper vadose zone layers with uranium contamination indicated and two lower uncontaminated vadose zone layers

[b] Maximum concentration is at the water table in the center of the source area.

Dilution Attenuation Factor calculated as the ratio of soil concentration to maximum groundwater concentration.

TABLE 6-1
ALPHA SPEC SAMPLE IDs FOR HHRA BY EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALITY STEEL CORPORATION FUSRAP SITE

IA01 - Excised Area, Building Interiors									IA02 - Building Exterior Areas		IA03 - Landfill Area	IA04 - NCIDA Property				IA05 - Railroad Right-of-Way		IA06 - Off-Site NE Properties	IA07 - Groundwater	IA08 - Site Utilities	IA09 - Erie Barge Canal	IA10 - Lot 4.1 ("Lombardi Property")	Building Material Background Samples	Off-Site Background Soil Samples
EU1 - Building 1	EU2 - Building 2	EU3 - Building 3	EU4 - Building 4/9	EU5 - Building 5	EU6 - Building 6	EU7 - Building 8	EU8 - Building 24	EU9 - Building 35	EU10 - E. of Buildings	EU11 - Between Buildings	EU12 - Landfill	EU13 - IA04A	EU14 - IA04B	EU15 - IA04C	EU16 - IA04D	EU17 - IA05A	EU18 - IA05B	---[a]	---[b]	---[c]	EU19	EU20	---[d]	---[e]
Building Materials:	*Building Materials:*	*Building Materials:*	*Building Materials:*	*Building Materials:*	*Building Materials:*	*Building Materials:*	*Building Materials:*	*Building Materials:*	*Surface Soil:*	*Surface Soil:*	*Surface Soil:*	*Surface Soil:*	*Surface Soil:*	*Surface Soil:*	*Surface Soil:*	*Surface Soil:*	*Surface Soil:*				*Sediment:*	*Surface Soil:*	B01-BM-003	*Total Soil:*
B01-BM-001	B02-BM-001	B03-BM-001	B04&B09-BM-001	B05BM001	B06-BM-001	B08-BM-001	B24-BM-001	B35-BM-001	A02SL-011-01	A02SL-001-01	A03SL-002-01	A04ASL-003-01	A04BSL-001-01	A04CSL-001-01	A04DSL-015-01	A05ASL-003-01	A05BSL-001-01				A09-SD-001	A10SL-001-01[f]	B02-BM-010	BKGSL-001-01
B01-BM-002	B02-BM-002	B03-BM-002	B04&B09-BM-002		B06-BM-002	*Surface Soil:*	B24-BM-002	*Surface Soil:*	A02SL-012-01[h]	A02SL-002-01	A03SL-009-01	A04ASL-009-01	A04BSL-002-01	A04CSL-002-01	A04DSL-020-01	A05ASL-004-01	A05BSL-003-01				A09-SD-002	A10SL-003-01[f]	B03-BM-007	BKGSL-001-02
Sediment:	B02-BM-003	B03-BM-003	B04&B09-BM-003		B06-BM-003	B08SL-003-01	B24-BM-003	B35SL-001-01[f]	A02SL-014-01	A02SL-003-01[i]	A03SL-011-01	A04ASL-014-01	A04BSL-003-01[f]	A04CSL-003-01	A04DSL-021-01	A05ASL-005-01	A05BSL-004-01				A09-SD-003	A10SL-004-01[f]	B04&B09-BM-004	BKGSL-002-01
A08-B1-SD-001	B02-BM-004	B03-BM-004	*Surface Soil:*		B06-BM-004	B08SL-014-01[f]	B24SL-601-01	*Subsurface Soil:*	A02SL-015-01	A02SL-005-01	A03SL-018-01	A04ASL-020-01	A04BSL-004-01	A04CSL-005-01	A04DSL-023-01	A05ASL-007-01	A05BSL-005-01				A09-SD-004	A10SL-005-01[f]	B05BM002	BKGSL-002-04
A08-B1-SD-002	B02-BM-005	B03-BM-005	B04&B09SL-015-01		B06-BM-005	B08SL-015-01[f]	B24SL-602-01	B35SL-003-07	A02SL-016-01	A02SL-007-01	A03SL-021-01	A04ASL-024-01	A04BSL-005-01	A04CSL-006-01	A04DSL-024-01	A05ASL-008-01	A05BSL-006-01				A09-SD-005	A10SL-006-01[f]	B06-BM-006	BKGSL-003-01
A08-B1-SD-003	B02-BM-006	B03-BM-006	B04&B09SL-017-01		*Surface Soil:*	B08SL-017-01[f]	B24SL-603-01		A02SL-020-01	A02SL-024-01	A03SL-026-01	A04ASL-031-01	A04BSL-006-01	A04CSL-007-01	A04DSL-026-01	A05ASL-009-01[f]	A05BSL-007-01				A09-SD-006	A10SL-007-01[f]	B08-BM-002	BKGSL-003-09
A08-B1-SD-004	B02-BM-007	*Surface Soil:*	B04&B09SL-018-01		B06SL-003-01	B08SL-022-01[f]	*Surface Soil:*		A02SL-022-01	A02SL-025-01	A03SL-027-01	A04ASL-034-01	A04BSL-008-01	A04CSL-008-01	A04DSL-029-01	A05ASL-011-01	A05BSL-008-01				A09-SD-007	A10SL-008-01[f]	B24-BM-004	BKGSL-004-01
A08-B1-SD-005	B02-BM-008	B03SL-009-01[f]	B04&B09SL-020-01[f]		B06SL-005-01	B08SL-023-01	B24SL-019-01[f]		A02SL-023-01	A02SL-026-01	A03SL-028-01	A04ASL-038-01	A04BSL-009-01	A04CSL-009-01	A04DSL-204-01[h]	A05ASL-012-01	A05BSL-009-01				A09-SD-008	A10SL-009-01[f]	B35-BM-002	BKGSL-004-02
A08-B1-SD-006	B02-BM-009	B03SL-013-01[f]	B04&B09SL-026-01		B06SL-006-01[f]	*Subsurface Soil:*	B24SL-021-01[f]		A02SL-034-01	A02SL-027-01[f]	A03SL-029-01	A04ASL-044-01	A04BSL-010-01	A04CSL-011-01	A04DSL-220-01	A05ASL-017-01	A05BSL-010-01				A09-SD-009	A10SL-010-01[f]		BKGSL-005-01
A08-B1-SL-001	*Surface Soil:*	B03SL-014-01	B04&B09SL-027-01[f]		B06SL-021-01	B08SL-003-05	B24SL-022-01[f]		A02SL-035-01	A02SL-028-01[f]	A03SL-031-01	A04ASL-051-01	A04BSL-011-01	A04CSL-012-01	A04DSL-307-01	A05ASL-018-01	A05BSL-011-01				A09-SD-010	A10SL-012-01[f]		BKGSL-005-02
Surface Water:	B02SL-005-01[f]	B03SL-016-01	B04&B09SL-030-01[f]		B06SL-024-01[f]	B08SL-015-09	B24SL-026-01[f]		A02SL-038-01	A02SL-029-01	A03SL-033-01	A04ASL-054-01	A04BSL-013-01	A04CSL-013-01	A04DSL-308-01	A05ASL-019-01	*Subsurface Soil:*				A09-SD-011	A10SL-013-01[f]		BKGSL-006-01
A08-B1-SW-001	B02SL-008-01[f]	B03SL-020-01	B04&B09SL-032-01[f]		*Subsurface Soil:*	B08SL-017-05	B24SL-028-01[f]		A02SL-042-01	A02SL-030-01	A03SL-035-01	A04ASL-055-01	A04BSL-014-01	A04CSL-014-01	A04DSL-317-01	A05ASL-020-01	A05BSL-001-12				A09-SD-012	A10SL-301-01[j]		BKGSL-006-03
A08-B1-SW-002	B02SL-009-01[f]	B03SL-023-01[f]	B04&B09SL-034-01[f]		B06SL-004-05	B08SL-021-06	B24SL-033-01[f]		A02SL-215-01	A02SL-032-01	A03SL-036-01	A04ASL-056-01	A04BSL-016-01	A04CSL-015-01	A04DSL-326-01	A05ASL-021-01	A05BSL-001-13				*Surface Water:*	A10SL-303-01		BKGSL-007-01
A08-B1-SW-003	B02SL-012-01[f]	B03SL-030-01	*Subsurface Soil:*		B06SL-006-02	B08SL-023-03	B24SL-034-01[f]		A02SL-216-01	A02SL-033-01	A03SL-037-01	A04ASL-058-01	A04BSL-019-01	A04CSL-301-01	*Subsurface Soil:*	A05ASL-022-01	A05BSL-002-11				A09-SW-001	*Subsurface Soil:*		BKGSL-007-04
A08-B1-SW-004	B02SL-018-01[f]	B03SL-035-01[f]	B04&B09SL-009-02		B06SL-011-05	B08SL-026-02	*Subsurface Soil:*		A02SL-234-01	A02SL-041-01	A03SL-038-01	A04ASL-059-01	A04BSL-021-01	A04CSL-305-01	A04DSL-008-05	A05ASL-023-01	A05BSL-003-03				A09-SW-002	A10SL-004-02		BKGSL-008-01
A08-B1-SW-005	B02SL-020-01	B03SL-037-01	B04&B09SL-015-02		B06SL-021-05	*Sediment:*	B24SL-018-02		*Subsurface Soil:*	A02SL-043-01	A03SL-040-01	A04ASL-060-01	A04BSL-025-01	A04CSL-307-01	A04DSL-022-06	A05ASL-024-01	A05BSL-004-03				A09-SW-003	A10SL-009-02		BKGSL-008-03
A08-B1-SW-006	B02SL-045-01[f]	*Subsurface Soil:*	B04&B09SL-017-02		B06SL-021-06	A08-B8-SD-001	B24SL-018-03		A02SL-009-04	*Subsurface Soil:*	A03SL-042-01	A04ASL-061-01	A04BSL-026-01[f]	A04CSL-308-01	A04DSL-023-03	A05ASL-025-01	A05BSL-005-03				A09-SW-004	A10SL-010-02		BKGSL-009-01
	B02SL-046-01	B03SL-014-05	B04&B09SL-018-02		*Sediment:*	A08-B8-SD-002	B24SL-019-02		A02SL-012-02	A02SL-004-07	A03SL-203-01	A04ASL-062-01	A04BSL-027-01	A04CSL-309-01	A04DSL-031-03	A05ASL-026-01	A05BSL-006-11				A09-SW-005	A10SL-011-02		BKGSL-009-03
	B02SL-049-01[f]	B03SL-016-05	B04&B09SL-025-02		A08-B6-SD-001	*Surface Water:*	B24SL-021-02		A02SL-015-10	A02SL-005-02	A03SL-209-01	A04ASL-203-01	A04BSL-028-01	A04CSL-310-01	A04DSL-210-02	A05ASL-029-01	A05BSL-007-03				A09-SW-006	A10SL-013-02		BKGSL-010-01
	B02SL-059-01[f]	B03SL-018-02	B04&B09SL-033-02		A08-B6-SD-002	A08-B8-SW-001	B24SL-023-02		A02SL-015-11	A02SL-006-03	A03SL-217-01	A04ASL-214-01	A04BSL-033-01	A04CSL-312-01	A04DSL-304-03	A05ASL-210-01	A05BSL-007-10				A09-SW-007	A10SL-301-02		BKGSL-010-03
	B02SL-302-01[f]	B03SL-025-03	B04&B09SL-036-02			A08-B8-SW-002	B24SL-025-02		A02SL-016-02	A02SL-007-05	A03SL-221-01	A04ASL-220-01	A04BSL-039-01	*Subsurface Soil:*	A04DSL-306-02	A05ASL-211-01	A05BSL-008-02				A09-SW-008	A10SL-302-02		BKGSL-011-01
	B02SL-721-01[g]	B03SL-027-03	B04&B09SL-038-02				B24SL-026-02		A02SL-016-03	A02SL-024-07	A03SL-224-01	A04ASL-238-01	A04BSL-042-01	A04CSL-003-02	A04DSL-307-02	A05ASL-219-01	A05BSL-010-03				A09-SW-009	A10SL-302-13		BKGSL-011-08
	B02SL-739-01[g]	B03SL-030-02	B04&B09SL-038-03				*Sediment:*		A02SL-018-03	A02SL-028-02	A03SL-226-01	A04ASL-241-01	A04BSL-043-01	A04CSL-004-02	A04DSL-311-02	A05ASL-226-01	A05BSL-010-04				A09-SW-010	A10SL-303-02		BKGSL-012-01
	Subsurface Soil:	B03SL-036-02	*Sediment:*				A08-B24-SD-001		A02SL-019-02	A02SL-030-06	A03SL-228-01	A04ASL-244-01	A04BSL-221-01	A04CSL-006-02	A04DSL-320-05	A05ASL-301-01	A05BSL-011-03				A09-SW-011	A10SL-303-13		BKGSL-012-04
	B02SL-009-02	*Sediment:*	A08-B04&B09-SD-001				A08-B24-SD-002		A02SL-019-06	A02SL-031-06	A03SL-231-01	A04ASL-276-01	A04BSL-303-01[f]	A04CSL-006-03	A04DSL-324-03	A05ASL-302-01	*Groundwater:*				A09-SW-012	A10SL-303-18		
	B02SL-012-02	A08-B3-SD-002	A08-B04&B09-SD-002				A08-B24-SD-003		A02SL-020-02	*Groundwater:*	A03SL-232-01	A04ASL-278-01	A04BSL-307-01[f]	A04CSL-011-03	A04DSL-324-04	A05ASL-303-01	A05BMW600D							
	B02SL-017-05	A08-B3-SD-003	A08-B04&B09-SD-003				A08-B24-SD-004		A02SL-020-03	A02-MW3	A03SL-233-01	A04ASL-309-01	A04BSL-308-01	A04CSL-011-04	*Groundwater:*	A05ASL-304-01								
	B02SL-018-02	A08-B3-SD-004	A08-B04&B09-SD-004				A08-B24-SD-005		A02SL-021-03	A02-MW4	A03SL-234-01	A04ASL-318-01	A04BSL-309-01	A04CSL-013-02	A04DMW24	A05ASL-305-01								
	B02SL-018-03	A08-B3-SD-005	A08-B04&B09-SD-005				A08-B24-SD-006		A02SL-021-04	A02-MW5	A03SL-237-01	A04ASL-319-01	A04BSL-310-01	A04CSL-302-05	A04DMW604D	A05ASL-307-01								
	B02SL-022-03	A08-B3-SD-006	*Surface Water:*				A08-B24-SD-007		A02SL-022-04	A02-MW11	A03SL-239-01	A04ASL-320-01	*Subsurface Soil:*	A04CSL-307-02	*Sediment:*	A05ASL-308-01								
	B02SL-025-02	A08-B3-SD-007	A08-B04&B09-SW-001						A02SL-023-02	*Sediment:*	*Subsurface Soil:*	*Subsurface Soil:*	A04BSL-007-06	A04CSL-308-02	A08-A01-SD-001R	*Subsurface Soil:*								
	B02SL-037-05	A08-B3-SD-008	A08-B04&B09-SW-002						A02SL-035-02	A08-A01-SD-003	A03SL-009-02	A04ASL-003-03	A04BSL-008-03	A04CSL-309-05	A08-A01-SD-005	A05ASL-004-02								
	B02SL-049-02	A08-B3-SD-009	A08-B04&B09-SW-003						A02SL-037-05	A08-A01-SD-009	A03SL-011-02	A04ASL-051-02	A04BSL-012-06	A04CSL-310-02		A05ASL-007-03								
	B02SL-052-03	A08-B3-SD-010	A08-B04&B09-SW-004						A02SL-037-06	A08-A01-SD-010	A03SL-015-02	A04ASL-052-02	A04BSL-013-07	A04CSL-312-02		A05ASL-008-07								
	B02SL-052-05	A08-B3-SD-011	A08-B04&B09-SW-005						A02SL-039-03	A08-A01-SD-011	A03SL-018-03	A04ASL-055-02	A04BSL-014-07	*Sediment:*		A05ASL-009-07								
	B02SL-055-03	A08-B3-SD-012							A02SL-216-13	A08-A01-SD-013	A03SL-022-02	A04ASL-056-04	A04BSL-015-06	A08-A01-SD-004		A05ASL-010-07								
	B02SL-302-05	A08-B3-SD-013							A02SL-229-02	*Surface Water:*	A03SL-028-03	A04ASL-056-05	A04BSL-015-07	A08-A01-SD-012		A05ASL-010-08								
	Sediment:	A08-B3-SD-014							A02SL-234-02	A08-A01-SW-001	A03SL-028-05	A04ASL-058-02	A04BSL-016-03			A05ASL-011-06								
	A08-B2-SD-001	A08-B3-SD-015							*Groundwater:*	A08-A01-SW-004	A03SL-030-02	A04ASL-062-02	A04BSL-018-06			A05ASL-012-06								
	A08-B2-SD-002	*Surface Water:*							A02MW1	A08-A01-SW-005	A03SL-031-02	A04ASL-063-03	A04BSL-018-07			A05ASL-012-07								
	A08-B2-SD-003	A08-B3-SW-001							A02MW2	A08-A01-SW-006	A03SL-035-02	A04ASL-067-02	A04BSL-019-02			A05ASL-017-03								
	A08-A01-SD-002	A08-B3-SW-003							A02MW06	A08-A01-SW-007	A03SL-038-10	A04ASL-203-06	A04BSL-020-06			A05ASL-018-02								
	Surface Water:	A08-B3-SW-004							A02MW08	A08-A01-SW-011	A03SL-039-02	A04ASL-209-10	A04BSL-025-03			A05ASL-022-03								
	A08-B2-SW-001	A08-B3-SW-005							A02MW09	A08-A01-SW-012	A03SL-042-02	A04ASL-214-05	A04BSL-031-06			A05ASL-023-03								
	A08-B2-SW-003	A08-B3-SW-006									A03SL-214-06	A04ASL-214-06	A04BSL-031-07			A05ASL-024-02								
		A08-B3-SW-007									A03SL-216-10	A04ASL-214-09	A04BSL-032-06			A05ASL-027-03								
		A08-B3-SW-008									A03SL-217-13	A04ASL-220-14	A04BSL-032-07			A05ASL-029-03								
		A08-B3-SW-009									A03SL-217-14	A04ASL-224-10	A04BSL-036-05			A05ASL-031-03								
		A08-B3-SW-011									A03SL-222-10	A04ASL-224-11	A04BSL-038-07			A05ASL-209-25								
		A08-B3-SW-012									A03SL-223-05	A04ASL-224-14	A04BSL-040-03			A05ASL-219-02								
		A08-B3-SW-013									A03SL-224-02	A04ASL-230-05	A04BSL-041-05			A05ASL-301-02								
		A08-B3-SW-014									A03SL-224-05	A04ASL-236-09	A04BSL-042-02			A05ASL-301-06								
		A08-B3-SW-015									A03SL-227-04	A04ASL-238-05	A04BSL-043-02			A05ASL-303-13								
											A03SL-228-06	A04ASL-239-03	A04BSL-219-03			A05ASL-303-14								
											A03SL-231-02	A04ASL-244-02	A04BSL-302-06			A05ASL-304-02								
											A03SL-231-05	A04ASL-250-04	A04BSL-304-03			A05ASL-304-13								
											A03SL-232-06	A04ASL-274-11	A04BSL-305-06			A05ASL-304-14								
											A03SL-233-07	A04ASL-276-05	A04BSL-306-03			A05ASL-305-02								
											A03SL-239-11	A04ASL-278-10	A04BSL-308-02			A05ASL-305-03								
											A03SL-240-06	A04ASL-314-03	A04BSL-310-06			A05ASL-305-13								
											A03SL-240-07	A04ASL-318-02	A04BSL-310-07			A05ASL-306-03								
											Sediment:	*Groundwater:*	*Groundwater:*											
											A03-SD-001	A04AMW20	A04BMW18											
											A03-SD-002	A04AMW21	A04BMW19											
											A03-SD-003	A04AMW22	A04BMW26											
											A03-SD-004	A04AMW23	A04BMW605D											
											A03-SD-005	A04AMW601D												
											A03-SD-006	A04AMW602D												
											Groundwater:	A04AMW603D												
											A03MW13D	Sediment												
											A03MW14	A08-A01-SD-006												
											A03MW15	A08-A01-SD-007												
											A03MW16	A08-A01-SD-008												
											A03MW17													
											A03MW606DR													
											A03MW607D													

Notes:
Samples were analyzed at the off-site laboratory for isotopic uranium and isotopic thorium by alpha spectroscophy; a minimum of 50% of samples were analyzed for isotopic radium by gas flow proportional counting.
Blank cell indicates no sample for the medium and IA/EU other than what is indicated in occupied cells.
[a] No exposure units are associated with IA06, Off-Site NE Properties, as this area is considered non-impacted and will be designated for No Further Action.
[b] No exposure units are associated with IA07, Groundwater, as data from each monitoring well will be evaluated with the other media for each exposure unit within which it lies.
[c] No exposure units are associated with IA08, Site Utilities, as sediment or surface water data from each ditch or trench will be evaluated with the other media for each exposure unit within which it lies.
[d] Volumentric background reference samples for building materials were collected as Class 3 samples within the Excised Area to avoid damaging existing structures outside of the area.
[e] Soil background samples were not assigned an exposure unit number; soil background was not designated as surface or subsurface soil.
[f] This sample was collected immediately below the current building floor and is considered a surface soil sample for exposure purposes assuming that the building will be demolished.
[g] B02SL-721-01 and B02SL-739-01 are detritus samples being evaluated with surface soil data because they are dust/dirt and more closely resembled soil matrix (see Section 3.7.3 for more detail).
[h] Samples A02SL-012-01 and A04DSL-204-01 were only analyzed for Ra and not for isotopes of U and Th.
[i] A02SL-003-01 was originally labeled as A02SL-703-01. Surface soil collected at A02-003 location could not be drilled due to utility access issues; it was not collected by drilling.
[j] Sample A10SL-301-01 is a surface soil sample collected just outside the boundary of EU20 to delineate the extent of contamination it EU20.
EU = exposure units
IA = investigative area
NCIDA = Niagara County Industrial Development Agency
NE = northeast

TABLE 6-2
BACKGROUND CONCENTRATIONS USED IN ESTIMATING EPCs FOR HHRA
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Medium/Isotope	Units	# observations	# Nondetection	Minimum value	Maximum value	Distribution	Method	UCL95	UTL	UPL	Wt. Average Background[a]	Average Background
Background												
Surface Soil												
Radium-226	pCi/g	12	0	0.94	1.37	Gamma	95% UPL	1.18	1.37	1.37	1.11	1.11
Radium-228	pCi/g	12	0	0.42	1.26	Gamma	95% UPL	0.91	1.26	1.26	0.73	0.77
Thorium-228	pCi/g	12	0	0.65	1.10	Gamma	95% UPL	0.94	1.10	1.10	0.84	0.87
Thorium-230	pCi/g	12	0	0.68	1.18	Gamma	95% UPL	0.99	1.18	1.18	0.88	0.91
Thorium-232	pCi/g	12	0	0.59	1.02	Gamma	95% UPL	0.88	1.02	1.02	0.80	0.82
Uranium-234	pCi/g	12	0	0.66	0.93	Gamma	95% UPL	0.82	0.93	0.93	0.78	0.78
Uranium-235	pCi/g	12	0	0.01	0.07	Gamma	95% UPL	0.05	0.07	0.07	0.03	0.04
Uranium-238	pCi/g	12	0	0.67	1.06	Gamma	95% UPL	0.87	1.06	1.06	0.81	0.82
Boring (Total Soil)												
Radium-226	pCi/g	24	0	0.56	1.37	Gamma	95% UPL	1.10	1.37	1.37	0.12	1.04
Radium-228	pCi/g	24	0	0.35	1.26	Gamma	95% UPL	0.88	1.21	1.25	0.72	0.80
Thorium-228	pCi/g	24	0	0.56	1.11	Gamma	95% UPL	0.94	1.10	1.11	0.85	0.89
Thorium-230	pCi/g	24	0	0.67	1.18	Gamma	95% UPL	0.96	1.14	1.17	0.88	0.90
Thorium-232	pCi/g	24	0	0.59	1.08	Gamma	95% UPL	0.88	1.02	1.07	0.80	0.83
Uranium-234	pCi/g	24	0	0.44	0.93	Gamma	95% UPL	0.75	0.89	0.92	0.68	0.71
Uranium-235	pCi/g	24	0	0.01	0.07	Gamma	95% UPL	0.04	0.06	0.07	0.03	0.03
Uranium-238	pCi/g	24	0	0.46	1.06	Gamma	95% UPL	0.79	0.91	1.02	0.70	0.74
Sediments												
Radium-226	pCi/g	1	0	1.00	1.00	NA	NA	NA	NA	NA	1.00	1.00
Radium-228	pCi/g	1	0	0.60	0.60	NA	NA	NA	NA	NA	0.60	0.60
Thorium-228	pCi/g	3	0	0.70	1.00	NA	NA	NA	NA	NA	0.80	0.83
Thorium-230	pCi/g	3	0	0.70	0.90	NA	NA	NA	NA	NA	0.80	0.80
Thorium-232	pCi/g	3	0	0.70	0.80	NA	NA	NA	NA	NA	0.70	0.73
Uranium-234	pCi/g	3	0	0.70	0.80	NA	NA	NA	NA	NA	0.70	0.77
Uranium-235	pCi/g	3	0	0.03	0.07	NA	NA	NA	NA	NA	0.04	0.05
Uranium-238	pCi/g	3	0	0.50	0.70	NA	NA	NA	NA	NA	0.60	0.63

TABLE 6-2
BACKGROUND CONCENTRATIONS USED IN ESTIMATING EPCs FOR HHRA
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Medium/Isotope	Units	# observations	# Nondetection	Minimum value	Maximum value	Distribution	Method	UCL95	UTL	UPL	Wt. Average Background[a]	Average Background
Surface Water												
Radium-226	pCi/L	3	0	0.10	0.20	NA	NA	NA	NA	NA	0.13	0.13
Radium-228	pCi/L	3	0	0.30	0.40	NA	NA	NA	NA	NA	0.30	0.33
Thorium-228	pCi/L	3	0	0.10	0.30	NA	NA	NA	NA	NA	0.13	0.20
Thorium-230	pCi/L	3	0	0.20	0.20	NA	NA	NA	NA	NA	0.18	0.20
Thorium-232	pCi/L	3	0	-0.01	0.05	NA	NA	NA	NA	NA	0.00	0.01
Uranium-234	pCi/L	3	0	0.10	0.20	NA	NA	NA	NA	NA	0.15	0.17
Uranium-235	pCi/L	2	0	0.02	0.06	NA	NA	NA	NA	NA	0.03	0.04
Uranium-238	pCi/L	3	0	0.09	0.10	NA	NA	NA	NA	NA	0.10	0.10
Groundwater												
Radium-226	pCi/L	2	0	1.30	1.40	NA	NA	NA	NA	NA	1.30	1.35
Radium-228	pCi/L	2	0	2.00	2.40	NA	NA	NA	NA	NA	2.10	2.20
Thorium-228	pCi/L	2	0	0.02	0.12	NA	NA	NA	NA	NA	0.04	0.07
Thorium-230	pCi/L	2	0	0.14	0.20	NA	NA	NA	NA	NA	0.18	0.17
Thorium-232	pCi/L	2	0	0.00	0.00	NA	NA	NA	NA	NA	0.00	0.00
Uranium-234	pCi/L	2	0	0.80	1.20	NA	NA	NA	NA	NA	1.00	1.00
Uranium-235	pCi/L	2	0	0.07	0.10	NA	NA	NA	NA	NA	0.07	0.09
Uranium-238	pCi/L	2	0	0.70	1.20	NA	NA	NA	NA	NA	0.80	0.95
Building Materials[b]												
Radium-226	pCi/g	9	0	-0.16	1.41	Normal	95% UTL/ 90% Coverage	NA	1.96	1.70	1.96	0.68
Radium-228	pCi/g	9	0	-1.03	1.07	Normal	95% UTL/ 90% Coverage	NA	1.82	1.48	1.82	0.13
Thorium-228	pCi/g	9	0	0.07	1.51	Normal	95% UTL/ 90% Coverage	NA	2.00	1.73	2.00	0.67
Thorium-230	pCi/g	9	0	0.12	1.78	Normal	95% UTL/ 90% Coverage	NA	2.32	2.02	2.32	0.83
Thorium-232	pCi/g	9	0	0.04	1.64	Normal	95% UTL/ 90% Coverage	NA	2.13	1.83	2.13	0.67
Uranium-234	pCi/g	9	0	0.30	3.95	Normal	95% UTL/ 90% Coverage	NA	4.63	4.01	4.63	1.54
Uranium-235	pCi/g	9	0	0.03	0.21	Lognormal	95% UTL/ 90% Coverage	NA	0.39	0.27	0.39	0.08
Uranium-238	pCi/g	9	0	0.29	4.45	Normal	95% UTL/ 90% Coverage	NA	5.22	4.52	5.22	1.74

TABLE 6-2
BACKGROUND CONCENTRATIONS USED IN ESTIMATING EPCs FOR HHRA
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Medium/Isotope	Units	# observations	# Nondetection	Minimum value	Maximum value	Distribution	Method	UCL95	UTL	UPL	Wt. Average Background[a]	Average Background
Building Materials - Static Beta Measurements[c]												
Steel	dpm/ $100cm^2$	6	0	1866	2461	Gamma	95% UTL/ 90% Coverage	2359	3144	2461	2096	2148

Notes:

[a] Weighted averages were used as a method to combine multiple laboratory results and to reduce uncertainty.

[b] These are building material results collected from Class 3 areas within the buildings of the Excised Area.

[c] Static beta measurements were taken from a variety of Class 3 area building materials. Results of ProUCL 4.00.04 indicated that while bootstrap methods could be used - the resulting values might not be reliable enough for defensible conclusions. The weighted average value for steel was used as background for building materials because this background value was the lowest of the building materials - and would result in the fewest data being eliminated from the data set "due to being within background." Weighted averaged background results for all building materials are illustrated in Appendix V.

= number

dpm/$100cm^2$ = disintegrations per minute per 100 square centimeters.

EPCs = exposure point concentrations

HHRA = Human Health Risk Assessment

NA = not applicable; a minimum of 4 results is required for obtaining statistics through ProUCL.

pCi/g = picocuries per gram

pCi/L = picocuries per liter

UCL = upper confidence limit

UCL95 = 95th percent upper confidence limit

UPL = upper percentile limit

UTL = upper tolerence limit

Wt. = weighted

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
EU 1 - Building 1																				
Static Measurements (Beta)																				
Beta [c]	pCi/g	183	0	-1.20	27.77	01-200740-S-149	0.44	0.44	-0.35	Normal	95% Student's-t UCL	0.74	No	0.74	NA	NA	NA	NA	NA	0.74
Radium-226	pCi/g	183	0	0.00	0.00	01-200740-S-149	0.00	0.00	0.00	Normal	95% Student's-t UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Radium-228	pCi/g	183	0	0.00	0.75	01-200740-S-149	0.01	0.01	-0.01	Normal	95% Student's-t UCL	0.02	No	0.02	NA	NA	NA	NA	NA	0.02
Thorium-228	pCi/g	183	0	0.00	0.75	01-200740-S-149	0.01	0.01	-0.01	Normal	95% Student's-t UCL	0.02	No	0.02	NA	NA	NA	NA	NA	0.02
Thorium-230	pCi/g	183	0	0.00	0.00	01-200740-S-149	0.00	0.00	0.00	Normal	95% Student's-t UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Thorium-232	pCi/g	183	0	0.00	0.75	01-200740-S-149	0.01	0.01	-0.01	Normal	95% Student's-t UCL	0.02	No	0.02	NA	NA	NA	NA	NA	0.02
Uranium-234	pCi/g	183	0	0.00	26.44	01-200740-S-149	0.42	0.42	-0.33	Normal	95% Student's-t UCL	0.70	No	0.70	NA	NA	NA	NA	NA	0.70
Uranium-235	pCi/g	183	0	0.00	0.58	01-200740-S-149	0.01	0.01	-0.01	Normal	95% Student's-t UCL	0.02	No	0.02	NA	NA	NA	NA	NA	0.02
Uranium-238	pCi/g	183	0	0.00	26.44	01-200740-S-149	0.42	0.42	-0.33	Normal	95% Student's-t UCL	0.70	No	0.70	NA	NA	NA	NA	NA	0.70
Building Material																				
Radium-226	pCi/g	2	0	0.066	0.32	B01-BM-001	0.19	0.19	0.18	NA	NA	NA	NA	0.32	NA	1.96	1.70	0.68	0	0.00
Radium-228	pCi/g	2	0	-0.57	0.42	B01-BM-001	-0.08	-0.08	0.70	NA	NA	NA	NA	0.42	NA	1.82	1.48	0.13	1	0.29
Thorium-228	pCi/g	2	0	0.015	0.39	B01-BM-001	0.20	0.20	0.27	NA	NA	NA	NA	0.39	NA	2.00	1.73	0.67	0	0.00
Thorium-230	pCi/g	2	0	0.161	0.61	B01-BM-001	0.39	0.39	0.32	NA	NA	NA	NA	0.61	NA	2.32	2.02	0.83	0	0.00
Thorium-232	pCi/g	2	0	-0.003	0.48	B01-BM-001	0.24	0.24	0.34	NA	NA	NA	NA	0.48	NA	2.13	1.83	0.67	0	0.00
Uranium-234 [d]	pCi/g	2	0	0.093	0.39	B01-BM-001	0.24	0.24	0.21	NA	NA	NA	NA	0.39	NA	4.63	4.01	1.54	0	0.00
Uranium-235	pCi/g	2	0	-0.002	0.03	B01-BM-002	0.01	0.01	0.02	NA	NA	NA	NA	0.03	NA	0.39	0.27	0.08	0	0.00
Uranium-238 [d]	pCi/g	2	0	0.113	0.32	B01-BM-001	0.22	0.22	0.15	NA	NA	NA	NA	0.32	NA	5.22	4.52	1.74	0	0.00
Sediment																				
Radium-226	pCi/g	7	0	0.22	1.82	A08-B1-004	0.55	0.55	0.57	Gamma	95% Approximate Gamma UCL	1.09	No	1.09	0.7	1.00	1.00	1.00	1	0.09
Radium-228	pCi/g	7	0	-0.08	1.43	A08-B1-004	0.56	0.56	0.48	Normal	95%Student's-t UCL	0.91	No	0.91	1.1	0.60	0.60	0.60	2	0.31
Thorium-228	pCi/g	7	0	0.24	1.24	A08-B1-004	0.44	0.44	0.36	None [f]	95% Chebyshev (Mean,Sd) UCL	1.03	No	1.03	NA	0.80	1.00	0.83	1	0.20
Thorium-230	pCi/g	7	0	0.28	0.75	A08-B1-004	0.44	0.44	0.17	Normal	95%Student's-t UCL	0.56	No	0.56	NA	0.80	0.90	0.80	0	0.00
Thorium-232	pCi/g	7	0	0.18	0.76	A08-B1-004	0.37	0.37	0.19	Normal	95%Student's-t UCL	0.51	No	0.51	1.1	0.70	0.80	0.73	0	0.00
Uranium-234 [e]	pCi/g	7	0	1.50	68.62	A08-B1-004	23.42	23.42	25.57	Normal	95%Student's-t UCL	42.19	No	42.19	13	0.70	0.80	0.77	7	41.42
Uranium-235	pCi/g	7	0	0.08	3.27	A08-B1-004	1.21	1.21	1.31	Normal	95%Student's-t UCL	2.17	No	2.17	8	0.04	0.07	0.05	7	2.12
Uranium-238 [e]	pCi/g	7	0	1.66	77.50	A08-B1-004	26.04	26.04	28.53	Normal	95%Student's-t UCL	47.00	No	47.00	14	0.60	0.70	0.63	7	46.37
Surface Water																				
Radium-226	pCi/L	6	0	0.00	0.12	A08-B1-003	0.07	0.07	0.04	Normal	95%Student's-t UCL	0.10	No	0.10	NA	0.13	0.20	0.13	0	0.00
Radium-228	pCi/L	6	0	-0.02	0.59	A08-B1-003	0.25	0.25	0.23	Normal	95%Student's-t UCL	0.44	No	0.44	NA	0.30	0.40	0.33	2	0.11
Thorium-228	pCi/L	6	0	0.04	0.41	A08-B1-001	0.20	0.20	0.16	Normal	95%Student's-t UCL	0.33	No	0.33	NA	0.13	0.30	0.20	4	0.13
Thorium-230	pCi/L	6	0	0.10	0.70	A08-B1-006	0.29	0.29	0.22	Normal	95%Student's-t UCL	0.47	No	0.47	NA	0.18	0.20	0.20	3	0.27
Thorium-232	pCi/L	6	0	-0.01	0.06	A08-B1-006	0.02	0.02	0.02	Normal	95%Student's-t UCL	0.04	No	0.04	NA	0.00	0.05	0.01	5	0.03
Uranium-234	pCi/L	6	0	11.50	27.60	A08-B1-006	17.62	17.62	7.48	Gamma	95% Approximate Gamma UCL	25.92	No	25.92	NA	0.15	0.20	0.17	6	25.75
Uranium-235	pCi/L	6	0	0.31	1.40	A08-B1-005	0.80	0.80	0.37	Normal	95%Student's-t UCL	1.11	No	1.11	NA	0.03	0.06	0.04	6	1.07
Uranium-238	pCi/L	6	0	12.40	30.50	A08-B1-006	19.22	19.22	8.26	Normal	95%Student's-t UCL	26.01	No	26.01	NA	0.10	0.10	0.10	6	25.91

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
EU2 - Building 2																				
Static Measurements (Beta)																				
Beta [c]	pCi/g	1229	0	-1.78	184.91	02-100740-S-207	0.23	0.23	2.82	Normal	95% Student's-t UCL	0.49	No	0.49	NA	NA	NA	NA	NA	0.49
Radium-226	pCi/g	1229	0	0.00	0.00	02-100740-S-207	0.00	0.00	0.00	Normal	95% Student's-t UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Radium-228	pCi/g	1229	0	0.00	4.99	02-100740-S-207	0.01	0.01	0.08	Normal	95% Student's-t UCL	0.01	No	0.01	NA	NA	NA	NA	NA	0.01
Thorium-228	pCi/g	1229	0	0.00	4.99	02-100740-S-207	0.01	0.01	0.08	Normal	95% Student's-t UCL	0.01	No	0.01	NA	NA	NA	NA	NA	0.01
Thorium-230	pCi/g	1229	0	0.00	0.00	02-100740-S-207	0.00	0.00	0.00	Normal	95% Student's-t UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Thorium-232	pCi/g	1229	0	0.00	4.99	02-100740-S-207	0.01	0.01	0.08	Normal	95% Student's-t UCL	0.01	No	0.01	NA	NA	NA	NA	NA	0.01
Uranium-234	pCi/g	1229	0	0.00	176.04	02-100740-S-207	0.21	0.21	2.68	Normal	95% Student's-t UCL	0.46	No	0.46	NA	NA	NA	NA	NA	0.46
Uranium-235	pCi/g	1229	0	0.00	3.88	02-100740-S-207	0.00	0.00	0.06	Normal	95% Student's-t UCL	0.01	No	0.01	NA	NA	NA	NA	NA	0.01
Uranium-238	pCi/g	1229	0	0.00	176.04	02-100740-S-207	0.21	0.21	2.68	Normal	95% Student's-t UCL	0.46	No	0.46	NA	NA	NA	NA	NA	0.46
Building Material																				
Radium-226	pCi/g	9	0	0.26	4.23	B02-BM-001	1.06	1.06	1.25	Gamma	95% Approximate Gamma UCL	2.04	No	2.04	NA	1.96	1.70	0.68	4	1.37
Radium-228	pCi/g	9	0	-0.49	0.98	B02-BM-001	0.23	0.23	0.47	Normal	95% Student's-t UCL	0.52	No	0.52	NA	1.82	1.48	0.13	5	0.38
Thorium-228	pCi/g	9	0	0.23	1.39	B02-BM-009	0.68	0.68	0.49	Gamma	95% Approximate Gamma UCL	1.11	No	1.11	NA	2.00	1.73	0.67	3	0.44
Thorium-230	pCi/g	9	0	0.39	4.07	B02-BM-001	1.02	1.02	1.16	None [f]	95% Chebyshev (Mean, Sd) UCL	2.71	No	2.71	NA	2.32	2.02	0.83	4	1.88
Thorium-232	pCi/g	9	0	0.14	1.34	B02-BM-001	0.57	0.57	0.47	Lognormal	95% H-UCL	1.33	No	1.33	NA	2.13	1.83	0.67	3	0.66
Uranium-234	pCi/g	9	0	0.26	3.37	B02-BM-001	0.97	0.97	0.98	Gamma	95% Approximate Gamma UCL	1.75	No	1.75	NA	4.63	4.01	1.54	1	0.21
Uranium-235	pCi/g	9	0	0.008	0.17	B02-BM-001	0.05	0.05	0.05	Gamma	95% Approximate Gamma UCL	0.10	No	0.10	NA	0.39	0.27	0.08	2	0.02
Uranium-238	pCi/g	9	0	0.31	3.50	B02-BM-001	0.98	0.98	1.01	Gamma	95% Approximate Gamma UCL	1.74	No	1.74	NA	5.22	4.52	1.74	1	0.00
Surface Soil																				
Radium-226	pCi/g	6	0	0.45	2.58	B02SL-018-01	1.68	1.68	0.88	Normal	95%Student's-t UCL	2.40	No	2.40	0.7	1.11	1.37	1.11	3	1.30
Radium-228	pCi/g	6	0	0.40	2.03	B02SL-018-01	1.48	1.25	0.59	Normal	95%Student's-t UCL	1.96	No	1.96	1.1	0.73	1.26	0.77	4	1.19
Thorium-228	pCi/g	13	0	0.27	2.97	B02SL-018-01	1.33	1.18	0.87	Normal	95%Student's-t UCL	1.76	No	1.76	NA	0.84	1.10	0.87	6	0.90
Thorium-230	pCi/g	13	0	0.40	3.00	B02SL-045-01	1.30	1.15	0.75	Normal	95%Student's-t UCL	1.67	No	1.67	NA	0.88	1.18	0.91	5	0.76
Thorium-232	pCi/g	13	0	0.44	2.67	B02SL-018-01	1.29	1.26	0.73	Normal	95%Student's-t UCL	1.65	No	1.65	1.1	0.80	1.02	0.82	7	0.83
Uranium-234	pCi/g	13	0	1.70	26.40	B02SL-008-01	11.24	8.57	7.88	Normal	95%Student's-t UCL	15.14	No	15.14	13	0.78	0.93	0.78	13	14.36
Uranium-235	pCi/g	13	0	0.07	1.48	B02SL-008-01	0.60	0.49	0.42	Normal	95%Student's-t UCL	0.81	No	0.81	8	0.03	0.07	0.04	12	0.77
Uranium-238	pCi/g	13	0	2.03	26.70	B02SL-008-01	11.50	8.86	7.82	Normal	95%Student's-t UCL	15.37	No	15.37	14	0.81	1.06	0.82	13	14.55
Total Soil																				
Radium-226	pCi/g	13	0	0.45	3.14	B02-018	1.93	1.93	0.79	Normal	95% Student's-t UCL	2.32	No	2.32	0.7	1.02	1.37	1.04	11	1.27
Radium-228	pCi/g	13	0	0.4	2.11	B02-018	1.51	1.51	0.49	Normal	95% Student's-t UCL	1.75	No	1.75	1.1	0.72	1.25	0.80	11	0.96
Thorium-228	pCi/g	26	0	0.27	2.97	B02-018	1.41	1.41	0.73	Normal	95% Student's-t UCL	1.65	No	1.65	NA	0.85	1.11	0.89	16	0.77
Thorium-230	pCi/g	26	0	0.4	3.00	B02-045	1.34	1.34	0.64	Gamma	95% Approximate Gamma UCL	1.58	No	1.58	NA	0.88	1.17	0.90	15	0.67
Thorium-232	pCi/g	26	0	0.44	2.67	B02-005	1.28	1.28	0.63	Gamma	95% Approximate Gamma UCL	1.52	No	1.52	1.1	0.80	1.07	0.83	16	0.69
Uranium-234	pCi/g	26	0	1.03	29	B02-302	8.97	8.97	8.80	Gamma	95% Approximate Gamma UCL	12.74	No	12.74	13	0.68	0.92	0.71	22	12.03
Uranium-235	pCi/g	26	0	0.018	1.48	B02-008	0.46	0.46	0.46	Gamma	95% Approximate Gamma UCL	0.68	No	0.68	8	0.03	0.07	0.03	21	0.65
Uranium-238	pCi/g	26	0	0.98	28	B02-302	9.06	9.06	8.77	Gamma	95% Approximate Gamma UCL	12.88	No	12.88	14	0.70	1.02	0.74	22	12.14

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Sediment																				
Radium-226	pCi/g	4	0	0.66	1.02	A08-B2-003	0.79	0.79	0.16	NA	NA	NA	NA	1.02	0.7	1.00	1.00	1.00	1	0.02
Radium-228	pCi/g	4	0	0.26	1.06	A08-B2-001	0.61	0.61	0.33	NA	NA	NA	NA	1.06	1.1	0.60	0.60	0.60	1	0.46
Thorium-228	pCi/g	4	0	0.50	1.54	A08-B2-001	0.78	0.78	0.50	NA	NA	NA	NA	1.54	NA	0.80	1.00	0.83	1	0.71
Thorium-230	pCi/g	4	0	0.55	0.84	A08-B2-001	0.66	0.66	0.13	NA	NA	NA	NA	0.84	NA	0.80	0.90	0.80	1	0.04
Thorium-232	pCi/g	4	0	0.37	1.37	A08-B2-001	0.71	0.71	0.47	NA	NA	NA	NA	1.37	1.1	0.70	0.80	0.73	1	0.64
Uranium-234	pCi/g	4	0	1.18	5.64	A08-B2-002	3.47	3.47	2.41	NA	NA	NA	NA	5.64	13	0.70	0.80	0.77	4	4.87
Uranium-235	pCi/g	4	0	0.04	0.24	A08-B2-002	0.15	0.15	0.09	NA	NA	NA	NA	0.24	8	0.04	0.07	0.05	3	0.19
Uranium-238	pCi/g	4	0	1.33	5.70	A08-B2-003	3.59	3.59	2.37	NA	NA	NA	NA	5.70	14	0.60	0.70	0.63	4	5.07
Surface Water																				
Radium-226	pCi/L	2	0	0.01	0.44	A08-B2-003	0.22	0.22	0.30	NA	NA	NA	NA	0.44	NA	0.13	0.20	0.13	1	0.31
Radium-228	pCi/L	2	0	0.36	0.52	A08-B2-003	0.44	0.44	0.11	NA	NA	NA	NA	0.52	NA	0.30	0.40	0.33	2	0.19
Thorium-228	pCi/L	2	0	0.13	1.15	A08-B2-003	0.64	0.64	0.72	NA	NA	NA	NA	1.15	NA	0.13	0.30	0.20	1	0.95
Thorium-230	pCi/L	2	0	0.26	0.69	A08-B2-003	0.47	0.47	0.31	NA	NA	NA	NA	0.69	NA	0.18	0.20	0.20	1	0.49
Thorium-232	pCi/L	1	0	0.61	0.61	A08-B2-003	0.61	0.61		NA	NA	NA	NA	0.61	NA	0.00	0.05	0.01	1	0.60
Uranium-234	pCi/L	2	0	4.20	105.00	A08-B2-003	54.59	54.59	71.29	NA	NA	NA	NA	105	NA	0.15	0.20	0.17	2	105
Uranium-235	pCi/L	2	0	0.22	4.50	A08-B2-003	2.36	2.36	3.03	NA	NA	NA	NA	4.50	NA	0.03	0.06	0.04	2	4.46
Uranium-238	pCi/L	2	0	4.72	105.00	A08-B2-003	54.86	54.86	70.91	NA	NA	NA	NA	105	NA	0.10	0.10	0.10	2	105
EU3 - Building 3																				
Static Measurements (Beta)																				
Beta [c]	pCi/g	1561	0	-2.77	192.51	03-100740-S-214	4.59	4.59	11.24	Nonparametric	95% Chebyshev(Mean,Sd) UCL	6.13	No	6.13	NA	NA	NA	NA	NA	6.13
Radium-226	pCi/g	1561	0	0.00	0.00	03-100740-S-214	0.00	0.00	0.00	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Radium-228	pCi/g	1561	0	0.00	5.20	03-100740-S-214	0.12	0.12	0.30	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.17	No	0.17	NA	NA	NA	NA	NA	0.17
Thorium-228	pCi/g	1561	0	0.00	5.20	03-100740-S-214	0.12	0.12	0.30	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.17	No	0.17	NA	NA	NA	NA	NA	0.17
Thorium-230	pCi/g	1561	0	0.00	0.00	03-100740-S-214	0.00	0.00	0.00	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Thorium-232	pCi/g	1561	0	0.00	5.20	03-100740-S-214	0.12	0.12	0.30	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.17	No	0.17	NA	NA	NA	NA	NA	0.17
Uranium-234	pCi/g	1561	0	0.00	183.27	03-100740-S-214	4.37	4.37	10.70	Nonparametric	95% Chebyshev(Mean,Sd) UCL	5.84	No	5.84	NA	NA	NA	NA	NA	5.84
Uranium-235	pCi/g	1561	0	0.00	4.04	03-100740-S-214	0.10	0.10	0.24	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.13	No	0.13	NA	NA	NA	NA	NA	0.13
Uranium-238	pCi/g	1561	0	0.00	183.27	03-100740-S-214	4.37	4.37	10.70	Nonparametric	95% Chebyshev(Mean,Sd) UCL	5.84	No	5.84	NA	NA	NA	NA	NA	5.84
Building Material																				
Radium-226	pCi/g	6	0	0.118	1.39	B03-BM-004	0.52	0.52	0.48	Normal	95% Student's-t UCL	0.92	No	0.92	NA	1.96	1.70	0.68	2	0.24
Radium-228	pCi/g	6	0	-1.17	0.55	B03-BM-004	-0.09	-0.09	0.58	Normal	95% Student's-t UCL	0.38	No	0.38	NA	1.82	1.48	0.13	2	0.25
Thorium-228	pCi/g	6	0	0.103	1.38	B03-BM-004	0.46	0.46	0.47	Gamma	95% Approximate Gamma UCL	1.17	No	1.17	NA	2.00	1.73	0.67	1	0.50
Thorium-230	pCi/g	6	0	0.053	0.99	B03-BM-004	0.49	0.49	0.33	Normal	95% Student's-t UCL	0.76	No	0.76	NA	2.32	2.02	0.83	1	0.00
Thorium-232	pCi/g	6	0	0.022	1.60	B03-BM-004	0.42	0.42	0.59	Gamma	95% Approximate Gamma UCL	1.54	No	1.54	NA	2.13	1.83	0.67	1	0.88
Uranium-234	pCi/g	6	0	0.62	3.86	B03-BM-001	1.96	1.96	1.23	Normal	95% Student's-t UCL	2.98	No	2.98	NA	4.63	4.01	1.54	3	1.44
Uranium-235	pCi/g	6	0	0.058	0.20	B03-BM-006	0.12	0.12	0.06	Normal	95% Student's-t UCL	0.16	No	0.16	NA	0.39	0.27	0.08	4	0.08
Uranium-238	pCi/g	6	0	0.86	3.86	B03-BM-001	2.11	2.11	1.24	Normal	95% Student's-t UCL	3.14	No	3.14	NA	5.22	4.52	1.74	3	1.39

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Surface Soil																				
Radium-226	pCi/g	4	0	0.29	1.52	B03-016	0.86	0.86	0.51	NA	NA	NA	NA	1.52	0.7	1.11	1.37	1.11	1	0.41
Radium-228	pCi/g	4	0	0.21	0.86	B03-037	0.64	0.64	0.30	NA	NA	NA	NA	0.86	1.1	0.73	1.26	0.77	2	0.09
Thorium-228	pCi/g	9	0	0.26	1.70	B03-023	0.94	0.94	0.42	Normal	95% Student's-t UCL	1.20	No	1.20	NA	0.84	1.10	0.87	2	0.34
Thorium-230	pCi/g	9	0	0.42	1.48	B03-023	1.01	1.01	0.39	Normal	95% Student's-t UCL	1.25	No	1.25	NA	0.88	1.18	0.91	3	0.35
Thorium-232	pCi/g	9	0	0.31	1.41	B03-023	0.82	0.82	0.33	Normal	95% Student's-t UCL	1.02	No	1.02	1.1	0.80	1.02	0.82	2	0.20
Uranium-234	pCi/g	9	0	2.125448	33	B03-016	15	15	11	Normal	95% Student's-t UCL	21	No	21.42	13	0.78	0.93	0.78	5	20.64
Uranium-235	pCi/g	9	0	0.083	1.67	B03-016	0.76	0.76	0.57	Normal	95% Student's-t UCL	1.11	No	1.11	8	0.03	0.07	0.04	5	1.08
Uranium-238	pCi/g	9	0	2.17589	36	B03-016	16	16	12	Normal	95% Student's-t UCL	23	No	23.04	14	0.81	1.06	0.82	5	22.22
Total Soil																				
Radium-226	pCi/g	8	0	0.29	2.03	B03-016	1.06	1.06	0.59	Normal	95% Student's-t UCL	1.45	No	1.45	0.7	1.02	1.37	1.04	3	0.41
Radium-228	pCi/g	8	0	0.21	1.42	B03-016	0.84	0.84	0.33	Normal	95% Student's-t UCL	1.06	No	1.06	1.1	0.72	1.25	0.80	4	0.26
Thorium-228	pCi/g	16	0	0.26	1.78	B03-025	1.04	1.04	0.44	Normal	95% Student's-t UCL	1.23	No	1.23	NA	0.85	1.11	0.89	7	0.34
Thorium-230	pCi/g	16	0	0.42	1.96	B03-025	1.13	1.13	0.45	Normal	95% Student's-t UCL	1.33	No	1.33	NA	0.88	1.17	0.90	8	0.43
Thorium-232	pCi/g	16	0	0.31	1.48	B03-025	0.91	0.91	0.37	Normal	95% Student's-t UCL	1.07	No	1.07	1.1	0.80	1.07	0.83	7	0.24
Uranium-234	pCi/g	16	0	0.82	399	B03-014	39	39	97	Gamma	95% Adjusted Gamma UCL	95	No	94.80	13	0.68	0.92	0.71	11	94.09
Uranium-235	pCi/g	16	0	0.061	19	B03-014	1.92	1.92	4.67	Gamma	95% Adjusted Gamma UCL	4.54	No	4.54	8	0.03	0.07	0.03	11	4.51
Uranium-238	pCi/g	16	0	0.79	396	B03-014	40	40	96	Gamma	95% Adjusted Gamma UCL	96	No	95.50	14	0.70	1.02	0.74	11	94.76
Sediment																				
Radium-226	pCi/g	14	0	0.13	2.76	A08-B3-013	0.95	0.95	1.02	Lognormal	95% Chebyshev (MVUE) UCL	2.19	No	2.19	0.7	1.00	1.00	1.00	4	1.19
Radium-228	pCi/g	14	0	-1.30	2.00	A08-B3-013	0.42	0.42	0.76	None [f]	95% Chebyshev (Mean,Sd) UCL	1.31	No	1.31	1.1	0.60	0.60	0.60	4	0.71
Thorium-228	pCi/g	14	0	0.17	2.19	A08-B3-014	0.74	0.74	0.69	Gamma	95% Approximate Gamma UCL	1.16	No	1.16	NA	0.80	1.00	0.83	4	0.33
Thorium-230	pCi/g	14	0	0.15	2.44	A08-B3-010	0.81	0.81	0.75	Gamma	95% Approximate Gamma UCL	1.26	No	1.26	NA	0.80	0.90	0.80	4	0.46
Thorium-232	pCi/g	14	0	0.10	2.16	A08-B3-014	0.68	0.68	0.73	Gamma	95% Approximate Gamma UCL	1.16	No	1.16	1.1	0.70	0.80	0.73	4	0.43
Uranium-234 [e]	pCi/g	14	0	1.86	277.70	A08-B3-008	30.04	30.04	71.70	Lognormal	95% Chebyshev (MVUE) UCL	52.97	No	52.97	13	0.70	0.80	0.77	14	52.20
Uranium-235	pCi/g	14	0	0.12	14.47	A08-B3-008	1.58	1.58	3.73	Lognormal	95% Chebyshev (MVUE) UCL	2.84	No	2.84	8	0.04	0.07	0.05	14	2.79
Uranium-238 [e]	pCi/g	14	0	1.91	288.90	A08-B3-008	31.84	31.84	74.53	Lognormal	95% Chebyshev (MVUE) UCL	57.67	No	57.67	14	0.60	0.70	0.63	14	57.04
Surface Water																				
Radium-226	pCi/L	13	0	0.02	0.27	A08-B3-013	0.11	0.11	0.08	Normal	95%Student's-t UCL	0.15	No	0.15	NA	0.13	0.20	0.13	5	0.02
Radium-228	pCi/L	13	0	-0.86	0.78	A08-B3-013	0.20	0.20	0.41	Normal	95%Student's-t UCL	0.39	No	0.39	NA	0.30	0.40	0.33	5	0.06
Thorium-228	pCi/L	12	0	-0.03	0.18	A08-B3-013	0.07	0.07	0.06	Normal	95%Student's-t UCL	0.10	No	0.10	NA	0.13	0.30	0.20	0	0.00
Thorium-230	pCi/L	12	0	0.04	0.43	A08-B3-006	0.18	0.18	0.12	Normal	95%Student's-t UCL	0.24	No	0.24	NA	0.18	0.20	0.20	4	0.04
Thorium-232	pCi/L	12	0	-0.03	0.12	A08-B3-009	0.03	0.03	0.05	Normal	95%Student's-t UCL	0.06	No	0.06	NA	0.00	0.05	0.01	7	0.05
Uranium-234	pCi/L	12	0	0.74	29.60	A08-B3-015	10.90	10.90	10.14	Normal	95%Student's-t UCL	16.16	No	16.16	NA	0.15	0.20	0.17	12	15.99
Uranium-235	pCi/L	12	0	0.05	1.82	A08-B3-015	0.56	0.56	0.59	Gamma	95% Approximate Gamma UCL	1.05	No	1.05	NA	0.03	0.06	0.04	12	1.01
Uranium-238	pCi/L	12	0	0.62	32.80	A08-B3-015	11.78	11.78	11.20	None [f]	95% Hall's Bootstrap UCL [g]	16.79	No	16.79	NA	0.10	0.10	0.10	12	16.69

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
EU4 - Building 4/9																				
Static Measurements (Beta)																				
Beta [c]	pCi/g	788	0	-1.25	40.52	49-100740-S-105	1.49	1.49	0.41	Normal	95% Student's-t UCL	1.68	No	1.68	NA	NA	NA	NA	NA	1.68
Radium-226	pCi/g	788	0	0.00	0.00	49-100740-S-105	0.00	0.00	0.00	Normal	95% Student's-t UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Radium-228	pCi/g	788	0	0.00	1.09	49-100740-S-105	0.04	0.04	0.01	Normal	95% Student's-t UCL	0.05	No	0.05	NA	NA	NA	NA	NA	0.05
Thorium-228	pCi/g	788	0	0.00	1.09	49-100740-S-105	0.04	0.04	0.01	Normal	95% Student's-t UCL	0.05	No	0.05	NA	NA	NA	NA	NA	0.05
Thorium-230	pCi/g	788	0	0.00	0.00	49-100740-S-105	0.00	0.00	0.00	Normal	95% Student's-t UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Thorium-232	pCi/g	788	0	0.00	1.09	49-100740-S-105	0.04	0.04	0.01	Normal	95% Student's-t UCL	0.05	No	0.05	NA	NA	NA	NA	NA	0.05
Uranium-234	pCi/g	788	0	0.00	38.58	49-100740-S-105	1.42	1.42	0.39	Normal	95% Student's-t UCL	1.60	No	1.60	NA	NA	NA	NA	NA	1.60
Uranium-235	pCi/g	788	0	0.00	0.85	49-100740-S-105	0.03	0.03	0.01	Normal	95% Student's-t UCL	0.04	No	0.04	NA	NA	NA	NA	NA	0.04
Uranium-238	pCi/g	788	0	0.00	38.58	49-100740-S-105	1.42	1.42	0.39	Normal	95% Student's-t UCL	1.60	No	1.60	NA	NA	NA	NA	NA	1.60
Building Material																				
Radium-226	pCi/g	3	0	0.33	1.35	B04&B09-BM-001	0.73	0.73	0.54	NA	NA	NA	NA	1.35	NA	1.96	1.70	0.68	1	0.67
Radium-228	pCi/g	3	0	-0.19	1.11	B04&B09-BM-001	0.42	0.42	0.66	NA	NA	NA	NA	1.11	NA	1.82	1.48	0.13	2	0.98
Thorium-228	pCi/g	3	0	0.22	1.09	B04&B09-BM-001	0.61	0.61	0.44	NA	NA	NA	NA	1.09	NA	2.00	1.73	0.67	1	0.42
Thorium-230	pCi/g	3	0	0.45	0.93	B04&B09-BM-001	0.67	0.67	0.24	NA	NA	NA	NA	0.93	NA	2.32	2.02	0.83	1	0.10
Thorium-232	pCi/g	3	0	0.38	1.01	B04&B09-BM-001	0.59	0.59	0.36	NA	NA	NA	NA	1.01	NA	2.13	1.83	0.67	1	0.34
Uranium-234 [d]	pCi/g	3	0	0.44	1.90	B04&B09-BM-001	1.22	1.22	0.74	NA	NA	NA	NA	1.90	NA	4.63	4.01	1.54	1	0.36
Uranium-235	pCi/g	3	0	0.008	0.07	B04&B09-BM-001	0.04	0.04	0.03	NA	NA	NA	NA	0.07	NA	0.39	0.27	0.08	0	0.00
Uranium-238 [d]	pCi/g	3	0	0.4	1.79	B04&B09-BM-001	1.15	1.15	0.70	NA	NA	NA	NA	1.79	NA	5.22	4.52	1.74	1	0.05
Surface Soil																				
Radium-226	pCi/g	5	0	0.36	1.93	B04-09-018	1.11	1.11	0.67	Normal	95% Student's-t UCL	1.75	No	1.75	0.7	1.11	1.37	1.11	1	0.65
Radium-228	pCi/g	5	0	0.1	1.03	B04-09-015	0.60	0.60	0.34	Normal	95% Student's-t UCL	0.92	No	0.92	1.1	0.73	1.26	0.77	1	0.15
Thorium-228	pCi/g	9	0	0.47	1.36	B04-09-027	1.03	1.03	0.29	Normal	95% Student's-t UCL	1.21	No	1.21	NA	0.84	1.10	0.87	3	0.34
Thorium-230	pCi/g	9	0	0.37	1.41	B04-09-027	0.93	0.93	0.42	Normal	95% Student's-t UCL	1.19	No	1.19	NA	0.88	1.18	0.91	1	0.29
Thorium-232	pCi/g	9	0	0.29	1.42	B04-09-017	0.94	0.94	0.35	Normal	95% Student's-t UCL	1.16	No	1.16	1.1	0.80	1.02	0.82	3	0.34
Uranium-234 [h]	pCi/g	9	0	1.63	17	B04-09-015	5.07	5.07	4.81	Lognormal	95% H-UCL	9.84	No	9.84	13	0.78	0.93	0.78	4	9.06
Uranium-235	pCi/g	9	0	0.056	0.72	B04-09-015	0.24	0.24	0.21	Gamma	95% Approximate Gamma UCL	0.41	No	0.41	8	0.03	0.07	0.04	4	0.37
Uranium-238 [h]	pCi/g	9	0	1.7	20	B04-09-015	6.77	6.77	6.58	Gamma	95% Approximate Gamma UCL	12.69	No	12.69	14	0.81	1.06	0.82	4	11.87
Total Soil																				
Radium-226	pCi/g	10	0	0.36	1.94	B04-09-025	1.32	1.32	0.54	Normal	95% Student's-t UCL	1.63	No	1.63	0.7	1.02	1.37	1.04	7	0.59
Radium-228	pCi/g	10	0	0.1	1.17	B04-09-025	0.81	0.81	0.33	Normal	95% Student's-t UCL	1.01	No	1.01	1.1	0.72	1.25	0.80	5	0.21
Thorium-228	pCi/g	18	0	0.4	1.45	B04-09-025	1.07	1.07	0.29	Normal	95% Student's-t UCL	1.19	No	1.19	NA	0.85	1.11	0.89	12	0.30
Thorium-230	pCi/g	18	0	0.37	2.02	B04-09-025	1.13	1.13	0.44	Normal	95% Student's-t UCL	1.31	No	1.31	NA	0.88	1.17	0.90	11	0.40
Thorium-232	pCi/g	18	0	0.29	1.42	B04-09-017	1.01	1.01	0.32	Normal	95% Student's-t UCL	1.14	No	1.14	1.1	0.80	1.07	0.83	12	0.31
Uranium-234	pCi/g	18	0	0.73795	16.50	B04-09-015	3.74	3.74	3.94	Lognormal	97.5% Chebyshev (MVUE) UCL [g]	8.65	No	8.65	13	0.68	0.92	0.71	14	7.94
Uranium-235	pCi/g	18	0	0	0.72	B04-09-015	0.16	0.16	0.18	None [f]	95% Chebyshev (Mean, Sd) UCL	0.34	No	0.34	8	0.03	0.07	0.03	12	0.31
Uranium-238	pCi/g	18	0	0.904756	20	B04-09-015	4.73	4.73	5.37	Lognormal	95% H-UCL	8.67	No	8.67	14	0.70	1.02	0.74	14	7.93

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Sediment																				
Radium-226	pCi/g	5	0	0.26	0.56	A08-B4-002	0.44	0.44	0.11	Normal	95%Student's-t UCL	0.54	No	0.54	0.7	1.00	1.00	1.00	0	0.00
Radium-228	pCi/g	5	0	0.20	0.58	A08-B4-003	0.40	0.40	0.18	Normal	95%Student's-t UCL	0.57	No	0.57	1.1	0.60	0.60	0.60	0	0.00
Thorium-228	pCi/g	5	0	0.16	0.35	A08-B4-001	0.26	0.26	0.07	Normal	95%Student's-t UCL	0.33	No	0.33	NA	0.80	1.00	0.83	0	0.00
Thorium-230	pCi/g	5	0	0.23	0.45	A08-B4-003	0.33	0.33	0.08	Normal	95%Student's-t UCL	0.41	No	0.41	NA	0.80	0.90	0.80	0	0.00
Thorium-232	pCi/g	5	0	0.13	0.26	A08-B4-001	0.19	0.19	0.05	Normal	95%Student's-t UCL	0.24	No	0.24	1.1	0.70	0.80	0.73	0	0.00
Uranium-234 [e]	pCi/g	5	0	4.00	18.40	A08-B4-003	9.94	9.94	6.29	Normal	95%Student's-t UCL	15.94	No	15.94	13	0.70	0.80	0.77	5	15.17
Uranium-235	pCi/g	5	0	0.22	0.83	A08-B4-003	0.49	0.49	0.31	Normal	95%Student's-t UCL	0.78	No	0.78	8	0.04	0.07	0.05	5	0.73
Uranium-238 [e]	pCi/g	5	0	4.53	20.60	A08-B4-003	11.20	11.20	7.16	Normal	95%Student's-t UCL	18.03	No	18.03	14	0.60	0.70	0.63	5	17.40
Surface Water																				
Radium-226	pCi/L	5	0	-0.04	0.17	A08-B4-001	0.08	0.08	0.08	Normal	95%Student's-t UCL	0.15	No	0.15	NA	0.13	0.20	0.13	1	0.02
Radium-228	pCi/L	5	0	-0.33	0.63	A08-B4-005	0.27	0.27	0.38	Normal	95%Student's-t UCL	0.63	Yes	0.63	NA	0.30	0.40	0.33	2	0.30
Thorium-228	pCi/L	5	0	0.04	0.11	A08-B4-004	0.08	0.08	0.03	Normal	95%Student's-t UCL	0.11	No	0.11	NA	0.13	0.30	0.20	0	0.00
Thorium-230	pCi/L	5	0	0.05	0.30	A08-B4-003	0.11	0.11	0.10	Lognormal	95% H-UCL	0.40	Yes	0.30	NA	0.18	0.20	0.20	1	0.10
Thorium-232	pCi/L	5	0	-0.02	0.05	A08-B4-002	0.00	0.00	0.03	Normal	95%Student's-t UCL	0.03	No	0.03	NA	0.00	0.05	0.01	2	0.02
Uranium-234 [e]	pCi/L	5	0	0.42	4.84	A08-B4-003	2.01	2.01	1.79	Normal	95%Student's-t UCL	3.71	No	3.71	NA	0.15	0.20	0.17	5	3.54
Uranium-235	pCi/L	5	0	0.02	0.23	A08-B4-003	0.11	0.11	0.07	Normal	95%Student's-t UCL	0.19	No	0.19	NA	0.03	0.06	0.04	4	0.15
Uranium-238 [e]	pCi/L	5	0	0.43	8.90	A08-B4-003	2.81	2.81	3.52	Normal	95%Student's-t UCL	11.76	Yes	8.90	NA	0.10	0.10	0.10	5	8.80
EU5 - Building 5																				
Static Measurements (Beta)																				
Beta [c]	pCi/g	38	0	0.25	2.91	3-100740-S-191	1.34	1.34	-2.12	Normal	95% Student's-t UCL	1.52	No	1.52	NA	NA	NA	NA	NA	1.52
Radium-226	pCi/g	38	0	0.00	0.00	3-100740-S-191	0.00	0.00	0.00	Normal	95% Student's-t UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Radium-228	pCi/g	38	0	0.00	0.08	3-100740-S-191	0.04	0.04	-0.06	Normal	95% Student's-t UCL	0.04	No	0.04	NA	NA	NA	NA	NA	0.04
Thorium-228	pCi/g	38	0	0.00	0.08	3-100740-S-191	0.04	0.04	-0.06	Normal	95% Student's-t UCL	0.04	No	0.04	NA	NA	NA	NA	NA	0.04
Thorium-230	pCi/g	38	0	0.00	0.00	3-100740-S-191	0.00	0.00	0.00	Normal	95% Student's-t UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Thorium-232	pCi/g	38	0	0.00	0.08	3-100740-S-191	0.04	0.04	-0.06	Normal	95% Student's-t UCL	0.04	No	0.04	NA	NA	NA	NA	NA	0.04
Uranium-234	pCi/g	38	0	0.00	2.77	3-100740-S-191	1.28	1.28	-2.02	Normal	95% Student's-t UCL	1.44	No	1.44	NA	NA	NA	NA	NA	1.44
Uranium-235	pCi/g	38	0	0.00	0.06	3-100740-S-191	0.03	0.03	-0.04	Normal	95% Student's-t UCL	0.03	No	0.03	NA	NA	NA	NA	NA	0.03
Uranium-238	pCi/g	38	0	0.00	2.77	3-100740-S-191	1.28	1.28	-2.02	Normal	95% Student's-t UCL	1.44	No	1.44	NA	NA	NA	NA	NA	1.44
Building Materials																				
Radium-226	pCi/g	1	0	0.4	0.40	B05-BM-001	0.40	0.40	NA	NA	NA	NA	NA	0.40	NA	1.96	1.70	0.68	0	0.00
Radium-228	pCi/g	1	0	-0.14	-0.14	B05-BM-001	-0.14	-0.14	NA	NA	NA	NA	NA	-0.14	NA	1.82	1.48	0.13	0	0.00
Thorium-228	pCi/g	1	0	0.35	0.35	B05-BM-001	0.35	0.35	NA	NA	NA	NA	NA	0.35	NA	2.00	1.73	0.67	0	0.00
Thorium-230	pCi/g	1	0	0.67	0.67	B05-BM-001	0.67	0.67	NA	NA	NA	NA	NA	0.67	NA	2.32	2.02	0.83	0	0.00
Thorium-232	pCi/g	1	0	0.34	0.34	B05-BM-001	0.34	0.34	NA	NA	NA	NA	NA	0.34	NA	2.13	1.83	0.67	0	0.00
Uranium-234	pCi/g	1	0	0.47	0.47	B05-BM-001	0.47	0.47	NA	NA	NA	NA	NA	0.47	NA	4.63	4.01	1.54	0	0.00
Uranium-235	pCi/g	1	0	0.037	0.04	B05-BM-001	0.04	0.04	NA	NA	NA	NA	NA	0.04	NA	0.39	0.27	0.08	0	0.00
Uranium-238	pCi/g	1	0	0.4	0.40	B05-BM-001	0.40	0.40	NA	NA	NA	NA	NA	0.40	NA	5.22	4.52	1.74	0	0.00

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
EU6 - Building 6																				
Static Measurements (Beta)																				
Beta [c]	pCi/g	101	0	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Radium-226	pCi/g	101	0	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Radium-228	pCi/g	101	0	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Thorium-228	pCi/g	101	0	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Thorium-230	pCi/g	101	0	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Thorium-232	pCi/g	101	0	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Uranium-234	pCi/g	101	0	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Uranium-235	pCi/g	101	0	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Uranium-238	pCi/g	101	0	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Building Material																				
Radium-226	pCi/g	5	0	-0.03	2.19	B06-BM-005	0.93	0.93	0.95	Normal	95%Student's-t UCL	1.84	No	1.84	NA	1.96	1.70	0.68	3	1.16
Radium-228	pCi/g	5	0	-0.28	1.29	B06-BM-005	0.56	0.56	0.72	Normal	95%Student's-t UCL	1.25	No	1.25	NA	1.82	1.48	0.13	3	1.12
Thorium-228	pCi/g	5	0	0.075	1.66	B06-BM-005	0.94	0.94	0.78	Normal	95%Student's-t UCL	1.68	Yes	1.66	NA	2.00	1.73	0.67	3	0.99
Thorium-230	pCi/g	5	0	0.148	2.15	B06-BM-005	0.96	0.96	0.84	Normal	95%Student's-t UCL	1.76	No	1.76	NA	2.32	2.02	0.83	3	0.93
Thorium-232	pCi/g	5	0	0.008	1.67	B06-BM-005	0.90	0.90	0.77	Normal	95%Student's-t UCL	1.64	No	1.64	NA	2.13	1.83	0.67	3	0.97
Uranium-234	pCi/g	5	0	0.97	4.93	B06-BM-003	2.51	2.51	1.76	Normal	95%Student's-t UCL	4.19	No	4.19	NA	4.63	4.01	1.54	2	2.65
Uranium-235	pCi/g	5	0	0.063	0.20	B06-BM-003	0.12	0.12	0.07	Normal	95%Student's-t UCL	0.19	No	0.19	NA	0.39	0.27	0.08	3	0.11
Uranium-238	pCi/g	5	0	0.91	4.96	B06-BM-003	2.48	2.48	1.86	Normal	95%Student's-t UCL	4.24	No	4.24	NA	5.22	4.52	1.74	2	2.50
Surface Soil																				
Radium-226	pCi/g	3	0	0.52	3.60	B06-021	1.59	1.59	1.74	NA	NA	NA	NA	3.60	0.7	1.11	1.37	1.11	1	2.23
Radium-228	pCi/g	3	0	0.54	16	B06-021	5.92	5.92	8.99	NA	NA	NA	NA	16.30	1.1	0.73	1.26	0.77	2	15.04
Thorium-228	pCi/g	5	0	0.52	23	B06-021	5.40	5.40	10.07	Lognormal	99% Chebyshev (MVUE) UCL	26.84	Yes	23.40	NA	0.84	1.10	0.87	1	22.30
Thorium-230	pCi/g	5	0	0.45	1.98	B06-021	0.91	0.91	0.61	Gamma	95% Approximate Gamma UCL	1.81	No	1.81	NA	0.88	1.18	0.91	1	0.63
Thorium-232	pCi/g	5	0	0.31	22	B06-021	4.99	4.99	9.46	Gamma	95% Adjusted Gamma UCL	95.37	Yes	21.90	1.1	0.80	1.02	0.82	1	20.88
Uranium-234	pCi/g	5	0	8.68	66	B06-005	22	22	25	None [f]	95% Chebyshev (Mean, Sd) UCL	70	Yes	66.00	13	0.78	0.93	0.78	3	65.07
Uranium-235	pCi/g	5	0	0.48	3.07	B06-005	1.05	1.05	1.13	None [f]	95% Chebyshev (Mean, Sd) UCL	3.25	Yes	3.07	8	0.03	0.07	0.04	3	3.00
Uranium-238	pCi/g	5	0	10.4	68	B06-005	24	24	25	None [f]	95% Chebyshev (Mean, Sd) UCL	72	Yes	67.60	14	0.81	1.06	0.82	3	66.54
Total Soil																				
Radium-226	pCi/g	6	0	0.52	3.60	B06-021	1.67	1.67	1.44	Gamma	95% Approximate Gamma UCL	3.83	Yes	3.60	0.7	1.02	1.37	1.04	2	2.56
Radium-228	pCi/g	6	0	0.54	16	B06-021	5.67	5.67	7.22	Lognormal	95% Chebyshev (MVUE) UCL	18.27	Yes	16.30	1.1	0.72	1.25	0.80	3	15.51
Thorium-228	pCi/g	10	0	0.52	23	B06-021	5.57	5.57	8.95	None [f]	99% Chebyshev (Mean, Sd) UCL	33.74	Yes	23.40	NA	0.85	1.11	0.89	5	22.52
Thorium-230	pCi/g	10	0	0.45	2.48	B06-021	1.04	1.04	0.66	Gamma	95% Approximate Gamma UCL	1.49	No	1.49	NA	0.88	1.17	0.90	4	0.58
Thorium-232	pCi/g	10	0	0.31	22	B06-021	5.19	5.19	8.25	Lognormal	95% Chebyshev (MVUE) UCL	13.76	No	13.76	1.1	0.80	1.07	0.83	5	12.93
Uranium-234	pCi/g	10	0	1.65	82	B06-006	29	29	28	Gamma	95% Approximate Gamma UCL	57	No	57.22	13	0.68	0.92	0.71	7	56.51
Uranium-235	pCi/g	10	0	0.111	4.36	B06-006	1.53	1.53	1.52	Gamma	95% Approximate Gamma UCL	3.02	No	3.02	8	0.03	0.07	0.03	7	2.99
Uranium-238	pCi/g	10	0	1.94	107	B06-006	30	30	33	Gamma	95% Approximate Gamma UCL	60	No	59.78	14	0.70	1.02	0.74	7	59.04

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Sediment																				
Radium-226	pCi/g	2	0	0.552289	0.68	A08-B6-001	0.62	0.62	0.09	NA	NA	NA	NA	0.68	0.7	1.00	1.00	1.00	0	0.00
Radium-228	pCi/g	2	0	0.415399	1.26	A08-B6-001	0.84	0.84	0.60	NA	NA	NA	NA	1.26	1.1	0.60	0.60	0.60	1	0.66
Thorium-228	pCi/g	2	0	1.12	2.06	A08-B6-001	1.59	1.59	0.67	NA	NA	NA	NA	2.06	NA	0.80	1.00	0.83	2	1.23
Thorium-230	pCi/g	2	0	0.67	0.72	A08-B6-001	0.70	0.70	0.04	NA	NA	NA	NA	0.72	NA	0.80	0.90	0.80	0	0.00
Thorium-232	pCi/g	2	0	0.91	2.00	A08-B6-001	1.45	1.45	0.77	NA	NA	NA	NA	2.00	1.1	0.70	0.80	0.73	2	1.27
Uranium-234	pCi/g	2	0	42.3	48.84	A08-B6-001	45.57	45.57	4.62	NA	NA	NA	NA	48.84	13	0.70	0.80	0.77	2	48.07
Uranium-235	pCi/g	2	0	2.2	2.63	A08-B6-001	2.42	2.42	0.30	NA	NA	NA	NA	2.63	8	0.04	0.07	0.05	2	2.58
Uranium-238	pCi/g	2	0	41.5	50.81	A08-B6-001	46.16	46.16	6.58	NA	NA	NA	NA	50.81	14	0.60	0.70	0.63	2	50.18
EU7 - Building 8																				
Static Measurements (Beta)																				
Beta [c]	pCi/g	114	0	-1.55	76.93	08-2100740-S-248	3.49	3.49	10.84	Nonparametric	95% Chebyshev(Mean,Sd) UCL	9.04	No	9.04	NA	NA	NA	NA	NA	9.04
Radium-226	pCi/g	114	0	0.00	0.00	08-2100740-S-248	0.00	0.00	0.00	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Radium-228	pCi/g	114	0	0.00	2.08	08-2100740-S-248	0.09	0.09	0.29	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.24	No	0.24	NA	NA	NA	NA	NA	0.24
Thorium-228	pCi/g	114	0	0.00	2.08	08-2100740-S-248	0.09	0.09	0.29	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.24	No	0.24	NA	NA	NA	NA	NA	0.24
Thorium-230	pCi/g	114	0	0.00	0.00	08-2100740-S-248	0.00	0.00	0.00	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Thorium-232	pCi/g	114	0	0.00	2.08	08-2100740-S-248	0.09	0.09	0.29	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.24	No	0.24	NA	NA	NA	NA	NA	0.24
Uranium-234	pCi/g	114	0	0.00	73.24	08-2100740-S-248	3.32	3.32	10.32	Nonparametric	95% Chebyshev(Mean,Sd) UCL	8.61	No	8.61	NA	NA	NA	NA	NA	8.61
Uranium-235	pCi/g	114	0	0.00	1.62	08-2100740-S-248	0.07	0.07	0.23	Nonparametric	95% Chebyshev(Mean,Sd) UCL	0.19	No	0.19	NA	NA	NA	NA	NA	0.19
Uranium-238	pCi/g	114	0	0.00	73.24	08-2100740-S-248	3.32	3.32	10.32	Nonparametric	95% Chebyshev(Mean,Sd) UCL	8.61	No	8.61	NA	NA	NA	NA	NA	8.61
Building Materials																				
Radium-226	pCi/g	1	0	0.49	0.49	B08-BM-001	0.49	0.49	NA	NA	NA	NA	NA	0.49	NA	1.96	1.70	0.68	0	0.00
Radium-228	pCi/g	1	0	0.06	0.06	B08-BM-001	0.06	0.06	NA	NA	NA	NA	NA	0.06	NA	1.82	1.48	0.13	0	0.00
Thorium-228	pCi/g	1	0	0.37	0.37	B08-BM-001	0.37	0.37	NA	NA	NA	NA	NA	0.37	NA	2.00	1.73	0.67	0	0.00
Thorium-230	pCi/g	1	0	0.46	0.46	B08-BM-001	0.46	0.46	NA	NA	NA	NA	NA	0.46	NA	2.32	2.02	0.83	0	0.00
Thorium-232	pCi/g	1	0	0.23	0.23	B08-BM-001	0.23	0.23	NA	NA	NA	NA	NA	0.23	NA	2.13	1.83	0.67	0	0.00
Uranium-234	pCi/g	1	0	5.94	5.94	B08-BM-001	5.94	5.94	NA	NA	NA	NA	NA	5.94	NA	4.63	4.01	1.54	1	4.40
Uranium-235	pCi/g	1	0	0.31	0.31	B08-BM-001	0.31	0.31	NA	NA	NA	NA	NA	0.31	NA	0.39	0.27	0.08	1	0.23
Uranium-238	pCi/g	1	0	6.44	6.44	B08-BM-001	6.44	6.44	NA	NA	NA	NA	NA	6.44	NA	5.22	4.52	1.74	1	4.70
Surface Soil																				
Radium-226	pCi/g	3	0	0.57	2.14	B08-017	1.24	1.24	0.81	NA	NA	NA	NA	2.14	0.7	1.11	1.37	1.11	0	1.03
Radium-228	pCi/g	3	0	1.55	11.00	B08-017	5.11	5.11	5.14	NA	NA	NA	NA	11.00	1.1	0.73	1.26	0.77	1	10.23
Thorium-228	pCi/g	6	0	0.613642	5.07	B08-023	1.98	1.98	1.63	Normal	95% Student's-t UCL	3.32	No	3.32	NA	0.84	1.10	0.87	2	2.45
Thorium-230	pCi/g	6	0	0.61	8.47	B08-017	2.38	2.38	3.04	Gamma	95% Approximate Gamma UCL	6.71	No	6.71	NA	0.88	1.18	0.91	2	5.80
Thorium-232	pCi/g	6	0	0.484471	4.52	B08-023	1.85	1.85	1.44	Normal	95% Student's-t UCL	3.03	No	3.03	1.1	0.80	1.02	0.82	2	2.21
Uranium-234	pCi/g	6	0	166	18,514	B08-017	3,844	3,844	7,281	Gamma	95% Adjusted Gamma UCL	44,178	Yes	18514	13	0.78	0.93	0.78	2	18513
Uranium-235	pCi/g	6	0	9.7	1,022	B08-017	212	212	402	Gamma	95% Adjusted Gamma UCL	2,374	Yes	1022	8	0.03	0.07	0.04	2	1022
Uranium-238	pCi/g	6	0	245	17,919	B08-017	3,792	3,792	7,014	Gamma	95% Adjusted Gamma UCL	39,136	Yes	17919	14	0.81	1.06	0.82	2	17918

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Total Soil																				
Radium-226	pCi/g	6	0	0.57	2.14	B08-017	1.17	1.17	0.59	Normal	95% Student's-t UCL	1.66	No	1.66	0.7	1.02	1.37	1.04	3	0.62
Radium-228	pCi/g	6	0	1.1	11	B08-017	3.65	3.65	3.67	Gamma	95% Approximate Gamma UCL	8.31	No	8.31	1.1	0.72	1.25	0.80	5	7.52
Thorium-228	pCi/g	12	0	0.613642	7.63	B08-023	2.25	2.25	2.08	Gamma	95% Approximate Gamma UCL	3.52	No	3.52	NA	0.85	1.11	0.89	7	2.64
Thorium-230	pCi/g	12	0	0.5	8.47	B08-017	1.98	1.98	2.19	Gamma	95% Approximate Gamma UCL	3.20	No	3.20	NA	0.88	1.17	0.90	7	2.30
Thorium-232	pCi/g	12	0	0.484471	7.14	B08-023	2.10	2.10	1.93	Gamma	95% Approximate Gamma UCL	3.32	No	3.32	1.1	0.80	1.07	0.83	7	2.48
Uranium-234	pCi/g	12	0	121	18,514	B08-017	2,469	2,469	5,184	Gamma	95% Approximate Gamma UCL	6,035	No	6035	13	0.68	0.92	0.71	10	6034
Uranium-235	pCi/g	12	0	4.8	1,022	B08-017	134	134	287	Gamma	95% Approximate Gamma UCL	329	No	329	8	0.03	0.07	0.03	10	329
Uranium-238	pCi/g	12	0	142	17,919	B08-017	2,465	2,465	4,993	Gamma	95% Approximate Gamma UCL	5,722	No	5722	14	0.70	1.02	0.74	10	5721
Sediment																				
Radium-226	pCi/g	2	0	0.57	0.71	A08-B8-001	0.64	0.64	0.10	NA	NA	NA	NA	0.71	0.7	1.00	1.00	1.00	0	0.00
Radium-228	pCi/g	2	0	1.075299	1.08	A08-B8-002	1.08	1.08	0.00	NA	NA	NA	NA	1.08	1.1	0.60	0.60	0.60	2	0.48
Thorium-228	pCi/g	2	0	1.82	2.56	A08-B8-002	2.19	2.19	0.52	NA	NA	NA	NA	2.56	NA	0.80	1.00	0.83	2	1.73
Thorium-230	pCi/g	2	0	0.64	1.06	A08-B8-002	0.85	0.85	0.30	NA	NA	NA	NA	1.06	NA	0.80	0.90	0.80	1	0.26
Thorium-232	pCi/g	2	0	1.69	2.58	A08-B8-002	2.14	2.14	0.63	NA	NA	NA	NA	2.58	1.1	0.70	0.80	0.73	2	1.85
Uranium-234 [e]	pCi/g	2	0	92.08	199.00	A08-B8-002	145.54	145.54	75.60	NA	NA	NA	NA	199.00	13	0.70	0.80	0.77	2	198.23
Uranium-235	pCi/g	2	0	4.245721	11.40	A08-B8-002	7.82	7.82	5.06	NA	NA	NA	NA	11.40	8	0.04	0.07	0.05	2	11.35
Uranium-238 [e]	pCi/g	2	0	91.63741	224.00	A08-B8-002	157.82	157.82	93.59	NA	NA	NA	NA	224.00	14	0.60	0.70	0.63	2	223.37
Surface Water																				
Radium-226	pCi/L	2	0	0.09	0.10	A08-B8-002	0.10	0.10	0.01	NA	NA	NA	NA	0.10	NA	0.13	0.20	0.13	0	0.00
Radium-228	pCi/L	2	0	0.27	0.69	A08-B8-001	0.48	0.48	0.30	NA	NA	NA	NA	0.69	NA	0.30	0.40	0.33	1	0.36
Thorium-228	pCi/L	2	0	0.07	0.10	A08-B8-001	0.09	0.09	0.02	NA	NA	NA	NA	0.10	NA	0.13	0.30	0.20	0	0.00
Thorium-230	pCi/L	2	0	-0.003	0.17	A08-B8-001	0.08	0.08	0.12	NA	NA	NA	NA	0.17	NA	0.18	0.20	0.20	0	0.00
Thorium-232	pCi/L	2	0	-0.009	-0.01	A08-B8-001	-0.01	-0.01	0.00	NA	NA	NA	NA	-0.01	NA	0.00	0.05	0.01	0	0.00
Uranium-234	pCi/L	2	0	11.1	12.90	A08-B8-001	12.00	12.00	1.27	NA	NA	NA	NA	12.90	NA	0.15	0.20	0.17	2	12.73
Uranium-235	pCi/L	2	0	0.49	0.60	A08-B8-002	0.55	0.55	0.08	NA	NA	NA	NA	0.60	NA	0.03	0.06	0.04	2	0.56
Uranium-238	pCi/L	2	0	11.1	13.20	A08-B8-001	12.15	12.15	1.48	NA	NA	NA	NA	13.20	NA	0.10	0.10	0.10	2	13.10
EU8 - Building 24																				
Static Measurements (Beta)																				
Beta [c]	pCi/g	541	0	-1.91	163.89	24-100740-S-204	7.11	7.11	16.24	Nonparametric	97.5% Chebyshev(Mean,Sd) UCL	12.21	No	12.21	NA	NA	NA	NA	NA	12.21
Radium-226	pCi/g	541	0	0.00	0.00	24-100740-S-204	0.00	0.00	0.00	Nonparametric	97.5% Chebyshev(Mean,Sd) UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Radium-228	pCi/g	541	0	0.00	4.43	24-100740-S-204	0.19	0.19	0.44	Nonparametric	97.5% Chebyshev(Mean,Sd) UCL	0.33	No	0.33	NA	NA	NA	NA	NA	0.33
Thorium-228	pCi/g	541	0	0.00	4.43	24-100740-S-204	0.19	0.19	0.44	Nonparametric	97.5% Chebyshev(Mean,Sd) UCL	0.33	No	0.33	NA	NA	NA	NA	NA	0.33
Thorium-230	pCi/g	541	0	0.00	0.00	24-100740-S-204	0.00	0.00	0.00	Nonparametric	97.5% Chebyshev(Mean,Sd) UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Thorium-232	pCi/g	541	0	0.00	4.43	24-100740-S-204	0.19	0.19	0.44	Nonparametric	97.5% Chebyshev(Mean,Sd) UCL	0.33	No	0.33	NA	NA	NA	NA	NA	0.33
Uranium-234	pCi/g	541	0	0.00	156.03	24-100740-S-204	6.77	6.77	15.46	Nonparametric	97.5% Chebyshev(Mean,Sd) UCL	11.63	No	11.63	NA	NA	NA	NA	NA	11.63
Uranium-235	pCi/g	541	0	0.00	3.44	24-100740-S-204	0.15	0.15	0.34	Nonparametric	97.5% Chebyshev(Mean,Sd) UCL	0.26	No	0.26	NA	NA	NA	NA	NA	0.26
Uranium-238	pCi/g	541	0	0.00	156.03	24-100740-S-204	6.77	6.77	15.46	Nonparametric	97.5% Chebyshev(Mean,Sd) UCL	11.63	No	11.63	NA	NA	NA	NA	NA	11.63

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Building Material																				
Radium-226	pCi/g	4	0	0.28	1.59	B24SL-603-01	0.73	0.73	0.59	NA	NA	NA	NA	1.59	NA	1.96	1.70	0.68	1	0.91
Radium-228	pCi/g	4	0	-0.3	3.76	B24SL-603-01	1.02	1.02	1.87	NA	NA	NA	NA	3.76	NA	1.82	1.48	0.13	2	3.63
Thorium-228	pCi/g	6	0	0.26	17	B24SL-602-01	5.93	5.93	7.62	Gamma	95% Approximate Gamma UCL	29.27	Yes	16.80	NA	2.00	1.73	0.67	3	16.13
Thorium-230	pCi/g	6	0	0.42	4.06	B24SL-602-01	1.83	1.83	1.67	Normal	95% Student's-t UCL	3.21	No	3.21	NA	2.32	2.02	0.83	3	2.38
Thorium-232	pCi/g	6	0	0.26	16	B24SL-602-01	5.92	5.92	7.51	Gamma	95% Approximate Gamma UCL	29.46	Yes	16.44	NA	2.13	1.83	0.67	3	15.77
Uranium-234	pCi/g	6	0	0.26	2,110	B24SL-602-01	708	708	955	Gamma	95% Adjusted Gamma UCL	14,476	Yes	2,110.00	NA	4.63	4.01	1.54	4	2108
Uranium-235	pCi/g	5	0	0.057	94	B24SL-602-01	40	40	46	Normal	95% Student's-t UCL	84	No	83.94	NA	0.39	0.27	0.08	4	83.86
Uranium-238	pCi/g	6	0	0.33	2,169	B24SL-602-01	732	732	975	Gamma	95% Adjusted Gamma UCL	14,876	Yes	2,169.00	NA	5.22	4.52	1.74	4	2167
Surface Soil																				
Radium-226	pCi/g	4	0	0.63	1.14	B24-033	1.0	1.0	0.25	NA	NA	NA	NA	1.14	0.7	1.11	1.37	1.11	3	0.03
Radium-228	pCi/g	4	0	0.33	0.96	B24-028	0.72	0.72	0.30	NA	NA	NA	NA	0.96	1.1	0.73	1.26	0.77	2	0.19
Thorium-228	pCi/g	7	0	0.666587	1.17	B24-026	1.01	1.01	0.18	Normal	95% Student's-t UCL	1.14	No	1.14	NA	0.84	1.10	0.87	6	0.28
Thorium-230	pCi/g	7	0	0.489448	1.16	B24-026	0.93	0.93	0.22	Normal	95% Student's-t UCL	1.10	No	1.10	NA	0.88	1.18	0.91	5	0.19
Thorium-232	pCi/g	7	0	0.558049	1.17	B24-019	0.92	0.92	0.19	Normal	95% Student's-t UCL	1.05	No	1.05	1.1	0.80	1.02	0.82	6	0.23
Uranium-234	pCi/g	7	0	2.15	17	B24-021	8	8	6	Normal	95% Student's-t UCL	12	No	12	13	0.78	0.93	0.78	7	11.39
Uranium-235	pCi/g	7	0	0.124	1	B24-021	0	0	0	Normal	95% Student's-t UCL	1	No	1	8	0.03	0.07	0.04	7	0.47
Uranium-238	pCi/g	7	0	2.67	17	B24-021	8	8	6	Normal	95% Student's-t UCL	12	No	12	14	0.81	1.06	0.82	7	11.13
Total Soil																				
Radium-226	pCi/g	8	0	0.63	1.58	B24-019	1.15	1.15	0.27	Normal	95% Student's-t UCL	1.34	No	1.34	0.7	1.02	1.37	1.04	7	0.30
Radium-228	pCi/g	8	0	0.33	1.39	B24-019	0.91	0.91	0.31	Normal	95% Student's-t UCL	1.12	No	1.12	1.1	0.72	1.25	0.80	6	0.33
Thorium-228	pCi/g	14	0	0.666587	2.15	B24-019	1.20	1.20	0.35	Normal	95% Student's-t UCL	1.37	No	1.37	NA	0.85	1.11	0.89	13	0.48
Thorium-230	pCi/g	14	0	0.489448	1.73	B24-019	1.10	1.10	0.30	Normal	95% Student's-t UCL	1.25	No	1.25	NA	0.88	1.17	0.90	12	0.34
Thorium-232	pCi/g	14	0	0.558049	2.06	B24-019	1.08	1.08	0.35	Gamma	95% Approximate Gamma UCL	1.25	No	1.25	1.1	0.80	1.07	0.83	12	0.42
Uranium-234	pCi/g	14	0	0.79	17	B24-021	4.72	4.72	5.18	Gamma	95% Approximate Gamma UCL	8.03	No	8.03	13	0.68	0.92	0.71	14	7.32
Uranium-235	pCi/g	14	0	0.029	0.65	B24-021	0.22	0.22	0.20	Gamma	95% Approximate Gamma UCL	0.35	No	0.35	8	0.03	0.07	0.03	14	0.32
Uranium-238	pCi/g	14	0	0.7	17	B24-021	4.67	4.67	5.06	Gamma	95% Approximate Gamma UCL	7.82	No	7.82	14	0.70	1.02	0.74	14	7.08
Sediment																				
Radium-226	pCi/g	7	0	0.14	1.42	A08-B24-006	0.56	0.56	0.40	Lognormal	95% H-UCL	1.28	No	1.28	0.7	1.00	1.00	1.00	1	0.28
Radium-228	pCi/g	7	0	0.28	1.92	A08-B24-006	0.82	0.82	0.53	Normal	95% Student's-t UCL	1.21	No	1.21	1.1	0.60	0.60	0.60	5	0.61
Thorium-228	pCi/g	7	0	0.094	2.10	A08-B24-006	0.66	0.66	0.67	Gamma	95% Approximate Gamma UCL	1.44	No	1.44	NA	0.80	1.00	0.83	1	0.61
Thorium-230	pCi/g	7	0	0.35	1.27	A08-B24-006	0.59	0.59	0.31	Gamma	95% Approximate Gamma UCL	0.86	No	0.86	NA	0.80	0.90	0.80	1	0.06
Thorium-232	pCi/g	7	0	0.027	2.11	A08-B24-006	0.67	0.67	0.68	Gamma	95% Approximate Gamma UCL	1.72	No	1.72	1.1	0.70	0.80	0.73	2	0.99
Uranium-234	pCi/g	7	0	1.61	29.60	A08-B24-007	14	14	11	Normal	95% Student's-t UCL	21.96	No	21.96	13	0.70	0.80	0.77	7	21.19
Uranium-235	pCi/g	7	0	0.021	1.42	A08-B24-007	0.64	0.64	0.56	Normal	95% Student's-t UCL	1.05	No	1.05	8	0.04	0.07	0.05	6	1.00
Uranium-238	pCi/g	7	0	1.77	30.80	A08-B24-007	14	14	11	Normal	95% Student's-t UCL	22.44	No	22.44	14	0.60	0.70	0.63	7	21.81

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
EU9 - Building 35																				
Static Measurements (Beta)																				
Beta [c]	pCi/g	111	0	-0.95	3.69	35-100740-S-042	0.41	0.41	-1.95	Gamma	95% Approximate Gamma UCL	0.54	No	0.54	NA	NA	NA	NA	NA	0.54
Radium-226	pCi/g	111	0	0.00	0.00	35-100740-S-042	0.00	0.00	0.00	Gamma	95% Approximate Gamma UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Radium-228	pCi/g	111	0	0.00	0.10	35-100740-S-042	0.01	0.01	-0.05	Gamma	95% Approximate Gamma UCL	0.01	No	0.01	NA	NA	NA	NA	NA	0.01
Thorium-228	pCi/g	111	0	0.00	0.10	35-100740-S-042	0.01	0.01	-0.05	Gamma	95% Approximate Gamma UCL	0.01	No	0.01	NA	NA	NA	NA	NA	0.01
Thorium-230	pCi/g	111	0	0.00	0.00	35-100740-S-042	0.00	0.00	0.00	Gamma	95% Approximate Gamma UCL	0.00	No	0.00	NA	NA	NA	NA	NA	0.00
Thorium-232	pCi/g	111	0	0.00	0.10	35-100740-S-042	0.01	0.01	-0.05	Gamma	95% Approximate Gamma UCL	0.01	No	0.01	NA	NA	NA	NA	NA	0.01
Uranium-234	pCi/g	111	0	0.00	3.51	35-100740-S-042	0.39	0.39	-1.86	Gamma	95% Approximate Gamma UCL	0.51	No	0.51	NA	NA	NA	NA	NA	0.51
Uranium-235	pCi/g	111	0	0.00	0.08	35-100740-S-042	0.01	0.01	-0.04	Gamma	95% Approximate Gamma UCL	0.01	No	0.01	NA	NA	NA	NA	NA	0.01
Uranium-238	pCi/g	111	0	0.00	3.51	35-100740-S-042	0.39	0.39	-1.86	Gamma	95% Approximate Gamma UCL	0.51	No	0.51	NA	NA	NA	NA	NA	0.51
Building Materials																				
Radium-226	pCi/g	1	0	0.19	0.19	B35-001	0.19	0.19	NA	NA	NA	NA	NA	0.19	NA	1.96	1.70	0.68	0	0.00
Radium-228	pCi/g	1	0	0.16	0.16	B35-001	0.16	0.16	NA	NA	NA	NA	NA	0.16	NA	1.82	1.48	0.13	1	0.03
Thorium-228	pCi/g	1	0	0.2	0.20	B35-001	0.20	0.20	NA	NA	NA	NA	NA	0.20	NA	2.00	1.73	0.67	0	0.00
Thorium-230	pCi/g	1	0	0.27	0.27	B35-001	0.27	0.27	NA	NA	NA	NA	NA	0.27	NA	2.32	2.02	0.83	0	0.00
Thorium-232	pCi/g	1	0	0.222	0.22	B35-001	0.22	0.22	NA	NA	NA	NA	NA	0.22	NA	2.13	1.83	0.67	0	0.00
Uranium-234 [d]	pCi/g	1	0	0.093	0.09	B35-001	0.09	0.09	NA	NA	NA	NA	NA	0.09	NA	4.63	4.01	1.54	0	0.00
Uranium-235	pCi/g	1	0	0.034	0.03	B35-001	0.03	0.03	NA	NA	NA	NA	NA	0.03	NA	0.39	0.27	0.08	0	0.00
Uranium-238 [d]	pCi/g	1	0	0.118	0.12	B35-001	0.12	0.12	NA	NA	NA	NA	NA	0.12	NA	5.22	4.52	1.74	0	0.00
Surface Soil																				
Radium-226	pCi/g	1	0	0.67	0.67	B35-001	0.67	0.67	NA	NA	NA	NA	NA	0.67	0.7	1.11	1.37	1.11	0	0.00
Radium-228	pCi/g	1	0	1.96	1.96	B35-001	1.96	1.96	NA	NA	NA	NA	NA	1.96	1.1	0.73	1.26	0.77	1	1.19
Thorium-228	pCi/g	1	0	1.65	1.65	B35-001	1.65	1.65	NA	NA	NA	NA	NA	1.65	NA	0.84	1.10	0.87	1	0.79
Thorium-230	pCi/g	1	0	0.54	0.54	B35-001	0.54	0.54	NA	NA	NA	NA	NA	0.54	NA	0.88	1.18	0.91	0	0.00
Thorium-232	pCi/g	1	0	1.33	1.33	B35-001	1.33	1.33	NA	NA	NA	NA	NA	1.33	1.1	0.80	1.02	0.82	1	0.51
Uranium-234	pCi/g	1	0	6.72	6.72	B35-001	6.72	6.72	NA	NA	NA	NA	NA	6.72	13	0.78	0.93	0.78	1	5.94
Uranium-235	pCi/g	1	0	0.30	0.30	B35-001	0.30	0.30	NA	NA	NA	NA	NA	0.30	8	0.03	0.07	0.04	1	0.26
Uranium-238	pCi/g	1	0	6.58	6.58	B35-001	6.58	6.58	NA	NA	NA	NA	NA	6.58	14	0.81	1.06	0.82	1	5.76
Total Soil																				
Radium-226	pCi/g	2	0	0.67	2.45	B35-003	1.56	1.56	1.26	NA	NA	NA	NA	2.45	0.7	1.02	1.37	1.04	1	1.41
Radium-228	pCi/g	2	0	1.74	1.96	B35-001	1.85	1.85	0.16	NA	NA	NA	NA	1.96	1.1	0.72	1.25	0.80	2	1.17
Thorium-228	pCi/g	2	0	1.65	2.10	B35-003	1.88	1.88	0.32	NA	NA	NA	NA	2.10	NA	0.85	1.11	0.89	2	1.22
Thorium-230	pCi/g	2	0	0.54	2.50	B35-003	1.52	1.52	1.39	NA	NA	NA	NA	2.50	NA	0.88	1.17	0.90	1	1.60
Thorium-232	pCi/g	2	0	1.33	2.16	B35-003	1.75	1.75	0.59	NA	NA	NA	NA	2.16	1.1	0.80	1.07	0.83	2	1.33
Uranium-234	pCi/g	2	0	2.09	6.72	B35-001	4.41	4.41	3.27	NA	NA	NA	NA	6.72	13	0.68	0.92	0.71	2	6.01
Uranium-235	pCi/g	2	0	0.158	0.30	B35-001	0.23	0.23	0.10	NA	NA	NA	NA	0.30	8	0.03	0.07	0.03	2	0.27
Uranium-238	pCi/g	2	0	1.9	6.58	B35-001	4.24	4.24	3.31	NA	NA	NA	NA	6.58	14	0.70	1.02	0.74	2	5.84

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
EU10 - E. of Buildings																				
Surface Soil																				
Radium-226	pCi/g	8	0	0.53	1.48	A02-015	1.12	1.12	0.32	Normal	95% Student's-t UCL	1.34	No	1.34	0.7	1.11	1.37	1.11	5	0.23
Radium-228	pCi/g	8	0	0.63	1.67	A02-015	1.10	1.10	0.35	Normal	95% Student's-t UCL	1.33	No	1.33	1.1	0.73	1.26	0.77	7	0.56
Thorium-228	pCi/g	14	0	0.46	1.28	A02-020	0.90	0.90	0.28	Normal	95% Student's-t UCL	1.03	No	1.03	NA	0.84	1.10	0.87	8	0.17
Thorium-230	pCi/g	14	0	0.53	1.40	A02-015	0.97	0.97	0.29	Normal	95% Student's-t UCL	1.10	No	1.10	NA	0.88	1.18	0.91	7	0.20
Thorium-232	pCi/g	14	0	0.39	1.27	A02-015	0.85	0.85	0.28	Normal	95% Student's-t UCL	0.99	No	0.99	1.1	0.80	1.02	0.82	8	0.17
Uranium-234	pCi/g	14	0	1.519452	28.70	A02-034	5.63	5.63	7.07	None [f]	95% Chebyshev (Mean, Sd) UCL	13.86	No	13.86	13	0.78	0.93	0.78	14	13.08
Uranium-235	pCi/g	14	0	0.062	1.65	A02-034	0.29	0.29	0.41	Gamma	95% Approximate Gamma UCL	0.48	No	0.48	8	0.03	0.07	0.04	14	0.44
Uranium-238	pCi/g	14	0	1.473302	44.00	A02-034	6.79	6.79	11.01	None [f]	95% BCA Bootstrap UCL [g]	15.27	No	15.27	14	0.81	1.06	0.82	14	14.45
Total Soil																				
Radium-226	pCi/g	19	0	0.53	3.23	A02-021	1.61	1.61	0.64	Normal	95% Student's-t UCL	1.87	No	1.87	0.7	1.02	1.37	1.04	11	0.83
Radium-228	pCi/g	19	0	0.63	1.90	A02-022	1.27	1.27	0.36	Normal	95% Student's-t UCL	1.41	No	1.41	1.1	0.72	1.25	0.80	11	0.61
Thorium-228	pCi/g	36	0	0.43	2.20	A02-015	1.22	1.22	0.52	Normal	95% Student's-t UCL	1.36	No	1.36	NA	0.85	1.11	0.89	19	0.48
Thorium-230	pCi/g	36	0	0.31	2.85	A02-021	1.29	1.29	0.57	Normal	95% Student's-t UCL	1.45	No	1.45	NA	0.88	1.17	0.90	19	0.54
Thorium-232	pCi/g	36	0	0.37	2.25	A02-037	1.18	1.18	0.52	Normal	95% Student's-t UCL	1.32	No	1.32	1.1	0.80	1.07	0.83	19	0.49
Uranium-234	pCi/g	36	0	0.72	29	A02-034	4.60	4.60	6.28	None [f]	97.5% Chebyshev (Mean, Sd) UCL [g]	11.14	No	11.14	13	0.68	0.92	0.71	22	10.43
Uranium-235	pCi/g	36	0	0.034	1.65	A02-034	0.24	0.24	0.35	Lognormal	95% H-UCL	0.32	No	0.32	8	0.03	0.07	0.03	22	0.29
Uranium-238	pCi/g	36	0	0.67	44	A02-034	5.48	5.48	8.76	None [f]	95% Chebyshev (Mean, Sd) UCL	11.85	No	11.85	14	0.70	1.02	0.74	22	11.11
Groundwater																				
Radium-226	pCi/L	10	0	0.073433	0.25	MW-1	0.16	0.16	0.07	Normal	95% Student's-t UCL	0.20	No	0.20	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	10	0	-0.40158	0.99	MW-1	0.21	0.21	0.38	Normal	95% Student's-t UCL	0.43	No	0.43	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	10	0	-0.01461	0.03	MW-6	0.01	0.01	0.02	Normal	95% Student's-t UCL	0.02	No	0.02	NA	0.04	0.12	0.07	0	0.00
Thorium-230	pCi/L	10	0	0.072886	0.30	MW-6	0.21	0.21	0.06	Normal	95% Student's-t UCL	0.25	No	0.25	NA	0.18	0.20	0.17	8	0.08
Thorium-232	pCi/L	10	0	-0.00887	0.04	MW-1	0.01	0.01	0.01	Normal	95% Student's-t UCL	0.01	No	0.01	NA	0.00	0.00	0.00	7	0.01
Uranium-234 [e]	pCi/L	10	0	0.286302	6.15	MW-2	2.76	2.76	2.22	Normal	95% Student's-t UCL	4.05	No	4.05	NA	1.00	1.20	1.00	8	3.05
Uranium-235	pCi/L	9	0	0.013523	0.31	MW-2	0.13	0.13	0.12	Normal	95% Student's-t UCL	0.21	No	0.21	NA	0.07	0.10	0.09	5	0.12
Uranium-238 [e]	pCi/L	10	0	0.117877	7.15	MW-2	2.88	2.88	2.68	Normal	95% Student's-t UCL	4.43	No	4.43	NA	0.80	1.20	0.95	8	3.48
Groundwater-Filtered																				
Radium-226	pCi/L	5	0	0.073433	0.24	MW-8	0.15	0.15	0.07	Normal	95% Student's-t UCL	0.22	No	0.22	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	5	0	-0.0203	0.61	MW-1	0.19	0.19	0.27	Normal	95% Student's-t UCL	0.44	No	0.44	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	5	0	-0.01461	0.02	MW-1	0.01	0.01	0.02	Normal	95% Student's-t UCL	0.02	Yes	0.02	NA	0.04	0.12	0.07	0	0.00
Thorium-230	pCi/L	5	0	0.18122	0.30	MW-6	0.23	0.23	0.05	Normal	95% Student's-t UCL	0.28	No	0.28	NA	0.18	0.20	0.17	5	0.11
Thorium-232	pCi/L	5	0	-0.00887	0.04	MW-1	0.01	0.01	0.02	Normal	95% Student's-t UCL	0.03	No	0.03	NA	0.00	0.00	0.00	2	0.03
Uranium-234 [e]	pCi/L	5	0	0.286302	5.97	MW-2	2.69	2.69	2.38	Normal	95% Student's-t UCL	4.96	No	4.96	NA	1.00	1.20	1.00	4	3.96
Uranium-235	pCi/L	5	0	0.013523	0.31	MW-2	0.12	0.12	0.13	Normal	95% Student's-t UCL	0.24	No	0.24	NA	0.07	0.10	0.09	3	0.16
Uranium-238 [e]	pCi/L	5	0	0.117877	6.77	MW-2	2.80	2.80	2.78	Normal	95% Student's-t UCL	5.44	No	5.44	NA	0.80	1.20	0.95	4	4.49

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Groundwater-Unfiltered																				
Radium-226	pCi/L	5	0	0.085	0.25	MW-1	0.17	0.17	0.08	Normal	95% Student's-t UCL	0.24	No	0.24	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	5	0	-0.40158	0.99	MW-1	0.24	0.24	0.50	Normal	95% Student's-t UCL	0.71	No	0.71	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	5	0	-0.01091	0.03	MW-6	0.02	0.02	0.02	Normal	95% Student's-t UCL	0.03	No	0.03	NA	0.04	0.12	0.07	0	0.00
Thorium-230	pCi/L	5	0	0.072886	0.29	MW-1	0.20	0.20	0.08	Normal	95% Student's-t UCL	0.27	No	0.27	NA	0.18	0.20	0.17	3	0.10
Thorium-232	pCi/L	5	0	0.001	0.01	MW-6	0.01	0.01	0.00	Normal	95% Student's-t UCL	0.01	No	0.01	NA	0.00	0.00	0.00	5	0.01
Uranium-234 [e]	pCi/L	5	0	0.453057	6.15	MW-2	2.83	2.83	2.33	Normal	95% Student's-t UCL	5.05	No	5.05	NA	1.00	1.20	1.00	4	4.05
Uranium-235	pCi/L	4	0	0.024442	0.27	MW-2	0.15	0.15	0.13	NA	NA	NA	NA	0.27	NA	0.07	0.10	0.09	2	0.19
Uranium-238 [e]	pCi/L	5	0	0.26	7.15	MW-2	2.96	2.96	2.91	Normal	95% Student's-t UCL	5.73	No	5.73	NA	0.80	1.20	0.95	4	4.78
EU11 - Between Buildings																				
Surface Soil																				
Radium-226	pCi/g	7	0	0.59	1.23	A02-041	0.85	0.85	0.26	Normal	95% Student's-t UCL	1.04	No	1.04	0.7	1.11	1.37	1.11	2	0.00
Radium-228	pCi/g	7	0	0.42	2.26	A02-028	0.99	0.99	0.61	Gamma	95% Approximate Gamma UCL	1.55	No	1.55	1.1	0.73	1.26	0.77	4	0.78
Thorium-228	pCi/g	16	0	0.259	2.51	A02-028	0.79	0.79	0.54	Gamma	95% Approximate Gamma UCL	1.05	No	1.05	NA	0.84	1.10	0.87	7	0.19
Thorium-230	pCi/g	16	0	0.3	1.01	A02-002	0.58	0.58	0.22	Normal	95% Student's-t UCL	0.69	No	0.69	NA	0.88	1.18	0.91	2	0.00
Thorium-232	pCi/g	16	0	0.239	2.44	A02-028	0.71	0.71	0.51	Gamma	95% Approximate Gamma UCL	0.92	No	0.92	1.1	0.80	1.02	0.82	3	0.10
Uranium-234	pCi/g	16	0	3.89	64	A02-028	13	13	15	None [f]	99% Chebyshev (Mean, Sd) UCL [g]	49.14	No	49.14	13	0.78	0.93	0.78	16	48.36
Uranium-235	pCi/g	16	0	0.23	5.50	A02-028	0.81	0.81	1.28	None [f]	95% Chebyshev (Mean, Sd) UCL	2.33	No	2.33	8	0.03	0.07	0.04	16	2.29
Uranium-238	pCi/g	16	0	3.8	247	A02-028	25	25	59	None [f]	95% CLT UCL [g]	49.45	No	49.45	14	0.81	1.06	0.82	16	48.63
Total Soil																				
Radium-226	pCi/g	11	0	0.59	1.57	A02-024	1.00	1.00	0.32	Normal	95% Student's-t UCL	1.18	No	1.18	0.7	1.02	1.37	1.04	3	0.14
Radium-228	pCi/g	11	0	0.42	2.26	A02-028	1.14	1.14	0.54	Normal	95% Student's-t UCL	1.43	No	1.43	1.1	0.72	1.25	0.80	4	0.64
Thorium-228	pCi/g	24	0	0.258886	2.51	A02-028	0.92	0.92	0.59	Gamma	95% Approximate Gamma UCL	1.15	No	1.15	NA	0.85	1.11	0.89	6	0.27
Thorium-230	pCi/g	24	0	0.248844	1.66	A02-030	0.73	0.73	0.38	Normal	95% Student's-t UCL	0.86	No	0.86	NA	0.88	1.17	0.90	5	0.00
Thorium-232	pCi/g	24	0	0.239	2.44	A02-028	0.83	0.83	0.57	Gamma	95% Approximate Gamma UCL	1.04	No	1.04	1.1	0.80	1.07	0.83	6	0.21
Uranium-234	pCi/g	24	0	1.07	64	A02-028	10.38	10.38	12.57	Lognormal	99% Chebyshev (MVUE) UCL [g]	32.31	No	32.31	13	0.68	0.92	0.71	9	31.60
Uranium-235	pCi/g	24	0	0.058	5.50	A02-028	0.65	0.65	1.07	Lognormal	95% H-UCL	1.00	No	1.00	8	0.03	0.07	0.03	9	0.97
Uranium-238	pCi/g	24	0	1.02	247	A02-028	19.18	19.18	48.86	None [f]	95% CLT UCL [g]	35.6	No	36	14	0.70	1.02	0.74	9	34.8
Groundwater																				
Radium-226	pCi/L	8	0	0.118521	0.38	MW-4	0.23	0.23	0.09	Normal	95% Student's-t UCL	0.29	No	0.29	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	8	0	0.025	0.27	MW-4	0.15	0.15	0.10	Normal	95% Student's-t UCL	0.21	No	0.21	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	8	0	-0.01615	0.13	MW-4	0.04	0.04	0.05	Normal	95% Student's-t UCL	0.07	No	0.07	NA	0.04	0.12	0.07	4	0.00
Thorium-230	pCi/L	8	0	0.090273	0.30	MW-5	0.20	0.20	0.07	Normal	95% Student's-t UCL	0.25	No	0.25	NA	0.18	0.20	0.17	6	0.08
Thorium-232	pCi/L	8	0	-0.012	0.02	MW-11	0.00	0.00	0.01	Normal	95% Student's-t UCL	0.01	No	0.01	NA	0.00	0.00	0.00	5	0.01
Uranium-234 [e]	pCi/L	8	0	1.901081	18	MW-4	6.21	6.21	7.21	None [f]	95% Chebyshev (Mean, Sd) UCL	17.33	No	17.33	NA	1.00	1.20	1.00	8	16.33
Uranium-235	pCi/L	8	0	0.015263	0.75	MW-4	0.28	0.28	0.29	Gamma	95% Approximate Gamma UCL	0.66	No	0.66	NA	0.07	0.10	0.09	7	0.57
Uranium-238 [e]	pCi/L	8	0	1.67154	16	MW-4	5.62	5.62	6.50	None [f]	95% Chebyshev (Mean, Sd) UCL	15.64	No	15.64	NA	0.80	1.20	0.95	8	14.69

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Groundwater-Filtered																				
Radium-226	pCi/L	4	0	0.154081	0.36	MW-11	0.23	0.23	0.09	NA	NA	NA	NA	0.36	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	4	0	0.025	0.16	MW-11	0.08	0.08	0.06	NA	NA	NA	NA	0.16	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	4	0	-0.01615	0.05	MW-4	0.03	0.03	0.03	NA	NA	NA	NA	0.05	NA	0.04	0.12	0.07	2	0.00
Thorium-230	pCi/L	4	0	0.10002	0.30	MW-5	0.20	0.20	0.08	NA	NA	NA	NA	0.30	NA	0.18	0.20	0.17	3	0.13
Thorium-232	pCi/L	4	0	-0.012	0.00	MW-4	0.00	0.00	0.01	NA	NA	NA	NA	0.00	NA	0.00	0.00	0.00	2	0.00
Uranium-234 [e]	pCi/L	4	0	1.901081	17.86	MW-4	6.16	6.16	7.80	NA	NA	NA	NA	17.86	NA	1.00	1.20	1.00	4	16.86
Uranium-235	pCi/L	4	0	0.078551	0.73	MW-4	0.29	0.29	0.30	NA	NA	NA	NA	0.73	NA	0.07	0.10	0.09	4	0.65
Uranium-238 [e]	pCi/L	4	0	1.892417	16.08	MW-4	5.54	5.54	7.02	NA	NA	NA	NA	16.08	NA	0.80	1.20	0.95	4	15.13
Groundwater-Unfiltered																				
Radium-226	pCi/L	4	0	0.118521	0.38	MW-4	0.23	0.23	0.11	NA	NA	NA	NA	0.38	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	4	0	0.072386	0.27	MW-4	0.21	0.21	0.09	NA	NA	NA	NA	0.27	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	4	0	0.001091	0.13	MW-4	0.05	0.05	0.06	NA	NA	NA	NA	0.13	NA	0.04	0.12	0.07	2	0.06
Thorium-230	pCi/L	4	0	0.090273	0.27	MW-5	0.20	0.20	0.08	NA	NA	NA	NA	0.27	NA	0.18	0.20	0.17	3	0.10
Thorium-232	pCi/L	4	0	-0.00875	0.02	MW-11	0.01	0.01	0.01	NA	NA	NA	NA	0.02	NA	0.00	0.00	0.00	3	0.02
Uranium-234 [e]	pCi/L	4	0	2.100526	17.92	MW-4	6.27	6.27	7.77	NA	NA	NA	NA	17.92	NA	1.00	1.20	1.00	4	16.92
Uranium-235	pCi/L	4	0	0.015263	0.75	MW-4	0.26	0.26	0.34	NA	NA	NA	NA	0.75	NA	0.07	0.10	0.09	3	0.66
Uranium-238 [e]	pCi/L	4	0	1.67154	16.20	MW-4	5.70	5.70	7.01	NA	NA	NA	NA	16.20	NA	0.80	1.20	0.95	4	15.25
Sediment																				
Radium-226	pCi/g	5	0	0.32	0.91	A08-A01-013	0.54	0.54	0.22	Normal	95% Student's-t UCL	0.75	No	0.75	0.7	1.00	1.00	1.00	0	0.00
Radium-228	pCi/g	5	0	0.32	0.68	A08-A01-010	0.54	0.54	0.13	Normal	95% Student's-t UCL	0.66	No	0.66	1.1	0.60	0.60	0.60	1	0.06
Thorium-228	pCi/g	5	0	0.43	0.92	A08-A01-013	0.56	0.56	0.20	Normal	95% Student's-t UCL	0.76	No	0.76	NA	0.80	1.00	0.83	1	0.00
Thorium-230	pCi/g	5	0	0.39	0.97	A08-A01-013	0.59	0.59	0.25	Normal	95% Student's-t UCL	0.83	No	0.83	NA	0.80	0.90	0.80	1	0.03
Thorium-232	pCi/g	5	0	0.3	0.87	A08-A01-013	0.48	0.48	0.23	Normal	95% Student's-t UCL	0.70	No	0.70	1.1	0.70	0.80	0.73	1	0.00
Uranium-234 [e]	pCi/g	5	0	1.15	36	A08-A01-011	9.70	9.70	15.00	Gamma	95% Approximate Gamma UCL	49.76	Yes	36.30	13	0.70	0.80	0.77	5	35.53
Uranium-235	pCi/g	5	0	0.011	2.17	A08-A01-011	0.56	0.56	0.91	Gamma	95% Approximate Gamma UCL	3.72	Yes	2.17	8	0.04	0.07	0.05	4	2.12
Uranium-238 [e]	pCi/g	5	0	1.01	41	A08-A01-011	11	11	17	Gamma	95% Approximate Gamma UCL	58.64	Yes	41.00	14	0.60	0.70	0.63	5	40.37
Surface Water																				
Radium-226	pCi/L	7	0	0.005	0.25	A08-A01-007	0.11	0.11	0.08	Normal	95% Student's-t UCL	0.17	No	0.17	NA	0.13	0.20	0.13	3	0.04
Radium-228	pCi/L	7	0	-0.42	0.48	A08-A01-001	0.28	0.28	0.32	None [f]	95% Chebyshev (Mean, Sd) UCL	0.81	Yes	0.48	NA	0.30	0.40	0.33	5	0.15
Thorium-228	pCi/L	7	0	0.054	0.20	A08-A01-001	0.14	0.14	0.05	Normal	95% Student's-t UCL	0.17	No	0.17	NA	0.13	0.30	0.20	3	0.00
Thorium-230	pCi/L	7	0	0.027	0.19	A08-A01-007	0.11	0.11	0.06	Normal	95% Student's-t UCL	0.15	No	0.15	NA	0.18	0.20	0.20	1	0.00
Thorium-232	pCi/L	7	0	-0.013	0.06	A08-A01-004	0.01	0.01	0.03	Normal	95% Student's-t UCL	0.03	No	0.03	NA	0.00	0.05	0.01	4	0.02
Uranium-234	pCi/L	7	0	0.027	33	A08-A01-007	7.66	7.66	12.73	Gamma	95% Adjusted Gamma UCL	73.84	Yes	33.30	NA	0.15	0.20	0.17	5	33.13
Uranium-235	pCi/L	7	0	0.021	1.59	A08-A01-007	0.40	0.40	0.61	Gamma	95% Approximate Gamma UCL	1.54	No	1.54	NA	0.03	0.06	0.04	6	1.50
Uranium-238	pCi/L	7	0	0.039	33	A08-A01-007	7.84	7.84	12.90	Gamma	95% Adjusted Gamma UCL	80.41	Yes	32.80	NA	0.10	0.10	0.10	5	32.70

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
EU12 - Landfill																				
Surface Soil																				
Radium-226	pCi/g	15	0	0.4	1.89	A03-003	0.95	0.95	0.39	Gamma	95% Approximate Gamma UCL	1.15	No	1.15	0.7	1.11	1.37	1.11	2	0.04
Radium-228	pCi/g	15	0	0.18	1.54	A03-003	0.73	0.73	0.40	Normal	95% Student's-t UCL	0.92	No	0.92	1.1	0.73	1.26	0.77	8	0.14
Thorium-228	pCi/g	30	0	0.41	1.55	A03-003	0.77	0.77	0.34	Normal	95% Student's-t UCL	0.87	No	0.87	NA	0.84	1.10	0.87	8	0.01
Thorium-230	pCi/g	30	0	0.47	2.61	A03-021	0.95	0.95	0.40	Gamma	95% Approximate Gamma UCL	1.07	No	1.07	NA	0.88	1.18	0.91	14	0.16
Thorium-232	pCi/g	30	0	0.2	1.74	A03-011	0.72	0.72	0.35	Gamma	95% Approximate Gamma UCL	0.84	No	0.84	1.1	0.80	1.02	0.82	10	0.02
Uranium-234	pCi/g	30	0	1.41	56	A03-038	8.28	8.28	10.40	Lognormal	95% H-UCL	10.73	No	10.73	13	0.78	0.93	0.78	30	9.95
Uranium-235	pCi/g	30	0	0.037	3.23	A03-038	0.41	0.41	0.59	Lognormal	95% H-UCL	0.58	No	0.58	8	0.03	0.07	0.04	30	0.55
Uranium-238	pCi/g	30	0	1.27	58	A03-038	8.60	8.60	10.61	Lognormal	95% H-UCL	11.28	No	11.28	14	0.81	1.06	0.82	30	10.46
Total Soil																				
Radium-226	pCi/g	30	0	0.102	1.89	A03-003	0.90	0.90	0.41	None [f]	95% Chebyshev (Mean, Sd) UCL	1.23	No	1.23	0.7	1.02	1.37	1.04	5	0.18
Radium-228	pCi/g	30	0	0.08	2.13	A03-028	0.74	0.74	0.42	Gamma	95% Approximate Gamma UCL	0.90	No	0.90	1.1	0.72	1.25	0.80	7	0.11
Thorium-228	pCi/g	60	0	0.26	3.50	A03-039	0.87	0.87	0.58	None [f]	95% Chebyshev (Mean, Sd) UCL	1.19	No	1.19	NA	0.85	1.11	0.89	9	0.31
Thorium-230	pCi/g	60	0	0.279659	2.97	A03-039	0.99	0.99	0.48	Normal	95% Student's-t UCL	1.09	No	1.09	NA	0.88	1.17	0.90	18	0.19
Thorium-232	pCi/g	60	0	0.18	2.85	A03-028	0.80	0.80	0.55	Lognormal	95% H-UCL	0.91	No	0.91	1.1	0.80	1.07	0.83	11	0.08
Uranium-234	pCi/g	60	0	1.41	119	A03-017	11	11	19	None [f]	95% Chebyshev (Mean, Sd) UCL	22	No	21.94	13	0.68	0.92	0.71	30	21.23
Uranium-235	pCi/g	60	0	0.035	3.72	A03-017	0.54	0.54	0.77	None [f]	95% Chebyshev (Mean, Sd) UCL	0.97	No	0.97	8	0.03	0.07	0.03	30	0.94
Uranium-238	pCi/g	60	0	1.27	122	A03-017	12	12	19	None [f]	95% Chebyshev (Mean, Sd) UCL	23	No	22.75	14	0.70	1.02	0.74	30	22.01
Sediment																				
Radium-226	pCi/g	3	0	0.95	1.18	A03SD-005	1.06	1.06	0.12	NA	NA	NA	NA	1.18	0.7	1.00	1.00	1.00	2	0.18
Radium-228	pCi/g	3	0	0.71	0.91	A03SD-005	0.78	0.78	0.11	NA	NA	NA	NA	0.91	1.1	0.60	0.60	0.60	3	0.31
Thorium-228	pCi/g	6	0	0.52	0.98	A03SD-002	0.72	0.72	0.18	Normal	95% Student's-t UCL	0.87	No	0.87	NA	0.80	1.00	0.83	2	0.04
Thorium-230	pCi/g	6	0	0.83	1.28	A03SD-005	1.09	1.09	0.17	Normal	95% Student's-t UCL	1.23	No	1.23	NA	0.80	0.90	0.80	6	0.43
Thorium-232	pCi/g	6	0	0.52	0.99	A03SD-005	0.75	0.75	0.20	Normal	95% Student's-t UCL	0.91	No	0.91	1.1	0.70	0.80	0.73	4	0.18
Uranium-234 [e]	pCi/g	6	0	0.8	2.75	A03SD-001	1.79	1.79	0.82	Normal	95% Student's-t UCL	2.47	No	2.47	13	0.70	0.80	0.77	6	1.70
Uranium-235	pCi/g	6	0	0.044	0.17	A03SD-001	0.11	0.11	0.04	Normal	95% Student's-t UCL	0.14	No	0.14	8	0.04	0.07	0.05	6	0.09
Uranium-238 [e]	pCi/g	6	0	1.04	3.03	A03SD-006	2.09	2.09	0.81	Normal	95% Student's-t UCL	2.76	No	2.76	14	0.60	0.70	0.63	6	2.13
Groundwater																				
Radium-226	pCi/L	14	0	0.046198	0.39	MW-17	0.22	0.22	0.09	Normal	95% Student's-t UCL	0.26	No	0.26	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	14	0	-0.42396	0.22	MW-606DR	0.05	0.05	0.17	None [f]	95% Chebyshev (Mean, Sd) UCL	0.24	Yes	0.22	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	14	0	0.013843	0.15	MW-14	0.08	0.08	0.05	Normal	95% Student's-t UCL	0.10	No	0.10	NA	0.04	0.12	0.07	10	0.03
Thorium-230	pCi/L	14	0	0.12	0.28	MW-15	0.19	0.19	0.05	Normal	95% Student's-t UCL	0.22	No	0.22	NA	0.18	0.20	0.17	8	0.05
Thorium-232	pCi/L	14	0	-0.0135	0.07	MW-13D	0.01	0.01	0.02	None [f]	95% Chebyshev (Mean, Sd) UCL	0.03	No	0.03	NA	0.00	0.00	0.00	8	0.03
Uranium-234 [e]	pCi/L	14	0	0.029525	21	MW-13D	4.51	4.51	7.09	Gamma	95% Adjusted Gamma UCL	11.83	No	11.83	NA	1.00	1.20	1.00	7	10.83
Uranium-235	pCi/L	14	0	-0.00663	1.01	MW-13D	0.23	0.23	0.33	None [f]	95% Chebyshev (Mean, Sd) UCL	0.62	No	0.62	NA	0.07	0.10	0.09	7	0.53
Uranium-238 [e]	pCi/L	14	0	0.005906	22	MW-13D	4.77	4.77	7.55	Gamma	95% Adjusted Gamma UCL	13.90	No	13.90	NA	0.80	1.20	0.95	8	12.95

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Groundwater-Filtered																				
Radium-226	pCi/L	7	0	0.13	0.33	MW-17	0.22	0.22	0.07	Normal	95% Student's-t UCL	0.27	No	0.27	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	7	0	-0.42396	0.22	MW-606DR	0.02	0.02	0.23	Normal	95% Student's-t UCL	0.19	No	0.19	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	7	0	0.026067	0.15	MW-14	0.08	0.08	0.05	Normal	95% Student's-t UCL	0.12	No	0.12	NA	0.04	0.12	0.07	6	0.05
Thorium-230	pCi/L	7	0	0.12	0.28	MW-15	0.20	0.20	0.06	Normal	95% Student's-t UCL	0.25	No	0.25	NA	0.18	0.20	0.17	5	0.08
Thorium-232	pCi/L	7	0	-0.00471	0.02	MW-607D	0.00	0.00	0.01	Normal	95% Student's-t UCL	0.01	No	0.01	NA	0.00	0.00	0.00	4	0.01
Uranium-234	pCi/L	7	0	0.090462	21	MW-13D	4.56	4.56	7.56	Gamma	95% Adjusted Gamma UCL	31.62	Yes	20.88	NA	1.00	1.20	1.00	3	19.88
Uranium-235	pCi/L	7	0	0.007026	1.01	MW-13D	0.24	0.24	0.36	Gamma	95% Approximate Gamma UCL	0.91	No	0.91	NA	0.07	0.10	0.09	3	0.82
Uranium-238	pCi/L	7	0	0.01655	22	MW-13D	4.73	4.73	7.84	Gamma	95% Adjusted Gamma UCL	39.52	Yes	21.53	NA	0.80	1.20	0.95	4	20.58
Groundwater-Unfiltered																				
Radium-226	pCi/L	7	0	0.046198	0.39	MW-17	0.22	0.22	0.10	Normal	95% Student's-t UCL	0.30	No	0.30	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	7	0	-0.01583	0.19	MW-607D	0.07	0.07	0.08	Normal	95% Student's-t UCL	0.14	No	0.14	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	7	0	0.013843	0.15	MW-14	0.07	0.07	0.05	Normal	95% Student's-t UCL	0.11	No	0.11	NA	0.04	0.12	0.07	4	0.04
Thorium-230	pCi/L	7	0	0.13	0.24	MW-13D	0.18	0.18	0.04	Normal	95% Student's-t UCL	0.21	No	0.21	NA	0.18	0.20	0.17	3	0.04
Thorium-232	pCi/L	7	0	-0.0135	0.07	MW-13D	0.01	0.01	0.03	Normal	95% Student's-t UCL	0.03	No	0.03	NA	0.00	0.00	0.00	4	0.03
Uranium-234 [e]	pCi/L	7	0	0.029525	20	MW-13D	4.47	4.47	7.19	Gamma	95% Adjusted Gamma UCL	31.92	Yes	19.94	NA	1.00	1.20	1.00	4	18.94
Uranium-235	pCi/L	7	0	-0.00663	0.90	MW-13D	0.23	0.23	0.32	None [f]	95% Chebyshev (Mean, Sd) UCL	0.76	No	0.76	NA	0.07	0.10	0.09	4	0.67
Uranium-238 [e]	pCi/L	7	0	0.005906	22	MW-13D	4.81	4.81	7.86	Gamma	95% Adjusted Gamma UCL	41.77	Yes	21.68	NA	0.80	1.20	0.95	4	20.73
EU13 - IA04A																				
Surface Soil																				
Radium-226	pCi/g	16	0	0.56	1.19	A04A-056	0.73	0.73	0.20	Normal	95% Student's-t UCL	0.82	No	0.82	0.7	1.11	1.37	1.11	2	0.00
Radium-228	pCi/g	16	0	0.33	1.99	A04A-056	0.87	0.87	0.39	Gamma	95% Approximate Gamma UCL	1.05	No	1.05	1.1	0.73	1.26	0.77	10	0.28
Thorium-228	pCi/g	30	0	0.039	1.96	A04A-056	0.78	0.78	0.36	Normal	95% Student's-t UCL	0.89	No	0.89	NA	0.84	1.10	0.87	10	0.02
Thorium-230	pCi/g	30	0	0.28	8.65	A04A-020	1.23	1.23	1.70	None [f]	95% Chebyshev (Mean, Sd) UCL	2.58	No	2.58	NA	0.88	1.18	0.91	11	1.67
Thorium-232	pCi/g	30	0	0.008	1.90	A04A-056	0.71	0.71	0.36	None [f]	99% Chebyshev (Mean, Sd) UCL	1.37	No	1.37	1.1	0.80	1.02	0.82	12	0.55
Uranium-234	pCi/g	30	0	1.13	149	A04A-051	20	20	31	Lognormal	95% H-UCL	31.44	No	31.44	13	0.78	0.93	0.78	30	30.66
Uranium-235	pCi/g	30	0	0.057	8.00	A04A-051	1.01	1.01	1.64	Lognormal	95% H-UCL	1.57	No	1.57	8	0.03	0.07	0.04	30	1.53
Uranium-238	pCi/g	30	0	0.95	152	A04A-051	20	20	31	Lognormal	95% H-UCL	32.22	No	32.22	14	0.81	1.06	0.82	30	31.40
Total Soil																				
Radium-226	pCi/g	32	0	0.4	1.82	A04A-003	0.83	0.83	0.28	Gamma	95% Approximate Gamma UCL	0.91	No	0.91	0.7	1.02	1.37	1.04	7	0.00
Radium-228	pCi/g	32	0	0.33	2.14	A04A-036	0.94	0.94	0.44	Normal	95% Student's-t UCL	1.07	No	1.07	1.1	0.72	1.25	0.80	11	0.28
Thorium-228	pCi/g	60	0	0.039	3.61	A04A-314	0.88	0.88	0.56	None [f]	95% Chebyshev (Mean, Sd) UCL	1.20	No	1.20	NA	0.85	1.11	0.89	14	0.31
Thorium-230	pCi/g	60	0	0.28	8.65	A04A-020	1.25	1.25	1.41	None [f]	95% Chebyshev (Mean, Sd) UCL	2.04	No	2.04	NA	0.88	1.17	0.90	18	1.14
Thorium-232	pCi/g	60	0	0.008	3.08	A04A-314	0.79	0.79	0.49	None [f]	97.5% Chebyshev (Mean, Sd) UCL	1.19	No	1.19	1.1	0.80	1.07	0.83	15	0.36
Uranium-234	pCi/g	60	0	1.13	339	A04A-078	28	28	54	Lognormal	95% H-UCL	64	No	63.98	13	0.68	0.92	0.71	30	63.27
Uranium-235	pCi/g	60	0	0.057	18	A04A-078	1.43	1.43	2.78	Lognormal	95% H-UCL	2.67	No	2.67	8	0.03	0.07	0.03	30	2.63
Uranium-238	pCi/g	60	0	0.95	347	A04A-078	29	29	55	Lognormal	95% H-UCL	59	No	58.99	14	0.70	1.02	0.74	30	58.25

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Groundwater																				
Radium-226	pCi/L	14	0	0.04693	0.28	MW-22	0.18	0.18	0.07	Normal	95% Student's-t UCL	0.21	No	0.21	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	14	0	0.041516	0.53	MW-602D	0.21	0.21	0.14	Normal	95% Student's-t UCL	0.28	No	0.28	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	14	0	0.008977	0.10	MW-23	0.05	0.05	0.04	Normal	95% Student's-t UCL	0.07	No	0.07	NA	0.04	0.12	0.07	8	0.00
Thorium-230	pCi/L	14	0	0.081819	0.29	MW-603D	0.17	0.17	0.06	Normal	95% Student's-t UCL	0.20	No	0.20	NA	0.18	0.20	0.17	4	0.03
Thorium-232	pCi/L	14	0	-0.01124	0.07	MW-602D	0.01	0.01	0.02	None [f]	95% Chebyshev (Mean, Sd) UCL	0.03	No	0.03	NA	0.00	0.00	0.00	10	0.03
Uranium-234 [e]	pCi/L	14	0	1.728017	31	MW-602D	7.84	7.84	9.63	Lognormal	95% H-UCL	14.77	No	14.77	NA	1.00	1.20	1.00	14	13.77
Uranium-235	pCi/L	14	0	0.030965	1.58	MW-602D	0.39	0.39	0.52	Gamma	95% Approximate Gamma UCL	0.73	No	0.73	NA	0.07	0.10	0.09	10	0.65
Uranium-238 [e]	pCi/L	14	0	1.335502	31	MW-602D	7.72	7.72	9.74	Gamma	95% Approximate Gamma UCL	12.99	No	12.99	NA	0.80	1.20	0.95	14	12.04
Groundwater-Filtered																				
Radium-226	pCi/L	7	0	0.04693	0.28	MW-22	0.19	0.19	0.08	Normal	95% Student's-t UCL	0.25	No	0.25	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	7	0	0.083803	0.53	MW-602D	0.29	0.29	0.14	Normal	95% Student's-t UCL	0.39	No	0.39	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	7	0	0.01076	0.10	MW-23	0.05	0.05	0.04	Normal	95% Student's-t UCL	0.08	No	0.08	NA	0.04	0.12	0.07	4	0.01
Thorium-230	pCi/L	7	0	0.098227	0.29	MW-603D	0.18	0.18	0.06	Normal	95% Student's-t UCL	0.23	No	0.23	NA	0.18	0.20	0.17	3	0.06
Thorium-232	pCi/L	7	0	-0.00583	0.07	MW-602D	0.01	0.01	0.03	None [f]	95% Chebyshev (Mean, Sd) UCL	0.06	No	0.06	NA	0.00	0.00	0.00	5	0.06
Uranium-234	pCi/L	7	0	1.728017	31	MW-602D	7.71	7.71	10.41	Gamma	95% Approximate Gamma UCL	19.34	No	19.34	NA	1.00	1.20	1.00	7	18.34
Uranium-235	pCi/L	7	0	0.038365	1.58	MW-602D	0.37	0.37	0.55	Gamma	95% Approximate Gamma UCL	1.07	No	1.07	NA	0.07	0.10	0.09	5	0.99
Uranium-238	pCi/L	7	0	1.335502	31	MW-602D	7.46	7.46	10.39	Gamma	95% Approximate Gamma UCL	19.58	No	19.58	NA	0.80	1.20	0.95	7	18.63
Groundwater-Unfiltered																				
Radium-226	pCi/L	7	0	0.076197	0.27	MW-21	0.17	0.17	0.06	Normal	95% Student's-t UCL	0.21	No	0.21	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	7	0	0.041516	0.28	MW-602D	0.14	0.14	0.08	Normal	95% Student's-t UCL	0.20	No	0.20	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	7	0	0.008977	0.09	MW-21	0.05	0.05	0.03	Normal	95% Student's-t UCL	0.08	No	0.08	NA	0.04	0.12	0.07	4	0.01
Thorium-230	pCi/L	7	0	0.081819	0.25	MW-601D	0.16	0.16	0.05	Normal	95% Student's-t UCL	0.20	No	0.20	NA	0.18	0.20	0.17	1	0.03
Thorium-232	pCi/L	7	0	-0.01124	0.04	MW-20	0.01	0.01	0.02	Normal	95% Student's-t UCL	0.02	No	0.02	NA	0.00	0.00	0.00	5	0.02
Uranium-234	pCi/L	7	0	1.739629	29	MW-602D	7.96	7.96	9.63	Gamma	95% Approximate Gamma UCL	18.37	No	18.37	NA	1.00	1.20	1.00	7	17.37
Uranium-235	pCi/L	7	0	0.030965	1.55	MW-602D	0.42	0.42	0.53	Gamma	95% Approximate Gamma UCL	1.22	No	1.22	NA	0.07	0.10	0.09	5	1.14
Uranium-238	pCi/L	7	0	1.944432	30	MW-602D	7.98	7.98	9.87	Gamma	95% Approximate Gamma UCL	18.50	No	18.50	NA	0.80	1.20	0.95	7	17.55
Sediment																				
Radium-226	pCi/g	3	0	0.555	0.88	A08-A01-008	0.69	0.69	0.17	NA	NA	NA	NA	0.88	0.7	1.00	1.00	1.00	0	0.00
Radium-228	pCi/g	3	0	0.32	1.05	A08-A01-008	0.62	0.62	0.38	NA	NA	NA	NA	1.05	1.1	0.60	0.60	0.60	1	0.45
Thorium-228	pCi/g	3	0	0.26	0.57	A08-A01-006	0.42	0.42	0.16	NA	NA	NA	NA	0.57	NA	0.80	1.00	0.83	0	0.00
Thorium-230	pCi/g	3	0	0.43	0.68	A08-A01-006	0.57	0.57	0.13	NA	NA	NA	NA	0.68	NA	0.80	0.90	0.80	0	0.00
Thorium-232	pCi/g	3	0	0.178	0.46	A08-A01-008	0.33	0.33	0.14	NA	NA	NA	NA	0.46	1.1	0.70	0.80	0.73	0	0.00
Uranium-234	pCi/g	3	0	1.85	20	A08-A01-008	13	13	10	NA	NA	NA	NA	19.70	13	0.70	0.80	0.77	3	18.93
Uranium-235	pCi/g	3	0	0.061	1.02	A08-A01-008	0.64	0.64	0.51	NA	NA	NA	NA	1.02	8	0.04	0.07	0.05	3	0.97
Uranium-238	pCi/g	3	0	1.99	19	A08-A01-008	13	13	10	NA	NA	NA	NA	19.20	14	0.60	0.70	0.63	3	18.57

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
EU14 - IA04B																				
Surface Soil																				
Radium-226	pCi/g	15	0	0.36	1.54	A04B-042	0.78	0.78	0.33	Normal	95% Student's-t UCL	0.93	No	0.93	0.7	1.11	1.37	1.11	4	0.00
Radium-228	pCi/g	15	0	0.21	1.18	A04B-043	0.59	0.59	0.32	Normal	95% Student's-t UCL	0.73	No	0.73	1.1	0.73	1.26	0.77	3	0.00
Thorium-228	pCi/g	29	0	0.172	0.97	A04B-039	0.50	0.50	0.21	Normal	95% Student's-t UCL	0.57	No	0.57	NA	0.84	1.10	0.87	2	0.00
Thorium-230	pCi/g	29	0	0.23	1.34	A04B-042	0.60	0.60	0.29	Gamma	95% Approximate Gamma UCL	0.70	No	0.70	NA	0.88	1.18	0.91	5	0.00
Thorium-232	pCi/g	29	0	0.131	1.09	A04B-039	0.46	0.46	0.24	Gamma	95% Approximate Gamma UCL	0.54	No	0.54	1.1	0.80	1.02	0.82	3	0.00
Uranium-234	pCi/g	29	0	0.184	6.18	A04B-043	1.08	1.08	1.20	Gamma	95% Approximate Gamma UCL	1.44	No	1.44	13	0.78	0.93	0.78	15	0.66
Uranium-235	pCi/g	29	0	0	0.32	A04B-043	0.06	0.06	0.07	None [f]	95% Chebyshev (Mean, Sd) UCL	0.11	No	0.11	8	0.03	0.07	0.04	16	0.08
Uranium-238	pCi/g	29	0	0.208	9.50	A04B-043	1.24	1.24	1.73	Lognormal	95% H-UCL	1.70	No	1.70	14	0.81	1.06	0.82	15	0.88
Total Soil																				
Radium-226	pCi/g	30	0	0.36	1.54	A04B-042	0.92	0.92	0.32	Normal	95% Student's-t UCL	1.02	No	1.02	0.7	1.02	1.37	1.04	11	0.00
Radium-228	pCi/g	30	0	0.21	1.18	A04B-043	0.70	0.70	0.28	Normal	95% Student's-t UCL	0.79	No	0.79	1.1	0.72	1.25	0.80	11	0.00
Thorium-228	pCi/g	60	0	0.172	1.69	A04B-040	0.76	0.76	0.33	Normal	95% Student's-t UCL	0.83	No	0.83	NA	0.85	1.11	0.89	22	0.00
Thorium-230	pCi/g	60	0	0.23	1.94	A04B-015	0.88	0.88	0.39	Normal	95% Student's-t UCL	0.96	No	0.96	NA	0.88	1.17	0.90	24	0.06
Thorium-232	pCi/g	60	0	0.131	1.65	A04B-040	0.70	0.70	0.34	Normal	95% Student's-t UCL	0.77	No	0.77	1.1	0.80	1.07	0.83	20	0.00
Uranium-234	pCi/g	60	0	0.184	15	A04B-041	1.73	1.73	2.32	None [f]	95% Chebyshev (Mean, Sd) UCL	3.03	No	3.03	13	0.68	0.92	0.71	29	2.33
Uranium-235	pCi/g	60	0	-0.0048	0.81	A04B-041	0.09	0.09	0.13	None [f]	95% Chebyshev (Mean, Sd) UCL	0.17	No	0.17	8	0.03	0.07	0.03	30	0.14
Uranium-238	pCi/g	60	0	0.208	15	A04B-041	1.85	1.85	2.44	None [f]	95% Chebyshev (Mean, Sd) UCL	3.22	No	3.22	14	0.70	1.02	0.74	31	2.48
Groundwater																				
Radium-226	pCi/L	8	0	0.057634	0.28	MW-605D	0.19	0.19	0.07	Normal	95% Student's-t UCL	0.24	No	0.24	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	8	0	0.061419	0.41	MW-26	0.27	0.27	0.12	Normal	95% Student's-t UCL	0.35	No	0.35	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	8	0	0.003196	0.08	MW-605D	0.04	0.04	0.03	Normal	95% Student's-t UCL	0.05	No	0.05	NA	0.04	0.12	0.07	4	0.00
Thorium-230	pCi/L	8	0	0.078587	0.25	MW-605D	0.14	0.14	0.06	Normal	95% Student's-t UCL	0.19	No	0.19	NA	0.18	0.20	0.17	2	0.02
Thorium-232	pCi/L	8	0	-0.009	0.02	MW-605D	0.00	0.00	0.01	Normal	95% Student's-t UCL	0.01	No	0.01	NA	0.00	0.00	0.00	5	0.01
Uranium-234	pCi/L	8	0	2.278835	72	MW-26	46	46	29	None [f]	99% Chebyshev (Mean, Sd) UCL	149.50	Yes	71.84	NA	1.00	1.20	1.00	8	70.84
Uranium-235	pCi/L	8	0	0.070537	3.45	MW-26	2.18	2.18	1.46	None [f]	99% Chebyshev (Mean, Sd) UCL	7.32	Yes	3.45	NA	0.07	0.10	0.09	8	3.37
Uranium-238	pCi/L	8	0	2.061965	71	MW-26	44	44	28	None [f]	99% Chebyshev (Mean, Sd) UCL	143.80	Yes	70.84	NA	0.80	1.20	0.95	8	69.89
Groundwater-Filtered																				
Radium-226	pCi/L	4	0	0.143303	0.28	MW-605D	0.20	0.20	0.06	NA	NA	NA	NA	0.28	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	4	0	0.061419	0.41	MW-26	0.22	0.22	0.14	NA	NA	NA	NA	0.41	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	4	0	0.012009	0.08	MW-605D	0.04	0.04	0.03	NA	NA	NA	NA	0.08	NA	0.04	0.12	0.07	2	0.01
Thorium-230	pCi/L	4	0	0.079778	0.21	MW-18	0.12	0.12	0.06	NA	NA	NA	NA	0.21	NA	0.18	0.20	0.17	1	0.04
Thorium-232	pCi/L	4	0	0.005215	0.02	MW-605D	0.01	0.01	0.01	NA	NA	NA	NA	0.02	NA	0.00	0.00	0.00	4	0.02
Uranium-234	pCi/L	4	0	2.315002	69	MW-605D	46	46	31	NA	NA	NA	NA	69.20	NA	1.00	1.20	1.00	4	68.20
Uranium-235	pCi/L	4	0	0.070537	3.43	MW-605D	2.16	2.16	1.57	NA	NA	NA	NA	3.43	NA	0.07	0.10	0.09	4	3.34
Uranium-238	pCi/L	4	0	2.061965	66	MW-26	44	44	30	NA	NA	NA	NA	66.00	NA	0.80	1.20	0.95	4	65.05

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Groundwater-Unfiltered																				
Radium-226	pCi/L	4	0	0.057634	0.27	MW-605D	0.18	0.18	0.09	NA	NA	NA	NA	0.27	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	4	0	0.221598	0.40	MW-605D	0.31	0.31	0.08	NA	NA	NA	NA	0.40	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	4	0	0.003196	0.06	MW-19	0.03	0.03	0.03	NA	NA	NA	NA	0.06	NA	0.04	0.12	0.07	2	0.00
Thorium-230	pCi/L	4	0	0.078587	0.25	MW-605D	0.16	0.16	0.07	NA	NA	NA	NA	0.25	NA	0.18	0.20	0.17	1	0.08
Thorium-232	pCi/L	4	0	-0.009	0.00	MW-26	0.00	0.00	0.00	NA	NA	NA	NA	0.00	NA	0.00	0.00	0.00	1	0.00
Uranium-234	pCi/L	4	0	2.278835	72	MW-26	46	46	32	NA	NA	NA	NA	71.84	NA	1.00	1.20	1.00	4	70.84
Uranium-235	pCi/L	4	0	0.108197	3.45	MW-26	2.20	2.20	1.58	NA	NA	NA	NA	3.45	NA	0.07	0.10	0.09	4	3.37
Uranium-238	pCi/L	4	0	2.242452	71	MW-26	45	45	31	NA	NA	NA	NA	70.84	NA	0.80	1.20	0.95	4	69.89
EU15 - IA04C																				
Surface Soil																				
Radium-226	pCi/g	6	0	0.6	1.22	A04C-002	0.99	0.99	0.23	Normal	95% Student's-t UCL	1.18	No	1.18	0.7	1.11	1.37	1.11	3	0.07
Radium-228	pCi/g	6	0	-0.33	1.14	A04C-001	0.67	0.67	0.51	None [f]	95% Chebyshev (Mean, Sd) UCL	1.58	Yes	1.14	1.1	0.73	1.26	0.77	4	0.36
Thorium-228	pCi/g	20	0	0.41	1.67	A04C-309	0.90	0.90	0.26	Normal	95% Student's-t UCL	1.00	No	1.00	NA	0.84	1.10	0.87	10	0.14
Thorium-230	pCi/g	20	0	0.54	1.95	A04C-309	1.05	1.05	0.31	Normal	95% Student's-t UCL	1.17	No	1.17	NA	0.88	1.18	0.91	15	0.27
Thorium-232	pCi/g	20	0	0.39	1.48	A04C-309	0.87	0.87	0.24	Normal	95% Student's-t UCL	0.96	No	0.96	1.1	0.80	1.02	0.82	13	0.14
Uranium-234	pCi/g	20	0	0.49	5.26	A04C-301	1.42	1.42	1.12	Gamma	95% Approximate Gamma UCL	1.86	No	1.86	13	0.78	0.93	0.78	14	1.08
Uranium-235	pCi/g	20	0	-0.002	0.28	A04C-301	0.08	0.08	0.08	None [f]	95% Chebyshev (Mean, Sd) UCL	0.15	No	0.15	8	0.03	0.07	0.04	14	0.11
Uranium-238	pCi/g	20	0	0.38	4.92	A04C-301	1.42	1.42	1.03	Gamma	95% Approximate Gamma UCL	1.84	No	1.84	14	0.81	1.06	0.82	14	1.02
Total Soil																				
Radium-226	pCi/g	12	0	0.6	1.74	A04C-006	1.25	1.25	0.34	Normal	95% Student's-t UCL	1.43	No	1.43	0.7	1.02	1.37	1.04	6	0.39
Radium-228	pCi/g	12	0	-0.33	1.59	A04C-011	0.95	0.95	0.51	Normal	95% Student's-t UCL	1.21	No	1.21	1.1	0.72	1.25	0.80	5	0.42
Thorium-228	pCi/g	33	0	0.41	1.72	A04C-302	1.00	1.00	0.28	Normal	95% Student's-t UCL	1.09	No	1.09	NA	0.85	1.11	0.89	12	0.20
Thorium-230	pCi/g	33	0	0.54	1.95	A04C-309	1.13	1.13	0.29	Normal	95% Student's-t UCL	1.21	No	1.21	NA	0.88	1.17	0.90	13	0.31
Thorium-232	pCi/g	33	0	0.39	1.51	A04C-302	0.95	0.95	0.25	Normal	95% Student's-t UCL	1.02	No	1.02	1.1	0.80	1.07	0.83	11	0.19
Uranium-234	pCi/g	33	0	0.49	5.26	A04C-301	1.46	1.46	1.04	Lognormal	95% H-UCL	1.78	No	1.78	13	0.68	0.92	0.71	12	1.08
Uranium-235	pCi/g	33	0	-0.002	0.28	A04C-301	0.08	0.08	0.06	None [f]	95% Chebyshev (Mean, Sd) UCL	0.13	No	0.13	8	0.03	0.07	0.03	12	0.09
Uranium-238	pCi/g	33	0	0.38	4.92	A04C-301	1.47	1.47	1.01	Gamma	95% Approximate Gamma UCL	1.77	No	1.77	14	0.70	1.02	0.74	12	1.03
Sediment																				
Radium-226	pCi/g	2	0	0.55	0.82	A08-A01-004	0.69	0.69	0.19	NA	NA	NA	NA	0.82	0.7	1.00	1.00	1.00	0	0.00
Radium-228	pCi/g	2	0	0.16	0.99	A08-A01-004	0.58	0.58	0.59	NA	NA	NA	NA	0.99	1.1	0.60	0.60	0.60	1	0.39
Thorium-228	pCi/g	2	0	0.21	0.64	A08-A01-004	0.43	0.43	0.30	NA	NA	NA	NA	0.64	NA	0.80	1.00	0.83	0	0.00
Thorium-230	pCi/g	2	0	0.49	0.87	A08-A01-012	0.68	0.68	0.27	NA	NA	NA	NA	0.87	NA	0.80	0.90	0.80	1	0.07
Thorium-232	pCi/g	2	0	0.26	0.50	A08-A01-004	0.38	0.38	0.17	NA	NA	NA	NA	0.50	1.1	0.70	0.80	0.73	0	0.00
Uranium-234	pCi/g	2	0	6.04	10	A08-A01-004	8.17	8.17	3.01	NA	NA	NA	NA	10.30	13	0.70	0.80	0.77	2	9.53
Uranium-235	pCi/g	2	0	0.23	0.71	A08-A01-004	0.47	0.47	0.34	NA	NA	NA	NA	0.71	8	0.04	0.07	0.05	2	0.66
Uranium-238	pCi/g	2	0	5.51	11	A08-A01-004	8.11	8.11	3.67	NA	NA	NA	NA	10.70	14	0.60	0.70	0.63	2	10.07

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
EU16 - IA04D																				
Surface Soil																				
Radium-226	pCi/g	6	0	0.484715	1.56	A04D-023	1.00	1.00	0.40	Normal	95% Student's-t UCL	1.33	No	1.33	0.7	1.11	1.37	1.11	3	0.22
Radium-228	pCi/g	6	0	0.161045	1.26	A04D-307	0.76	0.76	0.40	Normal	95% Student's-t UCL	1.09	No	1.09	1.1	0.73	1.26	0.77	2	0.31
Thorium-228	pCi/g	12	0	0.611948	2.43	A04D-326	1.12	1.12	0.45	Gamma	95% Approximate Gamma UCL	1.35	No	1.35	NA	0.84	1.10	0.87	11	0.49
Thorium-230	pCi/g	12	0	0.527561	1.49	A04D-026	1.12	1.12	0.26	Normal	95% Student's-t UCL	1.25	No	1.25	NA	0.88	1.18	0.91	10	0.35
Thorium-232	pCi/g	12	0	0.614787	1.93	A04D-326	1.07	1.07	0.35	Normal	95% Student's-t UCL	1.25	No	1.25	1.1	0.80	1.02	0.82	10	0.43
Uranium-234	pCi/g	12	0	0.85	14	A04D-020	3.47	3.47	3.95	Gamma	95% Approximate Gamma UCL	5.83	No	5.83	13	0.78	0.93	0.78	12	5.05
Uranium-235	pCi/g	12	0	0.02	0.71	A04D-020	0.17	0.17	0.20	Gamma	95% Approximate Gamma UCL	0.32	No	0.32	8	0.03	0.07	0.04	10	0.28
Uranium-238	pCi/g	12	0	1.05	15	A04D-020	4.27	4.27	4.51	Gamma	95% Approximate Gamma UCL	7.28	No	7.28	14	0.81	1.06	0.82	12	6.46
Total Soil																				
Radium-226	pCi/g	12	0	0.484715	2.20	A04D-031	1.33	1.33	0.52	Normal	95% Student's-t UCL	1.60	No	1.60	0.7	1.02	1.37	1.04	6	0.56
Radium-228	pCi/g	12	0	0.161045	1.89	A04D-320	0.95	0.95	0.44	Normal	95% Student's-t UCL	1.18	No	1.18	1.1	0.72	1.25	0.80	5	0.39
Thorium-228	pCi/g	24	0	0.611948	2.43	A04D-326	1.25	1.25	0.39	Gamma	95% Approximate Gamma UCL	1.39	No	1.39	NA	0.85	1.11	0.89	12	0.50
Thorium-230	pCi/g	24	0	0.527561	2.27	A04D-031	1.38	1.38	0.43	Normal	95% Student's-t UCL	1.53	No	1.53	NA	0.88	1.17	0.90	12	0.63
Thorium-232	pCi/g	24	0	0.614787	1.99	A04D-324	1.23	1.23	0.38	Normal	95% Student's-t UCL	1.36	No	1.36	1.1	0.80	1.07	0.83	11	0.53
Uranium-234	pCi/g	24	0	0.85	14.06	A04D-020	2.62	2.62	2.92	None [f]	95% Chebyshev (Mean, Sd) UCL	5.22	No	5.22	13	0.68	0.92	0.71	12	4.51
Uranium-235	pCi/g	24	0	0.009	0.71	A04D-020	0.12	0.12	0.15	Gamma	95% Approximate Gamma UCL	0.18	No	0.18	8	0.03	0.07	0.03	10	0.14
Uranium-238	pCi/g	24	0	0.86	15.19	A04D-020	3.00	3.00	3.42	None [f]	95% Chebyshev (Mean, Sd) UCL	6.04	No	6.04	14	0.70	1.02	0.74	12	5.30
Groundwater																				
Radium-226	pCi/L	4	0	0.076154	0.21	MW-604D	0.13	0.13	0.06	NA	NA	NA	NA	0.21	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	4	0	0.356548	0.42	MW-24	0.38	0.38	0.03	NA	NA	NA	NA	0.42	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	4	0	-0.0318	0.09	MW-604D	0.03	0.03	0.05	NA	NA	NA	NA	0.09	NA	0.04	0.12	0.07	3	0.02
Thorium-230	pCi/L	4	0	0.072879	0.20	MW-604D	0.13	0.13	0.06	NA	NA	NA	NA	0.20	NA	0.18	0.20	0.17	1	0.03
Thorium-232	pCi/L	4	0	-0.01422	0.06	MW-604D	0.02	0.02	0.03	NA	NA	NA	NA	0.06	NA	0.00	0.00	0.00	3	0.06
Uranium-234	pCi/L	4	0	0.47	29	MW-604D	14	14	16	NA	NA	NA	NA	28.60	NA	1.00	1.20	1.00	2	27.60
Uranium-235	pCi/L	4	0	0.052226	1.70	MW-604D	0.83	0.83	0.85	NA	NA	NA	NA	1.70	NA	0.07	0.10	0.09	3	1.62
Uranium-238	pCi/L	4	0	0.430323	30	MW-604D	15	15	17	NA	NA	NA	NA	29.98	NA	0.80	1.20	0.95	2	29.03
Groundwater-Filtered																				
Radium-226	pCi/L	2	0	0.094	0.14	MW-604D	0.12	0.12	0.04	NA	NA	NA	NA	0.14	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	2	0	0.356548	0.38	MW-604D	0.37	0.37	0.02	NA	NA	NA	NA	0.38	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	2	0	-0.0318	0.04	MW-24	0.01	0.01	0.05	NA	NA	NA	NA	0.04	NA	0.04	0.12	0.07	1	0.00
Thorium-230	pCi/L	2	0	0.090564	0.20	MW-604D	0.14	0.14	0.07	NA	NA	NA	NA	0.20	NA	0.18	0.20	0.17	1	0.03
Thorium-232	pCi/L	2	0	-0.01422	0.06	MW-604D	0.02	0.02	0.05	NA	NA	NA	NA	0.06	NA	0.00	0.00	0.00	1	0.06
Uranium-234 [e]	pCi/L	2	0	0.583231	28	MW-604D	14	14	19	NA	NA	NA	NA	28.15	NA	1.00	1.20	1.00	1	27.15
Uranium-235	pCi/L	2	0	0.16	1.70	MW-604D	0.93	0.93	1.09	NA	NA	NA	NA	1.70	NA	0.07	0.10	0.09	2	1.62
Uranium-238 [e]	pCi/L	2	0	0.437675	30	MW-604D	15	15	21	NA	NA	NA	NA	29.98	NA	0.80	1.20	0.95	1	29.03

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Groundwater-Unfiltered																				
Radium-226	pCi/L	2	0	0.076154	0.21	MW-604D	0.14	0.14	0.09	NA	NA	NA	NA	0.21	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	2	0	0.377001	0.42	MW-24	0.40	0.40	0.03	NA	NA	NA	NA	0.42	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	2	0	0.040456	0.09	MW-604D	0.06	0.06	0.03	NA	NA	NA	NA	0.09	NA	0.04	0.12	0.07	2	0.02
Thorium-230	pCi/L	2	0	0.072879	0.14	MW-604D	0.11	0.11	0.05	NA	NA	NA	NA	0.14	NA	0.18	0.20	0.17	0	0.00
Thorium-232	pCi/L	2	0	0.006424	0.03	MW-604D	0.02	0.02	0.01	NA	NA	NA	NA	0.03	NA	0.00	0.00	0.00	2	0.03
Uranium-234	pCi/L	2	0	0.47	29	MW-604D	15	15	20	NA	NA	NA	NA	28.60	NA	1.00	1.20	1.00	1	27.60
Uranium-235	pCi/L	2	0	0.052226	1.41	MW-604D	0.73	0.73	0.96	NA	NA	NA	NA	1.41	NA	0.07	0.10	0.09	1	1.32
Uranium-238	pCi/L	2	0	0.430323	29	MW-604D	15	15	20	NA	NA	NA	NA	28.60	NA	0.80	1.20	0.95	1	27.65
Sediment																				
Radium-226	pCi/g	2	0	0.31	0.31	A08-A01-001	0.31	0.31	0.00	NA	NA	NA	NA	0.31	0.7	1.00	1.00	1.00	0	0.00
Radium-228	pCi/g	2	0	0.425149	0.57	A08-A01-005	0.50	0.50	0.10	NA	NA	NA	NA	0.57	1.1	0.60	0.60	0.60	0	0.00
Thorium-228	pCi/g	2	0	0.29489	0.35	A08-A01-005	0.32	0.32	0.04	NA	NA	NA	NA	0.35	NA	0.80	1.00	0.83	0	0.00
Thorium-230	pCi/g	2	0	0.31	0.40	A08-A01-001	0.35	0.35	0.06	NA	NA	NA	NA	0.40	NA	0.80	0.90	0.80	0	0.00
Thorium-232	pCi/g	2	0	0.229934	0.26	A08-A01-005	0.24	0.24	0.02	NA	NA	NA	NA	0.26	1.1	0.70	0.80	0.73	0	0.00
Uranium-234 [e]	pCi/g	2	0	1.83	6.19	A08-A01-001	4.01	4.01	3.08	NA	NA	NA	NA	6.19	13	0.70	0.80	0.77	2	5.42
Uranium-235	pCi/g	2	0	0.158	0.31	A08-A01-001	0.23	0.23	0.10	NA	NA	NA	NA	0.31	8	0.04	0.07	0.05	2	0.26
Uranium-238 [e]	pCi/g	2	0	1.76	6.71	A08-A01-001	4.24	4.24	3.50	NA	NA	NA	NA	6.71	14	0.60	0.70	0.63	2	6.08
EU17 - IA05A																				
Surface Soil																				
Radium-226	pCi/g	15	0	0.74	11	A05A-301	1.80	1.80	2.64	None [f]	95% Chebyshev (Mean, Sd) UCL	4.78	No	4.78	0.7	1.11	1.37	1.11	8	3.67
Radium-228	pCi/g	15	0	0.52	41	A05A-301	3.53	3.53	10.42	None [f]	99% Chebyshev (Mean, Sd) UCL	30.32	No	30.32	1.1	0.73	1.26	0.77	7	29.55
Thorium-228	pCi/g	30	0	0.585	46	A05A-301	2.48	2.48	8.23	None [f]	95% Chebyshev (Mean, Sd) UCL	9.03	No	9.03	NA	0.84	1.10	0.87	19	8.17
Thorium-230	pCi/g	30	0	0.428434	9.48	A05A-301	1.38	1.38	1.55	None [f]	95% Student's-t UCL	1.86	No	1.86	NA	0.88	1.18	0.91	26	0.95
Thorium-232	pCi/g	30	0	0.49	46	A05A-301	2.36	2.36	8.17	None [f]	95% Chebyshev (Mean, Sd) UCL	8.86	No	8.86	1.1	0.80	1.02	0.82	16	8.04
Uranium-234	pCi/g	30	0	0.42	4,083	A05A-301	138	138	745	None [f]	99% Chebyshev (Mean, Sd) UCL	1492	No	1492	13	0.78	0.93	0.78	24	1491
Uranium-235	pCi/g	30	0	-0.0073	216	A05A-301	7.30	7.30	39.37	None [f]	95% Chebyshev (Mean, Sd) UCL	38.63	No	38.63	8	0.03	0.07	0.04	18	38.59
Uranium-238	pCi/g	30	0	0.35	4,357	A05A-301	148	148	795	None [f]	99% Chebyshev (Mean, Sd) UCL	1592	No	1592	14	0.81	1.06	0.82	25	1591
Total Soil																				
Radium-226	pCi/g	30	0	0.74	11.30	A05A-301	1.51	1.51	1.89	None [f]	95% Chebyshev (Mean, Sd) UCL	3.01	No	3.01	0.7	1.02	1.37	1.04	12	1.97
Radium-228	pCi/g	30	0	0.34	41	A05A-301	2.68	2.68	7.64	None [f]	95% Chebyshev (Mean, Sd) UCL	8.77	No	8.77	1.1	0.72	1.25	0.80	12	7.97
Thorium-228	pCi/g	60	0	0.58	46	A05A-301	2.08	2.08	6.19	None [f]	95% Chebyshev (Mean, Sd) UCL	5.56	No	5.56	NA	0.85	1.11	0.89	26	4.68
Thorium-230	pCi/g	60	0	0.428434	9.48	A05A-301	1.30	1.30	1.18	Normal	95% Student's-t UCL	1.55	No	1.55	NA	0.88	1.17	0.90	26	0.65
Thorium-232	pCi/g	60	0	0.49	46	A05A-301	1.94	1.94	6.11	None [f]	95% Chebyshev (Mean, Sd) UCL	5.38	No	5.38	1.1	0.80	1.07	0.83	23	4.55
Uranium-234	pCi/g	60	0	0.42	4,083	A05A-301	102	102	570	None [f]	97.5% Chebyshev (Mean, Sd) UCL	562	No	562	13	0.68	0.92	0.71	24	561
Uranium-235	pCi/g	60	0	-0.0073	216	A05A-301	5.50	5.50	30.43	None [f]	95% Chebyshev (Mean, Sd) UCL	22.62	No	22.62	8	0.03	0.07	0.03	25	22.59
Uranium-238	pCi/g	60	0	0.35	4,357	A05A-301	109	109	608	None [f]	97.5% Chebyshev (Mean, Sd) UCL	600	No	600	14	0.70	1.02	0.74	24	599

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
EU18 - IA05B																				
Surface Soil																				
Radium-226	pCi/g	6	0	1	1.21	A05B-007	1.08	1.08	0.08	Normal	95% Student's-t UCL	1.15	No	1.15	0.7	1.11	1.37	1.11	2	0.04
Radium-228	pCi/g	6	0	0.8	1.15	A05B-009	0.96	0.96	0.13	Normal	95% Student's-t UCL	1.07	No	1.07	1.1	0.73	1.26	0.77	6	0.29
Thorium-228	pCi/g	10	0	0.67	1.17	A05B-009	0.88	0.88	0.15	Normal	95% Student's-t UCL	0.96	No	0.96	NA	0.84	1.10	0.87	4	0.10
Thorium-230	pCi/g	10	0	0.61	1.12	A05B-005	0.88	0.88	0.16	Normal	95% Student's-t UCL	0.97	No	0.97	NA	0.88	1.18	0.91	5	0.07
Thorium-232	pCi/g	10	0	0.62	1.18	A05B-004	0.83	0.83	0.18	Normal	95% Student's-t UCL	0.94	No	0.94	1.1	0.80	1.02	0.82	4	0.12
Uranium-234	pCi/g	10	0	0.69	0.89	A05B-006	0.79	0.79	0.06	Normal	95% Student's-t UCL	0.82	No	0.82	13	0.78	0.93	0.78	7	0.05
Uranium-235	pCi/g	10	0	0.025	0.08	A05B-001	0.05	0.05	0.02	Normal	95% Student's-t UCL	0.07	No	0.07	8	0.03	0.07	0.04	8	0.03
Uranium-238	pCi/g	10	0	0.55	0.79	A05B-011	0.69	0.69	0.08	Normal	95% Student's-t UCL	0.73	No	0.73	14	0.81	1.06	0.82	0	0.00
Total Soil																				
Radium-226	pCi/g	11	0	0.82	1.21	A05B-007	1.03	1.03	0.10	Normal	95% Student's-t UCL	1.09	No	1.09	0.7	1.02	1.37	1.04	4	0.05
Radium-228	pCi/g	11	0	0.78	1.42	A05B-005	1.02	1.02	0.21	Normal	95% Student's-t UCL	1.13	No	1.13	1.1	0.72	1.25	0.80	5	0.34
Thorium-228	pCi/g	23	0	0.58	1.18	A05B-011	0.90	0.90	0.17	Normal	95% Student's-t UCL	0.97	No	0.97	NA	0.85	1.11	0.89	9	0.08
Thorium-230	pCi/g	23	0	0.61	1.28	A05B-002	0.92	0.92	0.17	Normal	95% Student's-t UCL	0.98	No	0.98	NA	0.88	1.17	0.90	8	0.08
Thorium-232	pCi/g	23	0	0.62	1.18	A05B-004	0.88	0.88	0.15	Normal	95% Student's-t UCL	0.94	No	0.94	1.1	0.80	1.07	0.83	11	0.11
Uranium-234	pCi/g	23	0	0.35	0.90	A05B-008	0.73	0.73	0.12	Normal	95% Student's-t UCL	0.77	No	0.77	13	0.68	0.92	0.71	11	0.06
Uranium-235	pCi/g	23	0	-0.00343	0.08	A05B-001	0.05	0.05	0.02	Normal	95% Student's-t UCL	0.05	No	0.05	8	0.03	0.07	0.03	12	0.02
Uranium-238	pCi/g	23	0	0.46	0.91	A05B-004	0.69	0.69	0.11	Normal	95% Student's-t UCL	0.73	No	0.73	14	0.70	1.02	0.74	9	0.00
Groundwater																				
Radium-226	pCi/L	2	0	1.259145	1.36	MW-600D	1.31	1.31	0.07	NA	NA	NA	NA	1.36	NA	1.30	1.40	1.35	1	0.01
Radium-228	pCi/L	2	0	1.951303	2.35	MW-600D	2.15	2.15	0.28	NA	NA	NA	NA	2.35	NA	2.10	2.40	2.20	1	0.15
Thorium-228	pCi/L	2	0	0.020898	0.12	MW-600D	0.07	0.07	0.07	NA	NA	NA	NA	0.12	NA	0.04	0.12	0.07	1	0.05
Thorium-230	pCi/L	2	0	0.141529	0.25	MW-600D	0.19	0.19	0.07	NA	NA	NA	NA	0.25	NA	0.18	0.20	0.17	1	0.08
Thorium-232	pCi/L	2	0	0.003224	0.01	MW-600D	0.00	0.00	0.00	NA	NA	NA	NA	0.01	NA	0.00	0.00	0.00	2	0.01
Uranium-234 [e]	pCi/L	2	0	0.805426	1.23	MW-600D	1.02	1.02	0.30	NA	NA	NA	NA	1.23	NA	1.00	1.20	1.00	1	0.23
Uranium-235	pCi/L	2	0	0.072221	0.08	MW-600D	0.08	0.08	0.01	NA	NA	NA	NA	0.08	NA	0.07	0.10	0.09	2	0.00
Uranium-238 [e]	pCi/L	2	0	0.672706	1.23	MW-600D	0.95	0.95	0.39	NA	NA	NA	NA	1.23	NA	0.80	1.20	0.95	1	0.28
Groundwater-Filtered																				
Radium-226	pCi/L	1	0	1.359735	1.36	MW-600D	1.36	1.36	NA	NA	NA	NA	NA	1.36	NA	1.30	1.40	1.35	1	0.01
Radium-228	pCi/L	1	0	2.351553	2.35	MW-600D	2.35	2.35	NA	NA	NA	NA	NA	2.35	NA	2.10	2.40	2.20	1	0.15
Thorium-228	pCi/L	1	0	0.020898	0.02	MW-600D	0.02	0.02	NA	NA	NA	NA	NA	0.02	NA	0.04	0.12	0.07	0	0.00
Thorium-230	pCi/L	1	0	0.246423	0.25	MW-600D	0.25	0.25	NA	NA	NA	NA	NA	0.25	NA	0.18	0.20	0.17	1	0.08
Thorium-232	pCi/L	1	0	0.005015	0.01	MW-600D	0.01	0.01	NA	NA	NA	NA	NA	0.01	NA	0.00	0.00	0.00	1	0.01
Uranium-234 [e]	pCi/L	1	0	1.231123	1.23	MW-600D	1.23	1.23	NA	NA	NA	NA	NA	1.23	NA	1.00	1.20	1.00	1	0.23
Uranium-235	pCi/L	1	0	0.072221	0.07	MW-600D	0.07	0.07	NA	NA	NA	NA	NA	0.07	NA	0.07	0.10	0.09	1	0.00
Uranium-238 [e]	pCi/L	1	0	1.226305	1.23	MW-600D	1.23	1.23	NA	NA	NA	NA	NA	1.23	NA	0.80	1.20	0.95	1	0.28

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Groundwater-Unfiltered																				
Radium-226	pCi/L	1	0	1.259145	1.26	MW-600D	1.26	1.26	NA	NA	NA	NA	NA	1.26	NA	1.30	1.40	1.35	0	0.00
Radium-228	pCi/L	1	0	1.951303	1.95	MW-600D	1.95	1.95	NA	NA	NA	NA	NA	1.95	NA	2.10	2.40	2.20	0	0.00
Thorium-228	pCi/L	1	0	0.124822	0.12	MW-600D	0.12	0.12	NA	NA	NA	NA	NA	0.12	NA	0.04	0.12	0.07	1	0.05
Thorium-230	pCi/L	1	0	0.141529	0.14	MW-600D	0.14	0.14	NA	NA	NA	NA	NA	0.14	NA	0.18	0.20	0.17	0	0.00
Thorium-232	pCi/L	1	0	0.003224	0.00	MW-600D	0.00	0.00	NA	NA	NA	NA	NA	0.00	NA	0.00	0.00	0.00	1	0.00
Uranium-234	pCi/L	1	0	0.805426	0.81	MW-600D	0.81	0.81	NA	NA	NA	NA	NA	0.81	NA	1.00	1.20	1.00	0	0.00
Uranium-235	pCi/L	1	0	0.08	0.08	MW-600D	0.08	0.08	NA	NA	NA	NA	NA	0.08	NA	0.07	0.10	0.09	1	0.00
Uranium-238	pCi/L	1	0	0.672706	0.67	MW-600D	0.67	0.67	NA	NA	NA	NA	NA	0.67	NA	0.80	1.20	0.95	0	0.00
EU19 IA09 - Erie Barge Canal																				
Sediment																				
Radium-226	pCi/g	6	0	0.86	1.14	A09-001	0.98	0.98	0.09	Normal	95% Student's-t UCL	1.06	No	1.06	0.7	1.00	1.00	1.00	1	0.06
Radium-228	pCi/g	6	0	0.59	0.89	A09-008	0.73	0.73	0.12	Normal	95% Student's-t UCL	0.82	No	0.82	1.1	0.60	0.60	0.60	5	0.22
Thorium-228	pCi/g	12	0	0.54	1.09	A09-009	0.77	0.77	0.15	Normal	95% Student's-t UCL	0.85	No	0.85	NA	0.80	1.00	0.83	4	0.02
Thorium-230	pCi/g	12	0	0.6	1.04	A09-007	0.83	0.83	0.13	Normal	95% Student's-t UCL	0.90	No	0.90	NA	0.80	0.90	0.80	8	0.10
Thorium-232	pCi/g	12	0	0.55	1.08	A09-009	0.71	0.71	0.13	Gamma	95% Approximate Gamma UCL	0.78	No	0.78	1.1	0.70	0.80	0.73	4	0.05
Uranium-234	pCi/g	12	0	0.52	0.85	A09-009	0.69	0.69	0.10	Normal	95% Student's-t UCL	0.74	No	0.74	13	0.70	0.80	0.77	5	0.00
Uranium-235	pCi/g	11	0	0.021	0.09	A09-003	0.05	0.05	0.02	Normal	95% Student's-t UCL	0.06	No	0.06	8	0.04	0.07	0.05	6	0.01
Uranium-238	pCi/g	12	0	0.47	0.77	A09-009	0.63	0.63	0.10	Normal	95% Student's-t UCL	0.68	No	0.68	14	0.60	0.70	0.63	6	0.05
Surface Water																				
Radium-226	pCi/L	12	0	0.07	0.20	A09-012	0.11	0.11	0.04	Normal	95% Student's-t UCL	0.14	No	0.14	NA	0.13	0.20	0.13	4	0.01
Radium-228	pCi/L	12	0	-0.15	1.05	A09-003	0.46	0.46	0.30	Normal	95% Student's-t UCL	0.61	No	0.61	NA	0.30	0.40	0.33	8	0.28
Thorium-228	pCi/L	12	0	0.07	0.37	A09-001	0.21	0.21	0.08	Normal	95% Student's-t UCL	0.26	No	0.26	NA	0.13	0.30	0.20	10	0.06
Thorium-230	pCi/L	12	0	0.09	0.43	A09-001	0.19	0.19	0.11	Gamma	95% Approximate Gamma UCL	0.26	No	0.26	NA	0.18	0.20	0.20	4	0.06
Thorium-232	pCi/L	12	0	-0.017	0.07	A09-005	0.01	0.01	0.03	Normal	95% Student's-t UCL	0.03	No	0.03	NA	0.00	0.05	0.01	6	0.02
Uranium-234 [e]	pCi/L	12	0	0.015	0.24	A09-004, A09-006, A09-010	0.17	0.17	0.07	Normal	95% Student's-t UCL	0.20	No	0.20	NA	0.15	0.20	0.17	9	0.04
Uranium-235	pCi/L	8	0	-0.006	0.06	A09-012	0.01	0.01	0.02	None [f]	95% Chebyshev (Mean, Sd) UCL	0.05	No	0.05	NA	0.03	0.06	0.04	2	0.01
Uranium-238 [e]	pCi/L	12	0	0.086	0.25	A09-004	0.14	0.14	0.05	Normal	95% Student's-t UCL	0.17	No	0.17	NA	0.10	0.10	0.10	9	0.07
EU20																				
Surface Soil																				
Radium-226	pCi/g	5	0	0.94	1.35	A10-006	1.16	1.16	0.16	Normal	95% Student's-t UCL	1.30	No	1.30	0.7	1.11	1.37	1.11	3	0.20
Radium-228	pCi/g	5	0	0.44	1.25	A10-013	0.91	0.91	0.37	Normal	95% Student's-t UCL	1.26	Yes	1.25	1.1	0.73	1.26	0.77	3	0.48
Thorium-228	pCi/g	12	0	0.7	1.53	A10-013	0.93	0.93	0.24	Gamma	95% Approximate Gamma UCL	1.06	No	1.06	NA	0.84	1.10	0.87	7	0.19
Thorium-230	pCi/g	12	0	0.57	1.61	A10-007	1.10	1.10	0.29	Normal	95% Student's-t UCL	1.25	No	1.25	NA	0.88	1.18	0.91	9	0.34
Thorium-232	pCi/g	12	0	0.47	1.16	A10-013	0.83	0.83	0.18	Normal	95% Student's-t UCL	0.93	No	0.93	1.1	0.80	1.02	0.82	6	0.11
Uranium-234 [d]	pCi/g	12	0	0.62	4.03	A10-301	1.21	1.21	0.96	Gamma	95% Approximate Gamma UCL	1.70	No	1.70	13	0.78	0.93	0.78	7	0.93
Uranium-235	pCi/g	12	0	0.018	0.23	A10-301	0.06	0.06	0.06	Gamma	95% Approximate Gamma UCL	0.09	No	0.09	8	0.03	0.07	0.04	6	0.05
Uranium-238 [d]	pCi/g	12	0	0.61	4.26	A10-301	1.30	1.30	1.02	Lognormal	95% H-UCL	1.85	No	1.85	14	0.81	1.06	0.82	7	1.04

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]
Total Soil																				
Radium-226	pCi/g	12	0	0.65	1.35	A10-006	1.05	1.05	0.18	Normal	95% Student's-t UCL	1.15	No	1.15	0.7	1.02	1.37	1.04	8	0.11
Radium-228	pCi/g	12	0	0.44	1.74	A10-013	0.88	0.88	0.38	Normal	95% Student's-t UCL	1.08	No	1.08	1.1	0.72	1.25	0.80	7	0.29
Thorium-228	pCi/g	24	0	0.4	1.53	A10-013	0.85	0.85	0.23	Normal	95% Student's-t UCL	0.93	No	0.93	NA	0.85	1.11	0.89	12	0.04
Thorium-230	pCi/g	24	0	0.31	1.61	A10-007	0.98	0.98	0.30	Normal	95% Student's-t UCL	1.09	No	1.09	NA	0.88	1.17	0.90	15	0.19
Thorium-232	pCi/g	24	0	0.28	1.31	A10-013	0.80	0.80	0.23	Normal	95% Student's-t UCL	0.88	No	0.88	1.1	0.80	1.07	0.83	10	0.05
Uranium-234	pCi/g	24	0	0.53	4.42	A10-013	1.32	1.32	1.03	None [f]	95% Chebyshev (Mean, Sd) UCL	2.24	No	2.24	13	0.68	0.92	0.71	22	1.53
Uranium-235	pCi/g	24	0	0.018	0.23	A10-301	0.07	0.07	0.05	Gamma	95% Approximate Gamma UCL	0.08	No	0.08	8	0.03	0.07	0.03	21	0.05
Uranium-238	pCi/g	24	0	0.61	4.26	A10-301	1.41	1.41	0.98	None [f]	95% Chebyshev (Mean, Sd) UCL	2.28	No	2.28	14	0.70	1.02	0.74	22	1.54

Notes:

[a] Screening levels were obtained from Table 5-2 of the Final Field Sampling Plan for this project (USACE, 2007a). Preliminary remediation goals are developed in Section 8.

[b] Net EPCs are the lesser of the maximum detection and the UCL minus the average background value. All statistics were calculated using ProUCL; input and output files are located on the CD in Appendix V.

[c] Allocation of Beta activities was generated from Static Radioactivity Surveys (referred to as "Building Surveys" within the RI Report). The static measurements provided the gross Beta dpm per 100 cm2; these measurements were then run through ProUCL 4.00.04 to provide the Upper Confidence Limit of the gross Beta concentration. Background Beta for the building was subtracted and the resultant difference was multiplied by 0.293 to provide the Beta measurement from Beta emitting progeny. This value was then converted to the pCi/g Beta measurement on the series of Tables 6-3 and V1-1 by using two relationships: a volume activity concentration X pCi/g equates with a surface activity concentration of 10,000 X pCi/m2 (ANSI N13.12-1999) and 2.22 dpm converts to 1 pCi. Beta allocation of this Beta Measurement to the COPCs was accomplished through assumptions: Ra226 and Th230 were assumed to occur at background levels; Ra228, Th228, and Th232 were assumed to be in secular equilibrium; and, the uranium isotopes were assumed to occur in their natural relative abundances. The Beta Measurement row presents the result measured by the sampling equipment while the rows beneath present the COPC allocations of that measured activity.

[d] In some cases, a large relative percent difference (RPD) between concentrations of U-234 and U-238 cannot be explained through statistics. For example, in EU 1 there are only three building material samples (an insuffient number to run through ProUCL). The maximum concentrations for both U-234 and U-238 come from the same sample and yet a comparison between these two results yields a RPD of 12%.

[e] It is common for equilibrium between U-234 and U-238 to be upset when the uranium dissolves in water, as it may be in sediment, surface water, and groundwater, as suggested in NCRP Report No. 94.

[f] Data do not follow a Discernable Distribution and are therefore nonparametric.

[g] Did not accept ProUCL's recommended distribution, method and UCL95; selected UCLs more similar to that of Uranium-234 or Uranium-238. Note that in these cases, there is a wide disparity between the maximum concentrations for these isotopes even though they are from the same sample.

[h] ProUCL distributions and methods were evaluated and recommendation was found to be the best match.

TABLE 6-3
SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR COPCS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Medium/ Isotope	Units	# Observations	# Non-Detects	Minimum Detection	Maximum Detection	Station ID of Max Det	Mean	Mean (Det)	Sd	Distribution	Method	UCL95	UCL>Max?	EPC	Soil Screening Levels [a]	Background W.A. UTL	Background Max/UTL/UPL	Average Background	# Exceed Background	NET EPC [b]

BCA = bias-corrected accelerated bootstrap
CLT = central limit theorem
COPC = constituent of potential concern
Det = detection
EPC = exposure point concentration
EU = exposure unit
IA - investigative area
Max Det = maximum detection
MVUE = minimum variance unbiased estimate
NA = Not Applicable
pCi/g = picocuries per gram
pCi/L = picocuries per liter
Sd = standard deviation
UCL > max? = UCL greater than maximum detection?
UCL = upper confidence limit
UPL = upper prediction limit
UTL = upper tolerance limit
W.A. UTL = weighted average upper tolerance limit

TABLE 6-4
RECEPTOR-SPECIFIC AND SCENARIO-SPECIFIC RESRAD PARAMETER VALUES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

RESRAD Parameter	Units	RESRAD Default	Risk Variability[a]	Proposed Values[b]	Receptor or Scenario	Comment/Reference
Area of contaminated zone	m^2	10,000	3	67000	All receptors	Contaminated zone selected to represent all terrestrial EUs; individual EU values presented on Table 6-5
Thickness of contaminated zone	m	2.0	1	1	All receptors	Thickness of contaminated zone selected to represent all terrestrial EUs; individual EU values presented in Table 6-5
Length parallel to aquifer flow	m	100	4	600	All receptors	Value selected based on actual length of plume parallel to aquifer flow; individual EU values presented in Table 6-5
Time since placement of material	yr	0.0	-	Use default	All receptors	Using site-specific modeling option
Cover depth	m	0.0	3	Use default	All receptors	Cover will eliminate direct ingestion and inhalation pathways
Density of cover material	g/cm^3	1.5	3	Not used	All receptors	According to Manual Appendix A and E and DCH Section 2, omitted if cover depth = 0; geologist/hydrologist consulted
Cover depth erosion rate	m/yr	0.001	5	Not used	All receptors	If cover erodes, direct ingestion and inhalation pathways are relevant
Density of contaminated zone	g/cm^3	1.5	4	1.31	All receptors	Based on combining averages for each area
Contaminated zone erosion rate	m/yr	0.001	3	6.00E-05	All receptors	Can erode entire contaminated lens if value is large enough; assumed a conservative 2% slope and nonfarming use; DCH manual Section 14 for further discussion
Contaminated zone total porosity	unitless	0.4	5	0.3	All receptors	Geotech evaluation based on soil moisture of 15% for tills
Contaminated zone field capacity	unitless	0.2	7	0.15	All receptors	Based on available water content of 15%
Contaminated zone hydraulic conductivity	m/yr	10	7	3.15	All receptors	Based on native soil Shelby tube permeability lab tests (avg of two tests 1.3E-06 cm/sec), NYSDEC 2000 reference of 3.67E-07 cm/sec for a remolded sample, and Earth Tech geotechnical assessment of soil boring data (i.e., theoretical range based on soil types) of 1E-05 cm/sec to 1E-07 cm/sec
Contaminated zone b parameter	unitless	5.3	7	7.3	All receptors	Based on average manual and low hydraulic conductivity of till and silty clay soil type
Average annual wind speed	m/sec	2.0	6	4.5	All receptors	Averaged between Rochester and Buffalo windspeeds
Evapotranspiration coefficient	unitless	0.5	5	5.70E-01	All receptors	Based on average site-specific information; geologist/hydrologist consulted
Precipitation	m/yr	1.0	5	0.94	All receptors	Obtained from SEVIEW Climatic Database for Lockport 2 NE
Irrigation (I_r)	m/yr	0.2	5	0.2	Gardening	Small home garden will require watering.
Irrigation mode	unitless	Overhead	-	Use default	Gardening	Used in residential future scenario
Runoff coefficient	unitless	0.2	5	2.50E-01	All receptors	Value was selected to reflect poor drainage and silty soils that show infiltration and leaching capacity.
Watershed area for nearby stream or pond	m^2	1E+06	5	Use default	All receptors	Surface water dependent pathways; see Manual Appendix E and DCH Section 17
Accuracy for water/soil computations	unitless	0.001	-	Use default	All receptors	Related to water/soil concentration ratios; see Manual Appendix E
Saturated zone density	g/cm^3	1.5	4	2.61	All receptors	Estimate for dolostone based on reference[c] and USACE data.
Saturated zone total porosity	unitless	0.4	4	0.13	All receptors	Based on average site-specific information; geologist/hydrologist consulted
Saturated zone effective porosity	unitless	0.2	3	0.03	All receptors	Based on average site-specific information; geologist/hydrologist consulted
Saturated zone field capacity	unitless	0.2	7	0.03	All receptors	Geologist/hydrologist consulted
Saturated zone hydraulic conductivity	m/yr	100	3	1,540	All receptors	Geomean of measured hydraulic conductivity of bedrock and model manual; hydraulic conductivities ranged from 7.1x10E-05 cm/sec at monitoring well MW-15 to 8.9x10E-02 cm/sec at monitoring well MW-3. The average hydraulic conductivity for the site is 4.91x10E-03 cm/sec.
Saturated zone hydraulic gradient	unitless	0.02	3	0.007	All receptors	Based on site data
Saturated zone b parameter	unitless	5.3	7	2	All receptors	Average; based on geomean of measured hydraulic conductivity of bedrock and model manual
Water table drop rate	m/yr	0.001	7	0.87	All receptors	Value derived from natural seasonal variation and not due to pumping; seasonal low in November subtracted from seasonal high in March.
Well pump intake depth (m below water table)	m	10	5	Use default	All receptors	No site-specific pumping information available; assuming default.

TABLE 6-4
RECEPTOR-SPECIFIC AND SCENARIO-SPECIFIC RESRAD PARAMETER VALUES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

RESRAD Parameter	Units	RESRAD Default	Risk Variability[a]	Proposed Values[b]	Receptor or Scenario	Comment/Reference
Model: Nondispersion (ND)	unitless	ND		Site-specific	All receptors	See Manual Appendix E
Well pumping rate	m^3/yr	250	4	Use default	All receptors	No site-specific pumping information available; assuming default.
Number of unsaturated zone strata[d]	unitless	1	-	1	All receptors	Combined native soil and fill; assume all properties similar for both soil types
Unsaturated zone thickness	m	4.0	4	0.3	All receptors	Approximate average thickness based on RI boring data.
Unsaturated zone soil density	g/cm^3	1.5	7	1.31	All receptors	Based on combining averages for each area
Unsaturated zone total porosity	unitless	0.4	7	0.3	All receptors	Geotech evaluation based on soil moisture of 15% for tills
Unsaturated zone effective porosity	unitless	0.2	7	0.15	Resident, construction worker	Geotech evaluation based on soil properties; on-site worker and juvenile trespasser have drinking water pathway supressed, therefore not applicable.
Unsatuated zone field capacity	unitless	0.2	7	0.15	All receptors	Based on available water content of about 15%
Unsaturated zone b parameter	unitless	5	7	7.3	All receptors	Average; based on manual and low hydraulic conductivity of till and silty clay soil type
Unsaturated zone hydraulic conductivity	m/yr	10	7	3.15	All receptors	Based on lab tests and geotech evaluation of expected value
Distribution coefficients	cm^3/g	-[e]	4	Site-specific[f]	All receptors	Radionuclide-specific; impacts all pathways, not just groundwater
Inhalation rate	m^3/yr	8,400	6	Site-specific	All receptors	Average over entire 365-day year; default equivalent to 0.9589 m^3/hr
				5,548	Resident adult	Assuming adult male rate of 15.2 m^3/day (EFH, Table 1-2)
				2,765	Resident child	Assuming 1-5 year old rate of 7.55 m^3/day (EFH, Table 5-23)
				4,991	Adult/child Resident	Age-averaged exposure assuming 24 years as adult + 6 years as child.
				7,300	On-site worker	Assuming RAGS default rate of 20 m^3/day for workers
				7,300	Construction worker	Assuming RAGS default rate of 20 m^3/day for workers; differs from the RESRAD Build inhalation due to the different activities between the two construction workers; RESRAD Build construction worker is a renovation/demolition scenario
				5,110	Juvenile Trespasser	Avg. for 7-16 year old male of 14 m^3/day (EFH, Table 5-23)
Mass loading for inhalation	g/m^3	0.0001	5	Use default	Non-construction	RESRAD default used
				6.00E-04	Construction	DCH Section 35
Exposure duration	yr	30	7	Site-specific	All receptors	Same as ED in standard RAGS equations
				30	Resident adult	Duration for resident (EFH, RAGS)
				6	Resident child	Assuming 6 years of childhood spent at site
				25	On-site worker	Duration for occupational receptor (EFH, RAGS)
				1	Construction worker	Assuming construction activities during one calendar year
				10	Juvenile Trespasser	Assumed for off-site adolescent receptor through ages 7-16
Shielding factor, inhalation	unitless	0.4	6	Use default	All receptors	Fraction of outdoor air that is filtered/diluted; 1.0 = no filtering/dilution; RESRAD default used
Shielding factor, external gamma	unitless	0.7	4	Use default	All receptors	Fraction of outdoor gamma that is shielded; 1.0 = no shielding; RESRAD default used
				0.4	Building occupant	SSG Section 2; 60% shielding for all indoor receptors
Fraction of time spent indoors	unitless	0.5	5	Site-specific	All receptors	Fraction of 8,760 hours spent indoors on-site
				0.655	Resident adult	16.4 hr/day for 350 days/yr for resident (EFH, Table 1-2)
				0.655	Resident child	16.4 hr/day for 350 days/yr for resident (EFH, Table 1-2)
				0.20	On-site worker	7 of 8 hours per day for 250 days per year (assumed)
				0.0	All other receptors	No indoor exposure
Fraction of time spent outdoors (on site)	unitless	0.25	5	Site-specific	All receptors	Fraction of 8,760 hours spent outdoors on-site
				0.0799	Resident adult	2 hrs/day for 350 days/yr for resident (EFH, Table 1-2)
				0.223	Resident child	5 hrs/day on weekdays or 7 hrs/day on weekends for 350 days per year for children
						ages 1-11 (EFH, Table 1-2)
				0.0285	On-site worker	1 of 8 hrs/day for 250 days/yr (assumed)
				0.228	Construction worker	Assumes one full work-year for a supervisor-type worker
				0.011	Juvenile Trespasser	Assumes 4 hr/wk averaged over 24 wks/yr (1 day/week for 6 months).
Shape factor flag, external gamma	unitless	1.0	-	Use default	All receptors	Default = uniform circular
Fruits, vegetables and grain consumption	kg/yr	160	2	Use default	Gardening	RESRAD default used

TABLE 6-4
RECEPTOR-SPECIFIC AND SCENARIO-SPECIFIC RESRAD PARAMETER VALUES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

RESRAD Parameter	Units	RESRAD Default	Risk Variability[a]	Proposed Values[b]	Receptor or Scenario	Comment/Reference
				469	Resident adult	22.4 g/kg-day (12.4 for fruit and 10 for vegetables) minus leafy vegetable rate for 60
						kg adult; 60 kg used because intake rate data includes child data (EFH, Table 1-2)
				118	Resident child	22.4 g/kg-day (12.4 for fruit and 10 for vegetables) minus leafy vegetable rate for 15
						kg child (EFH, Table 1-2)
				N/C	All other receptors	Not used
Leafy vegetable consumption	kg/yr	14	5	Site-specific	Gardening	Average over entire 365-day year; (EFH Volume III)
				21.4	Resident adult	NUREG/CR-5512 Volume 4 default for resident farmer
				4.59	Resident child	Adult value scaled by child-to-adult body weight factor
				N/C	All other receptors	Not used
Soil ingestion rate	g/yr	36.5	4	Site-specific	All receptors	Average over entire 365-day year; default equivalent to 100 mg/day
				36.5	Resident adult	100 mg/day for residential adult (RAGS)
				73.0	Resident child	200 mg/day for residential child (RAGS)
				43.8	Adult/child Resident	Age-averaged exposure assuming 24 years as adult + 6 years as child.
				18.25	On-site worker	50 mg/day for industrial worker rate (RAGS)
				120.5	Construction worker	330 mg/day for assuming outdoor summer activities (EPA 2002, Exhibit 5-2)
				54.75	Juvenile Trespasser	150 mg/day assuming average of adult and child rates (RAGS)
Drinking water intake	L/yr	510	3	Site-specific	All receptors	Average over entire 365-day year; default equivalent to 1.397 L/day
				869	Resident adult	34 ml/kg-day for 70 kg adult (EFH, Table 1-2)
				186	Resident child	34 ml/kg-day for 15 kg child (EFH, Table 1-2)
				73	Construction worker	Based on an assumed incidental ingestion rate of 0.2 L/day
				N/C	All other receptors	Typically limited to above residential or farming scenarios
Contamination fraction of drinking water	unitless	1.0	-	1.0	All receptors	Typically set to 1.0; Manual Appendix E
Contamination fraction of irrigation water	unitless	1.0	-	1.0	Gardening	Assumes that home gardens are irrigated
Contamination fraction of plant food	unitless	-1[g]	-	0.05	Gardening	Typical for small suburban garden.
Mass loading for foliar deposition	g/m^3	0.0001	7	0.0001	Gardening	Used Manual Appendix E
Depth of soil mixing layer	m	0.15	5	0.15	All receptors	Relevant when contaminated thickness < 0. 15 m or cover thickness < 15 cm (original cover can erode to < 15 cm); default assumes tilling
Depth of roots	m	0.9	3	Use default	Gardening	RESRAD default used
Drinking water fraction from ground water	unitless	1.0	-	1.0	All receptors	Default assume 0% from surface water; set to 0.0 for 100% from surface water
Household water fraction from ground water	unitless	1.0	-	1.0	Resident only	Default assume 0% from surface water; set to 0.0 for 100% from surface water
Irrigation fraction from ground water	unitless	1.0	-	1.0	Gardening	Assumes that home gardens are not irrigated.
Wet weight crop yield for non-leafy	kg/m^2	0.7	5	Use default	Gardening	RESRAD default used
Wet weight crop yield for leafy	kg/m^2	1.5	7	Use default	Gardening	RESRAD default used
Wet weight crop yield for fodder	kg/m^2	1.1	7	Not Used	Gardening	Not used
Growing season for non-leafy	years	0.17	7	Use default	Gardening	RESRAD default used
Growing season for leafy	years	0.25	7	Use default	Gardening	RESRAD default used
Growing season for fodder	years	0.08	7	Not Used	Gardening	Not used
Translocation factor for non-leafy	unitless	0.1	7	Use default	Gardening	RESRAD default used
Translocation factor for leafy	unitless	1.0	7	Use default	Gardening	RESRAD default used
Translocation factor for fodder	unitless	0.1	7	Not Used	Gardening	Not used
Dry foliar interception fraction for non-leafy	unitless	0.25	7	Use default	Gardening	RESRAD default used
Dry foliar interception fraction for leafy	unitless	0.25	7	Use default	Gardening	RESRAD default used

TABLE 6-4
RECEPTOR-SPECIFIC AND SCENARIO-SPECIFIC RESRAD PARAMETER VALUES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

RESRAD Parameter	Units	RESRAD Default	Risk Variability[a]	Proposed Values[b]	Receptor or Scenario	Comment/Reference
Dry foliar interception fraction for fodder	unitless	0.25	7	Not Used	Gardening	Not used
Wet foliar interception fraction for leafy	unitless	0.25	7	Use default	Gardening	RESRAD default used
Wet foliar interception fraction for non-leafy	unitless	0.25	6	Use default	Gardening	RESRAD default used
Wet foliar interception fraction for fodder	unitless	0.25	7	Not Used	Gardening	Not used
Weathering removal constant for vegetation	1/yr	20	6	Use default	Gardening	RESRAD default used
Storage time: fruits, non-leafy vegetables, and grain	days	14	7	Use default	Gardening	RESRAD default used
Storage time: leafy vegetables	days	1.0	7	Use default	Gardening	RESRAD default used
Storage time: well water	days	1.0	7	Use default	Gardening	RESRAD default used
Storage time: surface water	days	1.0	7	Use default	Gardening	RESRAD default used
Pathway - external gamma	unitless	active	-	Active	All receptors	See Manual Appendix A
Pathway - inhalation (w/o radon)	unitless	active	-	Active	All receptors	See Manual Appendix B
Pathway - plant ingestion	unitless	active	-	Active	Gardening	See Manual Appendix D
				Inactive	All other receptors	Typically active for resident or subsistence farmer only
Pathway - drinking water	unitless	active	-	Active	Resident	See Manual Appendix E
				Inactive	All other receptors	Typically active for resident or subsistence farmer only
Pathway - soil ingestion	unitless	active	-	Active	All receptors	See Manual Appendix F

[a] From NUREG/CR-6697 Table 4.1; represents variability of radiological dose (same relationship with risk assumed) on parameter ranging from 1 (extremely sensitive) to 7 (insensitive). Dash (-) shown if no values listed in NUREG/CR-6697.

[b] Site-specific information/data (either physical, behavioral or metabolic) should be used whenever available. For this table, general information is provided in the Comment/Reference column when the Proposed Values is "site-specific."

[c] From Olhoeft, G.R. and Johnson, G.R., 1989. Densities of rocks and minerals. In: Carmichael, R.S., ed., Practical Handbook of Physical Properties of rocks and Minerals. CRC Press, Boca Raton, p. 141-176, as cited in: Dorsch, J. 1997. Effective Porosity and Density of Carbonate Rocks (Maynardvile Limestone and Copper Ridge Dolomite) within Bear Creek Valley on the Oak Ridge Reservation Based on Modern Petrophysical Techniques. ORNL/GWPO-026, Figure 5.

[d] The unsaturated zone may contain as many as four layers, including fill, reworked fill and native soil, reworked native soil, and native soil.

[e] Radionuclide-specific and can be soil-type-specific. See RESRAD support documentation for potential defaults.

[f] Values based on laboratory results. The value to use will depend on the modeled path.
(1) For unsaturated zone flow in native, uncontaminated soil, 70 mL/gm will be used.
(2) For unsaturated zone flow in contaminated soil/fill, 38.53 mL/gm (average of three samples) will be used.
(3) For saturated flow (bedrock), 0.22 mL/gm will be used.

[g] Adjusted automatically by RESRAD based on the contaminated surface area.

DCH = *Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil*(ANL 1993)
EFH = *Exposure Factors Handbook* (EPA 1997)
EPA 2002 = *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* . USEPA-OSWER 9355.4-24, December 2002.
Manual = *User's Manual for RESRAD Version 6* (ANL 2001)
N/C = not considered
RAGS = *Risk Assessment Guidance for Superfund* (EPA 1989)
SSG = *Soil Screening Guidance for Radionuclides: Technical Background Document (EPA 2000)*

avg = average
cm = centimeters
cm/sec = centimeters per second
cm^3/g = cubit centimeters per gram
days/yr = days per year
ED = exposure duration
EU = exposure unit
g/cm^3 = grams per cubic centimeter
g/kg-day = grams per kilogram per day
g/m^3 = grams per cubic meter
g/yr - grams per year
hr/day = hours per day
hr/wk = hours per week
kg = kilogram
kg/m^2 = kilograms per square meter
kg/yr = kilograms per year
L/day - liters per day
L/yr - liters per year
m = meters
m/sec = meters per second
m/yr = meters per year
m^2 = square meters
m^3/day = cubic meters per day
m^3/hr = cubic meters per hour
m^3/yr = cubic meters per year
mg/L = milligrams per liter
mL/g = mililiters per gram
mL/kg-day = milliliters per kilogram per day
NE = northeast
RI = remedial investigation
w/o = without
wk/yr = weeks per year
yr = year

TABLE 6-5
IA/EU-SPECIFIC RESRAD EXPOSURE PARAMETERS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

RESRAD Parameter	Investigative Areas/Exposure Units										
	IA01 - Excised Area, Building Interiors									IA02 - Building Exterior Areas	
	EU1 - Building 1	EU2 - Building 2	EU3 - Building 3	EU4 - Building 4/9	EU5 - Building 5	EU6 - Building 6	EU7 - Building 8	EU8 - Building 24	EU9 - Building 35	EU10 - E. of Buildings	EU11 - Between Buildings
Area of contaminated zone (m^2)[d]	5,600	8,360	21,130	13,410	1,370	4,235	10,210	19,270	1,445	9,700[e]	6,100[e]
Thickness of contaminated zone (m)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	1.2	1.2
Thickness unsaturated zone (m)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Length parallel to aquifer flow (m)	35	100	100	130	70	60	60	100	20	300	300
Contaminated zone erosion rate[f]	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006
Evapotranspiration coefficient (C_e)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Precipitation Rate[g] (P_r)	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Runoff coefficient[h] (C_r)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Resultant ETr Value (m/y)	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282
Resultant ETr (in/y)	11	11	11	11	11	11	11	11	11	11	11
Resultant Ir (RCH) (m/y)	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282
Resultant Ir (RCH) (in/y)	11	11	11	11	11	11	11	11	11	11	11
Runoff Rate (m/y)	0.376	0.376	0.376	0.376	0.376	0.376	0.376	0.376	0.376	0.376	0.376
Resultant Runoff (in/y)	15	15	15	15	15	15	15	15	15	15	15

TABLE 6-5
IA/EU-SPECIFIC RESRAD EXPOSURE PARAMETERS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

RESRAD Parameter	Investigative Areas/Exposure Units											
	IA03 - Landfill Area	IA04 - NCIDA Property				IA05 - Railroad Right-of-Way		IA06 - Off-Site NE Properties	IA07 - Groundwater	IA08 - Site Utilities	IA09 - Erie Barge Canal	IA10 - Lot 4.1 ("Lombardi Property")
	EU12 - Landfill	EU13 - IA04A	EU14 - IA04B	EU15 - IA04C	EU16 - IA04D	EU17 - IA05A	EU18 - IA05B	N/A[a]	N/A[b]	N/A[c]	EU19	EU20
Area of contaminated zone (m^2)[d]	36,500	67,000	74,000	31,000	38,000	15,800	8,500	N/A	N/A	N/A	N/A	6,400
Thickness of contaminated zone (m)	1.5	1	0.6	0.4	0.6	0.5	0	N/A	N/A	N/A	N/A	0.2
Thickness unsaturated zone (m)	0.3	0.8	0.6	0.6	0.3	1.8	1.5	N/A	N/A	N/A	N/A	0.6
Length parallel to aquifer flow (m)	240	260	390	180	190	100	130	N/A	N/A	N/A	N/A	80
Contaminated zone erosion rate[f]	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	N/A	N/A	N/A	N/A	0
Evapotranspiration coefficient (C_e)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	N/A	N/A	N/A	N/A	0
Precipitation Rate[g] (P_r)	0.94	0.94	0.94	0.94	0.94	0.94	0.94	N/A	N/A	N/A	0.94	0.94
Runoff coefficient[h] (C_r)	0.65	0.4	0.65	0.4	0.65	0.4	0.4	N/A	N/A	N/A	N/A	0.65
Resultant ETr Value (m/y)	0.165	0.282	0.165	0.282	0.165	0.282	0.282	N/A	N/A	N/A	N/A	0
Resultant ETr (in/y)	6.48	11.10	6.48	11.10	6.48	11.10	11.10	N/A	N/A	N/A	N/A	0
Resultant Ir (RCH) (m/y)	0.165	0.282	0.165	0.282	0.165	0.282	0.282	N/A	N/A	N/A	N/A	0.329
Resultant Ir (RCH) (in/y)	6.48	11.10	6.48	11.10	6.48	11.10	11.10	N/A	N/A	N/A	N/A	12.95
Runoff Rate (m/y)	0.611	0.376	0.611	0.376	0.611	0.376	0.376	N/A	N/A	N/A	0.94	0.611
Resultant Runoff (in/y)	24.06	14.80	24.06	14.80	24.06	14.80	14.80	N/A	N/A	N/A	37.01	24.06

TABLE 6-5
IA/EU-SPECIFIC RESRAD EXPOSURE PARAMETERS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

RESRAD Parameter	Investigative Areas/Exposure Units	
	Terrestrial Default EU (used to represent terrestrial EU1 through EU20)	**Rationale**
Area of contaminated zone (m^2)[d]	67,000	EU13 was selected to be representative of the site on an average basis
Thickness of contaminated zone (m)	1.00	Value selected represents the average contaminated zone in IA01 through IA04B (disturbed, active areas of the site during MED/AEC activities)
Thickness unsaturated zone (m)	0.30	Value selected represents the lower end of thickness of the unsaturated zone for conservative approach to calibration
Length parallel to aquifer flow (m)	600	Plume length of approximately 600 m was used to represent actual plume length
Contaminated zone erosion rate[f]	0.00006	Can erode entire contaminated lens if value is large enough; assumed a conservative 2% slope and nonfarming use; see DCH[i] manual Section 14 for further discussion
Evapotranspiration coefficient (C_e)	0.57	Consulted geologist/hydrologist; used DCH[i] as basis to derive
Precipitation Rate[g] (P_r)	0.94	Preciptation rate based on climatic data from Lockport 2NE in the SESOIL software
Runoff coefficient[h] (C_r)	0.25	Value was selected through calibration to reflect poor drainage capacity of silty soils that slow infiltration and leaching capacity
Resultant ETr Value (m/y)	0.40	Value calibrated based on proposed evaportanspiration coefficient, runnoff coefficient, and precipitation rate
Resultant ETr (in/y)	15.82	Resultant evapotranspiration value converted from m/yr to in/yr
Resultant Ir (RCH) (m/y)	0.30	Value calibrated based on proposed evaportanspiration efficient, runnoff coefficient, and precipitation rate
Resultant Ir (RCH) (in/y)	11.94	Resultant leaching value converted from m/yr to in/yr
Runoff Rate (m/y)	0.24	Value calibrated based on proposed evaportanspiration efficient, leaching, and precipitation rate
Resultant Runoff (in/y)	9.25	Resultant runoff value converted from m/yr to in/yr

Notes:

[a] No exposure units are associated with IA06 Off-Site NE Properties; area is considered non-impacted and will be designated for No Further Action.

[b] No exposure units are associated with IA07 Groundwater; data from each well will be evaluated with the other media for each EU within which it lies.

[c] No exposure units are associated with IA08, Site Utilities, as non-native sediment and/or non-native surface water data from each utility feature will be evaluated with the other media for each exposure unit within which it lies.

[d] Assumes entire area in EU is contaminated; EU areas estimated by adding the three classes from the field sampling plan.

[e] True areas for EU10/EU11 have not been established; listed areas are scaled off surveyed base map.

[f] 0.00006 m/yr from DCH[i] Section 14, 2% slope, no farming assumed. Scenario evaluated assumes buildings have been removed.

[g] Scenario evaluated assumes buildings have been removed where buildings currently are present.

[h] EU data represent range of possible values. Scenario evaluated assumes buildings have been removed. Landfill area (0.65) posseses steeper slopes. EUs covered with significant roads or buildings are 30% impervious and value of 0.4 from DCH[i] Section 10, flat urban area was assumed. Calibration resulted in value adjustment.

[i] Argonne National Laboratory. 1993. Yu, C. et al. Data Collection Handbook to Support Modeling Impacts of Radioactive Material in Soil. Environmental Assessment and Information Sciences Division. April. 1993.

ETr = Evapotranspiration rate
EU = exposure unit
DCH = Data Collection Handbook
IA = investigative area
in/y = inches per year
Ir = Infiltration rate
m = meters
m^2 = square meters
m/y = meters per year
MED/AEC = Manhattan Engineer District/Atomic Energy Commission
N/A = not applicable
NCIDA = Niagara County Industrial Development Agency
NE = Northeast
RCH = recharge

TABLE 6-6
RECEPTOR-SPECIFIC AND SCENARIO-SPECIFIC RESRAD-BUILD EXPOSURE PARAMETERS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALITY STEEL CORPORATION FUSRAP SITE

RESRAD-Build Parameter	Units	RESRAD Default	Value Used	Receptor or Scenario	Comment/Reference
Exposure Duration	days	365	24	Juvenile Trespasser	Assumes 4 hr/wk averaged over 24 wks/yr (1 day/week for 6 months).
		179	250	On-site Worker	USEPA RAGS Volume I: Standard Default Exposure Factors (March 1991)
		179	Use default	Construction Worker	RESRAD-Build Table 3.1, assumes building renovation scenario (including building decontamination and demolition)
Indoor fraction	unitless	0.267	0.011	Juvenile Trespasser	Assumes 4 hr/wk averaged over 24 wks/yr (1 day/week for 6 months).
		0.351	0.2	On-site Worker	USEPA, assuming standard default for on-site worker
		0.351	Use default	Construction Worker	RESRAD-Build Table 3.1, assumes building renovation scenario (including building decontamination and demolition)
Receptor location	m	0,0,1	x,y,z	All Receptors	Receptor is in the middle of the room; x,y,z coordinates based on room size
Receptor inhalation rate	m^3/day	33.6	14	Juvenile Trespasser	USEPA RAGS Volume I: Standard Default Exposure Factors (March 1991)
		33.6	20	On-site Worker	USEPA RAGS Volume I: Standard Default Exposure Factors (March 1991)
		38.4	Use default	Construction Worker	RESRAD-Build Table 3.1, assumes building renovation scenario (including building decontamination and demolition)
Receptor indirect ingestion rate	m^2/hr	$1.12x10^{-4}$	Use default	Juvenile Trespasser	RESRAD-Build Table 3.1, assumes building occupancy scenario
		$1.12x10^{-4}$	Use default	On-site Worker	RESRAD-Build Table 3.1, assumes building occupancy scenario
Source type		Area	Use default	Juvenile Trespasser	RESRAD-Build Table 3.1, assumes building occupancy scenario
		Area	Use default	On-site Worker	RESRAD-Build Table 3.1, assumes building occupancy scenario
		Volume	Use default	Construction Worker	RESRAD-Build Table 3.1, assumes building renovation scenario (including building decontamination and demolition)
Direct ingestion rate	g/hr	Area	$3.06x10^{-6}$	Juvenile Trespasser	RESRAD-Build Table 3.1, assumes building occupancy scenario
		Area	$3.06x10^{-6}$	On-site Worker	RESRAD-Build Table 3.1, assumes building occupancy scenario
		Volume	0.052	Construction Worker	RESRAD-Build Table 3.1, assumes building renovation scenario (including building decontamination and demolition)
Air release fraction	unitless	0.357	Use default	Juvenile Trespasser	RESRAD-Build Table 3.1, assumes building occupancy scenario
		0.357	Use default	On-site Worker	RESRAD-Build Table 3.1, assumes building occupancy scenario
		0.1	Use default	Construction Worker	RESRAD-Build Table 3.1, assumes building renovation scenario (including building decontamination and demolition)
Removable fraction	unitless	0.1	Use default	Juvenile Trespasser	RESRAD-Build Table 3.1, assumes building occupancy scenario
		0.1	Use default	On-site Worker	RESRAD-Build Table 3.1, assumes building occupancy scenario
Time for source removal	days	10,000	Use default	Juvenile Trespasser	RESRAD-Build Table 3.1, assumes building occupancy scenario
		10,000	Use default	On-site Worker	RESRAD-Build Table 3.1, assumes building occupancy scenario
Source erosion rate	cm/d	$4.1x10^{-4}$	Use default	Construction Worker	RESRAD-Build Table 3.1, assumes building renovation scenario (including building decontamination and demolition)
Time	years	1.0	10	Juvenile Trespasser	Assumes trespassering will occur from ages 7 through 16 years of age.
		--	25	On-site Worker	USEPA RAGS Volume I: Standard Default Exposure Factors (March 1991)
		1.0	Use default	Construction Worker	RESRAD-Build, Section J.1.4
Maximum Time Integration Points	unitless	17	Use default	All receptors	RESRAD-Build, Section J.1.5
Number of Rooms	unitless	1	See Table 6.3.4-4	Site-Specific	Taken from on-site observations; affects only pathways dependent on airflow.

TABLE 6-6
RECEPTOR-SPECIFIC AND SCENARIO-SPECIFIC RESRAD-BUILD EXPOSURE PARAMETERS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALITY STEEL CORPORATION FUSRAP SITE

RESRAD-Build Parameter	Units	RESRAD Default	Value Used	Receptor or Scenario	Comment/Reference
Deposition Velocity	m/s	0.1	Use default	All receptors	RESRAD-Build, Section J.2.2; deterministic analysis default value
Resuspension Rate	s^{-1}	$5x10^{-7}$	Use default	All receptors	RESRAD-Build, Section J.2.3; deterministic analysis default value
Room Height	m	2.5	See Table 6.3.4-4	Site-Specific	Taken from on-site observations; affects only pathways dependent on airflow.
Room Area	m^2	36	See Table 6.3.4-4	Site-Specific	Taken from on-site observations; affects only pathways dependent on airflow.
Air Exchange Rate	1/hr	0.8	Use default	All receptors	RESRAD-Build, Section J.2.6; deterministic analysis default value (for one room)
Flow Rate between Rooms	m^3/hr	various	See Table 6.3.4-4	Site-Specific	RESRAD-Build, Section J.2.7; based on number of rooms
Outdoor Inflow and Outflow	m^3/hr	various	See Table 6.3.4-4	Site-Specific	RESRAD-Build, Section J.2.8; based on number of rooms
Number of Receptors	unitless	1	Varied	All receptors	Number of receptors varies based on rooms/buildings in the scenario
Receptor Room	unitless	1	Varied	All receptors	Receptor is placed in room based on number of rooms/buildings in the scenario
Receptor Time Fraction	unitless	1	Use default	All receptors	RESRAD-Build, Section J.3.4; assumes receptor spent all indoor time in one area of building.
Number of Sources	unitless	1	Varied	All receptors	The number of sources is dependent on the buildings and rooms that define
Source Room	unitless	1	Use default	All receptors	RESRAD-Build, Section J.4.2; the source room is not relevant because EPC is developed for whole EU and not a particular room.
Source Direction	unitless	x axis	Use default	All receptors	RESRAD-Build, Section J.4.4
Source Location	m	0,0,0	x,y,z	All receptors	Source placed in building based on building dimensions
Source Thickness	cm	15	2.5 (walls & floors) 15 (soils)	Construction Worker	Minimum value in RESRAD-Build Section J.4.15; source has not penetrated surfaces (floors and walls) to great extent based on knowledge of site conditions and building characteristics; interior building soils assumed to be default of 15 cm due to soil conditions. Source thickness not applicable to juvenile trespassor and onsite worker because these receptors are exposed to surfaces.
Source Area	m^2	36	See Table 6.3.4-4	Site-Specific	RESRAD-Build, Section J.4.6; source should be limited to dimensions of room.

Notes:

cm = centimeter
cm/d = centimeters per day
EPC = exposure point concentration
EU = exposure units
g/hr = grams per hour
1/hr = quantity per hour
hr = hour
hr/wk = hours per week
m = meters
m/s = meters per second
m^2 = square meters
m^2/hr = square meters per hour
m^3 = cubic meters
m^3/day = cubic meters per day
RESRAD = residual radioactivity
s^{-1} = quantity per second
USEPA = U.S. Environmental Protection Agency
wk/yr = weeks per year
x,y,z = represents the three dimensions, x, y, and z

References:

USEPA. 1991. RAGS Volume 1 Standard Default Exposure Factors.
Argonne National Lab. 2003. User's Manual for RESRAD-Build Version 3. Prepared for U.S. Department of Energy. June.

Table 6-7
EU-SPECIFIC BUILDING PARAMETERS USED IN RESRAD-BUILD
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

RESRAD-Build Parameter	EU1-Building 1	EU2-Building 2	EU3-Building 3	EU4-Building 4/9	EU5-Building 5	EU6-Building 6[a]	EU7-Building 8	EU8-Building 24	EU9-Building 35
Building Height (m)	6	10.5	10	10	5	10	10	10	5
Building Floor Area (m^2)	802	5700	4320	4400	348	960	2700	7500	320
Number of Rooms	2	3[b]	1[b]	1	1	1	1	1	1
Room 1Outdoor Air Flow (m^3/hr)	76.1	60	34600	35200	1390	7700	21600	60000	1280
Room 2 Outdoor Air Flow (m^3/hr)	8.5	96	NA	NA	NA	NA	NA	NA	NA
Room 3 Outdoor Air Flow (m^3/hr)	NA	60	NA	NA	NA	NA	NA	NA	NA
Flow Rate between Rooms 1 & 2 (m^3/hr)	30	30	NA	NA	NA	NA	NA	NA	NA
Flow Rate between Rooms 2 & 3 (m^3/hr)	NA	30	NA	NA	NA	NA	NA	NA	NA
Room 1 Dimensions (m)	7.5 X 96.1	30 X 45	24 X 180	55 X 80	7.3 X 47.7	16 x 60	45 X 60	150 X 50	32 X 10
Room 2 Dimensions (m)	9 X 9	30 X 100	NA	NA	NA	NA	NA	NA	NA
Room 3 Dimensions (m)	NA	30 X 45	NA	NA	NA	NA	NA	NA	NA

Notes:
Parameters on this table are for the buildings; receptor-specific exposure parameters are provided on Table 6-6.

[a] EU6 Building 6 was not modeled with RESRAD Build because radioisotopes were all within the background. Background was defined as the "weighted background for steel." See Table 6-2 for background values.
[b] The actual number of rooms in Buildings 2 and 3 are 22 and 5, respectively. RESRAD-Build can model a maximum of three rooms; simplifications were made to these buildings for this evaluation.

RESRAD = Residual Radioactivity
EU = Exposure Unit
m = meters
m^2 = square meters
m^3/hr = cubic meters per hour
NA = Not Applicable; not applicable based on the number of rooms present and/or evaluated.

TABLE 6-8
EXPOSURE SCENARIO ASSUMPTIONS AND INGESTION INTAKE PARAMETERS FOR NONCARCINOGENIC EFFECTS OF URANIUM
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Parameter	Variable	Unit	Current-Use Scenarios				Future-Use Scenarios							
			Juvenile Trespasser[a]	Ref.	On-Site Worker	Ref.	Construction Worker[b]	Ref.	On-Site Worker	Ref.	Hypothetical Onsite Adult Resident	Ref.	Hypothetical Onsite Child Resident	Ref.
Ingestion Intake (mg/kg-d) = (C_s x IR x CF x FI x EF x ED)/(BW x AT)														
Constituent Concentration in soil or water	C_s or C_w	mg/kg or mg/L	s-s		s-s		s-s		s-s		s-s		s-s	
Ingestion Rate of Surface Soil	IR_s	mg/day	150	1	50	2	---		50	2	100	2	200	2
Ingestion Rate of Surface/Subsurface Soil	IR_s	mg/day	---		---		330	3	---		100	2	200	2
Incidental Ingestion Rate of Sediment	IR_{sd}	mg/day	50	4	25	5	25	5	25	5	25	5	50	4
Direct Ingestion Rate of Removable Building Materials from Interior Surfaces	IR_{bm}	mg/day	0.0122	6	0.0245	6	416	6	0.0245	6	---		---	
Incidental Ingestion Rate of Surface Water	IR_{sw}	L/day	0.05	4	0.025	4	0.025	4	0.025	4	0.025	5	0.05	5
Ingestion Rate of Groundwater	IR_{gw}	L/day	---		---		0.2	7	---		2.3	8	0.5	8
Ingestion Rate of Produce	IR_p	mg/day	---		---		---		---		0.18	8	0.04	8
Fraction of Contaminated Soil Ingested	FI_s	unitless	1	9	1	9	1	9	1	9	1	9	1	9
Fraction of Contaminated Produce Ingested	FI_p	unitless	---		---		---		---		0.05	10	0.05	10
Exposure Frequency	EF	days/year	24	11[a]	250	2	250	11[b]	250	2	350	2	350	2
Exposure Duration	ED	years	10	11[a]	25	2	1	11[b]	25	2	30	2	6	2
Body Weight	BW	kg	61.7	12[a]	70	2	70	2	70	2	70	2	15	2
Averaging Time	AT	days	3,650	13	9,125	13	365	13	9,125	13	10,950	13	2,190	13

Notes:

[a] It is assumed that a juvenile trespasser (male aged 7-16 years) would visit any of the exposure units no more than 24 times per year and would stay for 4 hours a visit. This assumes that these trespassers would be meeting in one location as a "club house."

[b] It is assumed that a construction worker would be either a supervisor-type worker or would be wearing protective gear while working outdoors or in a contaminated building for one full work year.

--- = parameter not used for that receptor
g/hr = grams per hour
kg = kilograms
L/day = liters per day
mg/day = milligrams per day
mg/kg = milligrams per kilogram
mg/kg-d = milligrams per kilogram per day
mg/L = milligrams per liter
Ref. = reference
RME = Reasonable Maximum Exposure
s-s = site-specific value

References:

1. Assuming the average between adult and child soil ingestion rates.
2. USEPA, 1991. RAGS, Volume I: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors. Summary Table.
3. USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Exhibit 5-1.
4. Assumes that exposure to surface water and sediment for these receptors would be the same as for residential receptors; residential parameters taken from Risk Assessment Guidance for Superfund Part A (USEPA 1989) Exhibit 6-12.
5. Incidental ingestion rate of sediment and surface water was assumed to be 1/2 that of juvenile/child.
6. Direct ingestion rates for removable COPCs from interior surfaces of buildings were estimated using default ingestion rates from RESRAD-Build of 3.06x10-6 g/hr for building occupancy (juvenile trespasser and on-site worker) and 0.052 for building renovation scenario (construction worker). An 8-hour day was used in converting g/hr to mg/day for the construction worker and onsite worker while a 4-hour day was used for the juvenile trespasser.
7. URS, 2005. *Final Shallow Land Disposal Area Remedial Investigation Report, Park Township, PA.* Prepared for USACE, Pittsburg District Office. Table 6-5.
8. USEPA, 1997. Exposure Factors Handbook, Volume I. Table 1-2.
9. Default (RME) value (inferred from USEPA, 1989, section 6.6.2).
10. Recommendation from USACE, Buffalo District, June 2008.
11. Assumed, see notes above for scenario descriptions.
12. USEPA, 1997. Exposure Factors Handbook, Volume I. Table 7-6. Averaged for 95 percentile males aged 7 through 16.
13. AT is ED x (365 days/year) for noncarcinogens (USEPA , 1989; Chapter 6 and Exhibit 6-11).

TABLE 6-9
EXPOSURE SCENARIO ASSUMPTIONS AND INTAKE PARAMETERS FOR CARCINOGENIC RISKS AND DOSES
FROM SEDIMENT, SURFACE WATER, AND GROUNDWATER
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

			Current-Use Scenarios				Future-Use Scenarios							
Parameter	**Variable**	**Unit**	**Juvenile Trespasser[a]**	**Ref.**	**On-Site Worker**	**Ref.**	**Construction Worker[b]**	**Ref.**	**On-Site Worker**	**Ref.**	**Hypothetical Onsite Adult Resident**	**Ref.**	**Hypothetical Onsite Child Resident**	**Ref.**
Ingestion Intake (pCi) = C x IR x CF x EF x ED														
Constituent Concentration in sediment, surface water, or groundwater	C_s or C_w	pCi/g or pCi/L	s-s		s-s		s-s		s-s		s-s		s-s	
Incidental Ingestion Rate of Sediment	IR_{sd}	mg/day	50	1	25	2	25	2	25	2	25	2	50	1
Incidental Ingestion Rate of Surface Water	IR_{sw}	mL/day	50	1	25	2	25	2	25	2	25	2	50	1
Ingestion Rate of Groundwater	IR_{gw}	mL/day	--		--		200	3	--		2,300	4	500	4
Conversion Factor	CF	g/mg or L/mL	1.00E-03		1.00E-03		1.00E-03		1.00E-03		1.00E-03		1.00E-03	
Exposure Frequency - Sediment/Surface Water	EF	days/year	24	5[a]	250	6	250	5[b]	250	6	24	5[c]	24	5[c]
Exposure Frequency - Groundwater	EF	days/year	NA		NA		250	6	NA		350	6	350	6
Exposure Duration	ED	years	10	5[a]	25	6	1	5[b]	25	6	30	6	6	6

Notes:

[a] It is assumed that a juvenile trespasser (male aged 7-16 years) would visit any of the exposure units no more than 24 times per year and would stay for 4 hours a visit. This assumes that these trespassers would be meeting in one location as a "club house."

[b] It is assumed that a construction worker would be either a supervisor-type worker or would be wearing protective gear while working outdoors or in a contaminated building for one full work year.

[c] It is assumed that the adult and child resident would be exposed no more than 24 days per year.

-- = parameter not used; it is assumed that this receptor will not come into contact with groundwater.
g/mg = gram per milligram
L/mL = liter per milliliter
L = liter
mg/day = milligram per day
mL/day - milliliter per day
pCi = picocurie
pCi/g = picocurie/gram
pCi/L = picocurie/liter
ref = reference
s-s = site-specific value

References:

1. Assumes that exposure to surface water and sediment for these receptors would be the same as for residental receptors; residential parameters taken from Risk Assessment Guidance for Superfund Part A (USEPA 1989) Exhibit 6-12.
2. Incidential ingestion rate of sediment and surface water are assumed to be 1/2 that of juvenile/child.
3. URS, 2005. *Final Shallow Land Disposal Area Remedial Investigation Report, Park Township, PA.* Prepared for USACE, Pittsburg District Office. Table 6-5.
4. USEPA, 1997. Exposure Factors Handbook, Volume 1. Table 1-2.
5. Assumed, see notes above for scenario descriptions.
6. USEPA, 1991. RAGS, Volume I: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors. Summary Table.

TABLE 6-10
COPC SEDIMENT, SURFACE WATER, AND GROUNDWATER INTAKES, RISKS, AND DOSES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Ingestion Intakes (pCi) Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU1:																			
Sediment	Radium-226	1.09	1.00	0.09	13.06	12.00	1.06	170.00	156.25	13.75	6.80	6.25	0.55	---	---	---	---	---	---
	Radium-228	0.91	0.60	0.31	10.87	7.20	3.67	141.56	93.75	47.81	5.66	3.75	1.91	---	---	---	---	---	---
	Thorium-228	1.03	0.83	0.20	12.35	9.96	2.39	160.78	129.69	31.09	6.43	5.19	1.24	---	---	---	---	---	---
	Thorium-230	0.56	0.80	0.00	6.76	9.60	0.00	87.97	125.00	0.00	3.52	5.00	0.00	---	---	---	---	---	---
	Thorium-232	0.51	0.73	0.00	6.11	8.76	0.00	79.53	114.06	0.00	3.18	4.56	0.00	---	---	---	---	---	---
	Uranium-234	42.19	0.77	41.42	506.28	9.19	497.09	6,592.19	119.69	6,472.50	263.69	4.79	258.90	---	---	---	---	---	---
	Uranium-235	2.17	0.05	2.12	26.09	0.60	25.49	339.69	7.81	331.88	13.59	0.31	13.28	---	---	---	---	---	---
	Uranium-238	47.00	0.63	46.37	564.00	7.56	556.44	7,343.75	98.44	7,245.31	293.75	3.94	289.81	---	---	---	---	---	---
	Total Intakes for EU1 Sediment:				**1,145.51**	**64.87**	**1,086.13**	**14,915.47**	**844.69**	**14,142.34**	**596.62**	**33.79**	**565.69**						
Surface Water	Radium-226	0.10	0.13	0.00	1.22	1.56	0.00	15.94	20.31	0.00	0.64	0.81	0.00	---	---	---	---	---	---
	Radium-228	0.44	0.33	0.11	5.27	3.96	1.31	68.59	51.56	17.03	2.74	2.06	0.68	---	---	---	---	---	---
	Thorium-228	0.33	0.20	0.13	3.96	2.40	1.56	51.56	31.25	20.31	2.06	1.25	0.81	---	---	---	---	---	---
	Thorium-230	0.47	0.20	0.27	5.59	2.40	3.19	72.81	31.25	41.56	2.91	1.25	1.66	---	---	---	---	---	---
	Thorium-232	0.04	0.01	0.03	0.48	0.12	0.36	6.27	1.56	4.70	0.25	0.06	0.19	---	---	---	---	---	---
	Uranium-234	25.92	0.17	25.75	311.04	1.99	309.05	4,050.00	25.94	4,024.06	162.00	1.04	160.96	---	---	---	---	---	---
	Uranium-235	1.11	0.04	1.07	13.28	0.48	12.80	172.97	6.25	166.72	6.92	0.25	6.67	---	---	---	---	---	---
	Uranium-238	26.01	0.10	25.91	312.12	1.15	310.97	4,064.06	15.00	4,049.06	162.56	0.60	161.96	---	---	---	---	---	---
	Total Intakes for EU1 Surface Water:				**652.97**	**14.06**	**639.24**	**8,502.20**	**183.13**	**8,323.45**	**340.09**	**7.33**	**332.94**						
EU2:																			
Sediment	Radium-226	1.02	1.00	0.02	12.24	12.00	0.24	159.38	156.25	3.13	6.38	6.25	0.13	---	---	---	---	---	---
	Radium-228	1.06	0.60	0.46	12.72	7.20	5.52	165.63	93.75	71.88	6.63	3.75	2.88	---	---	---	---	---	---
	Thorium-228	1.54	0.83	0.71	18.42	9.96	8.46	239.84	129.69	110.16	9.59	5.19	4.41	---	---	---	---	---	---
	Thorium-230	0.84	0.80	0.04	10.04	9.60	0.44	130.79	125.00	5.79	5.23	5.00	0.23	---	---	---	---	---	---
	Thorium-232	1.37	0.73	0.64	16.48	8.76	7.72	214.64	114.06	100.58	8.59	4.56	4.02	---	---	---	---	---	---
	Uranium-234	5.64	0.77	4.87	67.68	9.19	58.49	881.25	119.69	761.56	35.25	4.79	30.46	---	---	---	---	---	---
	Uranium-235	0.24	0.05	0.19	2.88	0.60	2.28	37.50	7.81	29.69	1.50	0.31	1.19	---	---	---	---	---	---
	Uranium-238	5.70	0.63	5.07	68.40	7.56	60.84	890.63	98.44	792.19	35.63	3.94	31.69	---	---	---	---	---	---
	Total Intakes for EU2 Sediment:				**208.87**	**64.87**	**144.00**	**2,719.64**	**844.69**	**1,874.96**	**108.79**	**33.79**	**75.00**						
Surface Water	Radium-226	0.44	0.13	0.31	5.28	1.56	3.72	68.75	20.31	48.44	2.75	0.81	1.94	---	---	---	---	---	---
	Radium-228	0.52	0.33	0.19	6.24	3.96	2.28	81.25	51.56	29.69	3.25	2.06	1.19	---	---	---	---	---	---
	Thorium-228	1.15	0.20	0.95	13.80	2.40	11.40	179.69	31.25	148.44	7.19	1.25	5.94	---	---	---	---	---	---
	Thorium-230	0.69	0.20	0.49	8.28	2.40	5.88	107.81	31.25	76.56	4.31	1.25	3.06	---	---	---	---	---	---
	Thorium-232	0.61	0.01	0.60	7.32	0.12	7.20	95.31	1.56	93.75	3.81	0.06	3.75	---	---	---	---	---	---
	Uranium-234	105.00	0.17	104.83	1,260.00	1.99	1,258.01	16,406.25	25.94	16,380.31	656.25	1.04	655.21	---	---	---	---	---	---
	Uranium-235	4.50	0.04	4.46	54.00	0.48	53.52	703.13	6.25	696.88	28.13	0.25	27.88	---	---	---	---	---	---
	Uranium-238	105.00	0.10	104.90	1,260.00	1.15	1,258.85	16,406.25	15.00	16,391.25	656.25	0.60	655.65	---	---	---	---	---	---
	Total Intakes for EU2 Surface Water:				**2,614.92**	**14.06**	**2,600.86**	**34,048.44**	**183.13**	**33,865.31**	**1,361.94**	**7.33**	**1,354.61**						
EU3:																			
Sediment	Radium-226	2.19	1.00	1.19	26.32	12.00	14.32	342.66	156.25	186.41	13.71	6.25	7.46	---	---	---	---	---	---
	Radium-228	1.31	0.60	0.71	15.74	7.20	8.54	205.00	93.75	111.25	8.20	3.75	4.45	---	---	---	---	---	---
	Thorium-228	1.16	0.83	0.33	13.97	9.96	4.01	181.88	129.69	52.19	7.28	5.19	2.09	---	---	---	---	---	---
	Thorium-230	1.26	0.80	0.46	15.10	9.60	5.50	196.56	125.00	71.56	7.86	5.00	2.86	---	---	---	---	---	---
	Thorium-232	1.16	0.73	0.43	13.88	8.76	5.12	180.78	114.06	66.72	7.23	4.56	2.67	---	---	---	---	---	---
	Uranium-234	52.97	0.77	52.20	635.64	9.19	626.45	8,276.56	119.69	8,156.88	331.06	4.79	326.28	---	---	---	---	---	---
	Uranium-235	2.84	0.05	2.79	34.12	0.60	33.52	444.22	7.81	436.41	17.77	0.31	17.46	---	---	---	---	---	---
	Uranium-238	57.67	0.63	57.04	692.04	7.56	684.48	9,010.94	98.44	8,912.50	360.44	3.94	356.50	---	---	---	---	---	---
	Total Intakes for EU3 Sediment:				**1,446.80**	**64.87**	**1,381.93**	**18,838.59**	**844.69**	**17,993.91**	**753.54**	**33.79**	**719.76**						
Surface Water	Radium-226	0.15	0.13	0.02	1.76	1.56	0.20	22.97	20.31	2.66	0.92	0.81	0.11	---	---	---	---	---	---
	Radium-228	0.39	0.33	0.06	4.62	3.96	0.66	60.16	51.56	8.59	2.41	2.06	0.34	---	---	---	---	---	---
	Thorium-228	0.10	0.20	0.00	1.18	2.40	0.00	15.42	31.25	0.00	0.62	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.24	0.20	0.04	2.90	2.40	0.50	37.81	31.25	6.56	1.51	1.25	0.26	---	---	---	---	---	---
	Thorium-232	0.06	0.01	0.05	0.67	0.12	0.55	8.72	1.56	7.16	0.35	0.06	0.29	---	---	---	---	---	---
	Uranium-234	16.16	0.17	15.99	193.92	1.99	191.93	2,525.00	25.94	2,499.06	101.00	1.04	99.96	---	---	---	---	---	---
	Uranium-235	1.05	0.04	1.01	12.65	0.48	12.17	164.69	6.25	158.44	6.59	0.25	6.34	---	---	---	---	---	---
	Uranium-238	16.79	0.10	16.69	201.48	1.15	200.33	2,623.44	15.00	2,608.44	104.94	0.60	104.34	---	---	---	---	---	---
	Total Intakes for EU3 Surface Water:				**419.19**	**14.06**	**406.34**	**5,458.20**	**183.13**	**5,290.91**	**218.33**	**7.33**	**211.64**						
EU4:																			
Sediment	Radium-226	0.54	1.00	0.00	6.49	12.00	0.00	84.53	156.25	0.00	3.38	6.25	0.00	---	---	---	---	---	---
	Radium-228	0.57	0.60	0.00	6.78	7.20	0.00	88.28	93.75	0.00	3.53	3.75	0.00	---	---	---	---	---	---
	Thorium-228	0.33	0.83	0.00	3.96	9.96	0.00	51.56	129.69	0.00	2.06	5.19	0.00	---	---	---	---	---	---
	Thorium-230	0.41	0.80	0.00	4.93	9.60	0.00	64.22	125.00	0.00	2.57	5.00	0.00	---	---	---	---	---	---
	Thorium-232	0.24	0.73	0.00	2.89	8.76	0.00	37.66	114.06	0.00	1.51	4.56	0.00	---	---	---	---	---	---
	Uranium-234	15.94	0.77	15.17	191.28	9.19	182.09	2,490.63	119.69	2,370.94	99.63	4.79	94.84	---	---	---	---	---	---
	Uranium-235	0.78	0.05	0.73	9.40	0.60	8.80	122.34	7.81	114.53	4.89	0.31	4.58	---	---	---	---	---	---
	Uranium-238	18.03	0.63	17.40	216.36	7.56	208.80	2,817.19	98.44	2,718.75	112.69	3.94	108.75	---	---	---	---	---	---
	Total Intakes for EU4 Sediment:				**442.09**	**64.87**	**399.68**	**5,756.41**	**844.69**	**5,204.22**	**230.26**	**33.79**	**208.17**						
Surface Water	Radium-226	0.15	0.13	0.02	1.82	1.56	0.26	23.75	20.31	3.44	0.95	0.81	0.14	---	---	---	---	---	---
	Radium-228	0.63	0.33	0.30	7.56	3.96	3.60	98.44	51.56	46.88	3.94	2.06	1.88	---	---	---	---	---	---
	Thorium-228	0.11	0.20	0.00	1.28	2.40	0.00	16.72	31.25	0.00	0.67	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.30	0.20	0.10	3.60	2.40	1.20	46.88	31.25	15.63	1.88	1.25	0.63	---	---	---	---	---	---
	Thorium-232	0.03	0.01	0.02	0.36	0.12	0.24	4.70	1.56	3.14	0.19	0.06	0.13	---	---	---	---	---	---
	Uranium-234	3.71	0.17	3.54	44.52	1.99	42.53	579.69	25.94	553.75	23.19	1.04	22.15	---	---	---	---	---	---
	Uranium-235	0.19	0.04	0.15	2.23	0.48	1.75	29.06	6.25	22.81	1.16	0.25	0.91	---	---	---	---	---	---
	Uranium-238	8.90	0.10	8.80	106.80	1.15	105.65	1,390.63	15.00	1,375.63	55.63	0.60	55.03	---	---	---	---	---	---
	Total Intakes for EU4 Surface Water:				**168.18**	**14.06**	**155.23**	**2,189.86**	**183.13**	**2,021.27**	**87.59**	**7.33**	**80.85**						
EU6:																			
Sediment	Radium-226	0.68	1.00	0.00	8.18	12.00	0.00	106.51	156.25	0.00	4.26	6.25	0.00	---	---	---	---	---	---
	Radium-228	1.26	0.60	0.66	15.15	7.20	7.95	197.24	93.75	103.49	7.89	3.75	4.14	---	---	---	---	---	---
	Thorium-228	2.06	0.83	1.23	24.76	9.96	14.80	322.37	129.69	192.69	12.89	5.19	7.71	---	---	---	---	---	---
	Thorium-230	0.72	0.80	0.00	8.64	9.60	0.00	112.50	125.00	0.00	4.50	5.00	0.00	---	---	---	---	---	---
	Thorium-232	2.00	0.73	1.27	23.98	8.76	15.22	312.30	114.06	198.24	12.49	4.56	7.93	---	---	---	---	---	---
	Uranium-234	48.84	0.77	48.07	586.06	9.19	576.87	7,630.96	119.69	7,511.27	305.24	4.79	300.45	---	---	---	---	---	---
	Uranium-235	2.63	0.05	2.58	31.56	0.60	30.96	410.94	7.81	403.13	16.44	0.31	16.13	---	---	---	---	---	---
	Uranium-238	50.81	0.63	50.18	609.74	7.56	602.18	7,939.37	98.44	7,840.93	317.57	3.94	313.64	---	---	---	---	---	---
	Total Intakes for EU6 Sediment:				**1,308.07**	**64.87**	**1,247.98**	**17,032.19**	**844.69**	**16,249.75**	**681.29**	**33.79**	**649.99**						
EU7:																			
Sediment	Radium-226	0.71	1.00	0.00	8.53	12.00	0.00	111.02	156.25	0.00	4.44	6.25	0.00	---	---	---	---	---	---
	Radium-228	1.08	0.60	0.48	12.96	7.20	5.76	168.75	93.75	75.00	6.75	3.75	3.00	---	---	---	---	---	---
	Thorium-228	2.56	0.83	1.73	30.72	9.96	20.76	400.00	129.69	270.31	16.00	5.19	10.81	---	---	---	---	---	---
	Thorium-230	1.06	0.80	0.26	12.72	9.60	3.12	165.63	125.00	40.63	6.63	5.00	1.63	---	---	---	---	---	---
	Thorium-232	2.58	0.73	1.85	30.96	8.76	22.20	403.13	114.06	289.06	16.13	4.56	11.56	---	---	---	---	---	---
	Uranium-234	199.00	0.77	198.23	2,388.00	9.19	2,378.81	31,093.75	119.69	30,974.06	1,243.75	4.79	1,238.96	---	---	---	---	---	---
	Uranium-235	11.40	0.05	11.35	136.80	0.60	136.20	1,781.25	7.81	1,773.44	71.25	0.31	70.94	---	---	---	---	---	---
	Uranium-238	224.00	0.63	223.37	2,688.00	7.56	2,680.44	35,000.00	98.44	34,901.56	1,400.00	3.94	1,396.06	---	---	---	---	---	---
	Total Intakes for EU7 Sediment:				**5,308.69**	**64.87**	**5,247.29**	**69,123.52**	**844.69**	**68,324.06**	**2,764.94**	**33.79**	**2,732.96**						
Surface Water	Radium-226	0.10	0.13	0.00	1.20	1.56	0.00	15.63	20.31	0.00	0.63	0.81	0.00	---	---	---	---	---	---
	Radium-228	0.69	0.33	0.36	8.28	3.96	4.32	107.81	51.56	56.25	4.31	2.06	2.25	---	---	---	---	---	---
	Thorium-228	0.10	0.20	0.00	1.20	2.40	0.00	15.63	31.25	0.00	0.63	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.17	0.20	0.00	2.04	2.40	0.00	26.56	31.25	0.00	1.06	1.25	0.00	---	---	---	---	---	---
	Thorium-232	-0.01	0.01	0.00	-0.07	0.12	0.00	-0.94	1.56	0.00	-0.04	0.06	0.00	---	---	---	---	---	---
	Uranium-234	12.90	0.17	12.73	154.80	1.99	152.81	2,015.63	25.94	1,989.69	80.63	1.04	79.59	---	---	---	---	---	---
	Uranium-235	0.60	0.04	0.56	7.20	0.48	6.72	93.75	6.25	87.50	3.75	0.25	3.50	---	---	---	---	---	---
	Uranium-238	13.20	0.10	13.10	158.40	1.15	157.25	2,062.50	15.00	2,047.50	82.50	0.60	81.90	---	---	---	---	---	---
	Total Intakes for EU7 Surface Water:				**333.05**	**14.06**	**321.10**	**4,336.56**	**183.13**	**4,180.94**	**173.46**	**7.33**	**167.24**						

Exposure Unit/ Sample Medium	COPC	Ingestion Slope Factor (1/pCi)	Ingestion Cancer Risk Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU1:																	
Sediment	Radium-226	7.30E-10	9.53E-09	8.76E-09	7.71E-10	1.24E-07	1.14E-07	1.00E-08	4.96E-09	4.56E-09	4.02E-10	---	---	---	---	---	---
	Radium-228	2.29E-09	2.49E-08	1.65E-08	8.41E-09	3.24E-07	2.15E-07	1.09E-07	1.30E-08	8.59E-09	4.38E-09	---	---	---	---	---	---
	Thorium-228	8.09E-10	9.99E-09	8.06E-09	1.93E-09	1.30E-07	1.05E-07	2.52E-08	5.20E-09	4.20E-09	1.01E-09	---	---	---	---	---	---
	Thorium-230	2.02E-10	1.36E-09	1.94E-09	0.00E+00	1.78E-08	2.53E-08	0.00E+00	7.11E-10	1.01E-09	0.00E+00	---	---	---	---	---	---
	Thorium-232	2.31E-10	1.41E-09	2.02E-09	0.00E+00	1.84E-08	2.63E-08	0.00E+00	7.35E-10	1.05E-09	0.00E+00	---	---	---	---	---	---
	Uranium-234	1.58E-10	8.00E-08	1.45E-09	7.85E-08	1.04E-06	1.89E-08	1.02E-06	4.17E-08	7.56E-10	4.09E-08	---	---	---	---	---	---
	Uranium-235	1.63E-10	4.25E-09	9.78E-11	4.15E-09	5.54E-08	1.27E-09	5.41E-08	2.21E-09	5.09E-11	2.16E-09	---	---	---	---	---	---
	Uranium-238	2.10E-10	1.18E-07	1.59E-09	1.17E-07	1.54E-06	2.07E-08	1.52E-06	6.17E-08	8.27E-10	6.09E-08	---	---	---	---	---	---
		ILCR:	**2.E-07**	**4.E-08**	**2.E-07**	**3.E-06**	**5.E-07**	**3.E-06**	**1.E-07**	**2.E-08**	**1.E-07**						
Surface Water	Radium-226	3.86E-10	4.72E-10	6.02E-10	0.00E+00	6.15E-09	7.84E-09	0.00E+00	2.46E-10	3.14E-10	0.00E+00	---	---	---	---	---	---
	Radium-228	1.04E-09	5.48E-09	4.12E-09	1.36E-09	7.13E-08	5.36E-08	1.77E-08	2.85E-09	2.15E-09	7.09E-10	---	---	---	---	---	---
	Thorium-228	3.00E-10	1.19E-09	7.20E-10	4.68E-10	1.55E-08	9.38E-09	6.09E-09	6.19E-10	3.75E-10	2.44E-10	---	---	---	---	---	---
	Thorium-230	9.10E-11	5.09E-10	2.18E-10	2.90E-10	6.63E-09	2.84E-09	3.78E-09	2.65E-10	1.14E-10	1.51E-10	---	---	---	---	---	---
	Thorium-232	1.01E-10	4.86E-11	1.21E-11	3.65E-11	6.33E-10	1.58E-10	4.75E-10	2.53E-11	6.31E-12	1.90E-11	---	---	---	---	---	---
	Uranium-234	7.07E-11	2.20E-08	1.41E-10	2.18E-08	2.86E-07	1.83E-09	2.85E-07	1.15E-08	7.34E-11	1.14E-08	---	---	---	---	---	---
	Uranium-235	7.18E-11	9.54E-10	3.45E-11	9.19E-10	1.24E-08	4.49E-10	1.20E-08	4.97E-10	1.80E-11	4.79E-10	---	---	---	---	---	---
	Uranium-238	8.71E-11	2.72E-08	1.00E-10	2.71E-08	3.54E-07	1.31E-09	3.53E-07	1.42E-08	5.23E-11	1.41E-08	---	---	---	---	---	---
		ILCR:	**6.E-08**	**6.E-09**	**5.E-08**	**8.E-07**	**8.E-08**	**7.E-07**	**3.E-08**	**3.E-09**	**3.E-08**						
EU2:																	
Sediment	Radium-226	7.30E-10	8.94E-09	8.76E-09	1.75E-10	1.16E-07	1.14E-07	2.28E-09	4.65E-09	4.56E-09	9.13E-11	---	---	---	---	---	---
	Radium-228	2.29E-09	2.91E-08	1.65E-08	1.26E-08	3.79E-07	2.15E-07	1.65E-07	1.52E-08	8.59E-09	6.58E-09	---	---	---	---	---	---
	Thorium-228	8.09E-10	1.49E-08	8.06E-09	6.84E-09	1.94E-07	1.05E-07	8.91E-08	7.76E-09	4.20E-09	3.56E-09	---	---	---	---	---	---
	Thorium-230	2.02E-10	2.03E-09	1.94E-09	8.98E-11	2.64E-08	2.53E-08	1.17E-09	1.06E-09	1.01E-09	4.68E-11	---	---	---	---	---	---
	Thorium-232	2.31E-10	3.81E-09	2.02E-09	1.78E-09	4.96E-08	2.63E-08	2.32E-08	1.98E-09	1.05E-09	9.29E-10	---	---	---	---	---	---
	Uranium-234	1.58E-10	1.07E-08	1.45E-09	9.24E-09	1.39E-07	1.89E-08	1.20E-07	5.57E-09	7.56E-10	4.81E-09	---	---	---	---	---	---
	Uranium-235	1.63E-10	4.69E-10	9.78E-11	3.72E-10	6.11E-09	1.27E-09	4.84E-09	2.45E-10	5.09E-11	1.94E-10	---	---	---	---	---	---
	Uranium-238	2.10E-10	1.44E-08	1.59E-09	1.28E-08	1.87E-07	2.07E-08	1.66E-07	7.48E-09	8.27E-10	6.65E-09	---	---	---	---	---	---
		ILCR:	**8.E-08**	**4.E-08**	**4.E-08**	**1.E-06**	**5.E-07**	**6.E-07**	**4.E-08**	**2.E-08**	**2.E-08**						
Surface Water	Radium-226	3.86E-10	2.04E-09	6.02E-10	1.44E-09	2.65E-08	7.84E-09	1.87E-08	1.06E-09	3.14E-10	7.48E-10	---	---	---	---	---	---
	Radium-228	1.04E-09	6.49E-09	4.12E-09	2.37E-09	8.45E-08	5.36E-08	3.09E-08	3.38E-09	2.15E-09	1.24E-09	---	---	---	---	---	---
	Thorium-228	3.00E-10	4.14E-09	7.20E-10	3.42E-09	5.39E-08	9.38E-09	4.45E-08	2.16E-09	3.75E-10	1.78E-09	---	---	---	---	---	---
	Thorium-230	9.10E-11	7.53E-10	2.18E-10	5.35E-10	9.81E-09	2.84E-09	6.97E-09	3.92E-10	1.14E-10	2.79E-10	---	---	---	---	---	---
	Thorium-232	1.01E-10	7.39E-10	1.21E-11	7.27E-10	9.63E-09	1.58E-10	9.47E-09	3.85E-10	6.31E-12	3.79E-10	---	---	---	---	---	---
	Uranium-234	7.07E-11	8.91E-08	1.41E-10	8.89E-08	1.16E-06	1.83E-09	1.16E-06	4.64E-08	7.34E-11	4.63E-08	---	---	---	---	---	---
	Uranium-235	7.18E-11	3.88E-09	3.45E-11	3.84E-09	5.05E-08	4.49E-10	5.00E-08	2.02E-09	1.80E-11	2.00E-09	---	---	---	---	---	---
	Uranium-238	8.71E-11	1.10E-07	1.00E-10	1.10E-07	1.43E-06	1.31E-09	1.43E-06	5.72E-08	5.23E-11	5.71E-08	---	---	---	---	---	---
		ILCR:	**2.E-07**	**6.E-09**	**2.E-07**	**3.E-06**	**8.E-08**	**3.E-06**	**1.E-07**	**3.E-09**	**1.E-07**						
EU3:																	
Sediment	Radium-226	7.30E-10	1.92E-08	8.76E-09	1.05E-08	2.50E-07	1.14E-07	1.36E-07	1.00E-08	4.56E-09	5.44E-09	---	---	---	---	---	---
	Radium-228	2.29E-09	3.61E-08	1.65E-08	1.96E-08	4.69E-07	2.15E-07	2.55E-07	1.88E-08	8.59E-09	1.02E-08	---	---	---	---	---	---
	Thorium-228	8.09E-10	1.13E-08	8.06E-09	3.24E-09	1.47E-07	1.05E-07	4.22E-08	5.89E-09	4.20E-09	1.69E-09	---	---	---	---	---	---
	Thorium-230	2.02E-10	3.05E-09	1.94E-09	1.11E-09	3.97E-08	2.53E-08	1.45E-08	1.59E-09	1.01E-09	5.78E-10	---	---	---	---	---	---
	Thorium-232	2.31E-10	3.21E-09	2.02E-09	1.18E-09	4.18E-08	2.63E-08	1.54E-08	1.67E-09	1.05E-09	6.16E-10	---	---	---	---	---	---
	Uranium-234	1.58E-10	1.00E-07	1.45E-09	9.90E-08	1.31E-06	1.89E-08	1.29E-06	5.23E-08	7.56E-10	5.16E-08	---	---	---	---	---	---
	Uranium-235	1.63E-10	5.56E-09	9.78E-11	5.46E-09	7.24E-08	1.27E-09	7.11E-08	2.90E-09	5.09E-11	2.85E-09	---	---	---	---	---	---
	Uranium-238	2.10E-10	1.45E-07	1.59E-09	1.44E-07	1.89E-06	2.07E-08	1.87E-06	7.57E-08	8.27E-10	7.49E-08	---	---	---	---	---	---
		ILCR:	**3.E-07**	**4.E-08**	**3.E-07**	**4.E-06**	**5.E-07**	**4.E-06**	**2.E-07**	**2.E-08**	**1.E-07**						
Surface Water	Radium-226	3.86E-10	6.81E-10	6.02E-10	7.87E-11	8.87E-09	7.84E-09	1.03E-09	3.55E-10	3.14E-10	4.10E-11	---	---	---	---	---	---
	Radium-228	1.04E-09	4.80E-09	4.12E-09	6.86E-10	6.26E-08	5.36E-08	8.94E-09	2.50E-09	2.15E-09	3.58E-10	---	---	---	---	---	---
	Thorium-228	3.00E-10	3.55E-10	7.20E-10	0.00E+00	4.63E-09	9.38E-09	0.00E+00	1.85E-10	3.75E-10	0.00E+00	---	---	---	---	---	---
	Thorium-230	9.10E-11	2.64E-10	2.18E-10	4.59E-11	3.44E-09	2.84E-09	5.97E-10	1.38E-10	1.14E-10	2.39E-11	---	---	---	---	---	---
	Thorium-232	1.01E-10	6.76E-11	1.21E-11	5.55E-11	8.81E-10	1.58E-10	7.23E-10	3.52E-11	6.31E-12	2.89E-11	---	---	---	---	---	---
	Uranium-234	7.07E-11	1.37E-08	1.41E-10	1.36E-08	1.79E-07	1.83E-09	1.77E-07	7.14E-09	7.34E-11	7.07E-09	---	---	---	---	---	---
	Uranium-235	7.18E-11	9.08E-10	3.45E-11	8.74E-10	1.18E-08	4.49E-10	1.14E-08	4.73E-10	1.80E-11	4.55E-10	---	---	---	---	---	---
	Uranium-238	8.71E-11	1.75E-08	1.00E-10	1.74E-08	2.29E-07	1.31E-09	2.27E-07	9.14E-09	5.23E-11	9.09E-09	---	---	---	---	---	---
		ILCR:	**4.E-08**	**6.E-09**	**3.E-08**	**5.E-07**	**8.E-08**	**4.E-07**	**2.E-08**	**3.E-09**	**2.E-08**						
EU4:																	
Sediment	Radium-226	7.30E-10	4.74E-09	8.76E-09	0.00E+00	6.17E-08	1.14E-07	0.00E+00	2.47E-09	4.56E-09	0.00E+00	---	---	---	---	---	---
	Radium-228	2.29E-09	1.55E-08	1.65E-08	0.00E+00	2.02E-07	2.15E-07	0.00E+00	8.09E-09	8.59E-09	0.00E+00	---	---	---	---	---	---
	Thorium-228	8.09E-10	3.20E-09	8.06E-09	0.00E+00	4.17E-08	1.05E-07	0.00E+00	1.67E-09	4.20E-09	0.00E+00	---	---	---	---	---	---
	Thorium-230	2.02E-10	9.96E-10	1.94E-09	0.00E+00	1.30E-08	2.53E-08	0.00E+00	5.19E-10	1.01E-09	0.00E+00	---	---	---	---	---	---
	Thorium-232	2.31E-10	6.68E-10	2.02E-09	0.00E+00	8.70E-09	2.63E-08	0.00E+00	3.48E-10	1.05E-09	0.00E+00	---	---	---	---	---	---
	Uranium-234	1.58E-10	3.02E-08	1.45E-09	2.88E-08	3.94E-07	1.89E-08	3.75E-07	1.57E-08	7.56E-10	1.50E-08	---	---	---	---	---	---
	Uranium-235	1.63E-10	1.53E-09	9.78E-11	1.43E-09	1.99E-08	1.27E-09	1.87E-08	7.98E-10	5.09E-11	7.47E-10	---	---	---	---	---	---
	Uranium-238	2.10E-10	4.54E-08	1.59E-09	4.38E-08	5.92E-07	2.07E-08	5.71E-07	2.37E-08	8.27E-10	2.28E-08	---	---	---	---	---	---
		ILCR:	**1.E-07**	**4.E-08**	**7.E-08**	**1.E-06**	**5.E-07**	**1.E-06**	**5.E-08**	**2.E-08**	**4.E-08**						
Surface Water	Radium-226	3.86E-10	7.04E-10	6.02E-10	1.02E-10	9.17E-09	7.84E-09	1.33E-09	3.67E-10	3.14E-10	5.31E-11	---	---	---	---	---	---
	Radium-228	1.04E-09	7.86E-09	4.12E-09	3.74E-09	1.02E-07	5.36E-08	4.88E-08	4.10E-09	2.15E-09	1.95E-09	---	---	---	---	---	---
	Thorium-228	3.00E-10	3.85E-10	7.20E-10	0.00E+00	5.02E-09	9.38E-09	0.00E+00	2.01E-10	3.75E-10	0.00E+00	---	---	---	---	---	---
	Thorium-230	9.10E-11	3.28E-10	2.18E-10	1.09E-10	4.27E-09	2.84E-09	1.42E-09	1.71E-10	1.14E-10	5.69E-11	---	---	---	---	---	---
	Thorium-232	1.01E-10	3.65E-11	1.21E-11	2.44E-11	4.75E-10	1.58E-10	3.17E-10	1.90E-11	6.31E-12	1.27E-11	---	---	---	---	---	---
	Uranium-234	7.07E-11	3.15E-09	1.41E-10	3.01E-09	4.10E-08	1.83E-09	3.92E-08	1.64E-09	7.34E-11	1.57E-09	---	---	---	---	---	---
	Uranium-235	7.18E-11	1.60E-10	3.45E-11	1.26E-10	2.09E-09	4.49E-10	1.64E-09	8.35E-11	1.80E-11	6.55E-11	---	---	---	---	---	---
	Uranium-238	8.71E-11	9.30E-09	1.00E-10	9.20E-09	1.21E-07	1.31E-09	1.20E-07	4.84E-09	5.23E-11	4.79E-09	---	---	---	---	---	---
		ILCR:	**2.E-08**	**6.E-09**	**2.E-08**	**3.E-07**	**8.E-08**	**2.E-07**	**1.E-08**	**3.E-09**	**8.E-09**						
EU6:																	
Sediment	Radium-226	7.30E-10	5.97E-09	8.76E-09	0.00E+00	7.78E-08	1.14E-07	0.00E+00	3.11E-09	4.56E-09	0.00E+00	---	---	---	---	---	---
	Radium-228	2.29E-09	3.47E-08	1.65E-08	1.82E-08	4.52E-07	2.15E-07	2.37E-07	1.81E-08	8.59E-09	9.48E-09	---	---	---	---	---	---
	Thorium-228	8.09E-10	2.00E-08	8.06E-09	1.20E-08	2.61E-07	1.05E-07	1.56E-07	1.04E-08	4.20E-09	6.24E-09	---	---	---	---	---	---
	Thorium-230	2.02E-10	1.75E-09	1.94E-09	0.00E+00	2.27E-08	2.53E-08	0.00E+00	9.09E-10	1.01E-09	0.00E+00	---	---	---	---	---	---
	Thorium-232	2.31E-10	5.54E-09	2.02E-09	3.52E-09	7.21E-08	2.63E-08	4.58E-08	2.89E-09	1.05E-09	1.83E-09	---	---	---	---	---	---
	Uranium-234	1.58E-10	9.26E-08	1.45E-09	9.11E-08	1.21E-06	1.89E-08	1.19E-06	4.82E-08	7.56E-10	4.75E-08	---	---	---	---	---	---
	Uranium-235	1.63E-10	5.14E-09	9.78E-11	5.05E-09	6.70E-08	1.27E-09	6.57E-08	2.68E-09	5.09E-11	2.63E-09	---	---	---	---	---	---
	Uranium-238	2.10E-10	1.28E-07	1.59E-09	1.26E-07	1.67E-06	2.07E-08	1.65E-06	6.67E-08	8.27E-10	6.59E-08	---	---	---	---	---	---
		ILCR:	**3.E-07**	**4.E-08**	**3.E-07**	**4.E-06**	**5.E-07**	**3.E-06**	**2.E-07**	**2.E-08**	**1.E-07**						
EU7:																	
Sediment	Radium-226	7.30E-10	6.22E-09	8.76E-09	0.00E+00	8.10E-08	1.14E-07	0.00E+00	3.24E-09	4.56E-09	0.00E+00	---	---	---	---	---	---
	Radium-228	2.29E-09	2.97E-08	1.65E-08	1.32E-08	3.86E-07	2.15E-07	1.72E-07	1.55E-08	8.59E-09	6.87E-09	---	---	---	---	---	---
	Thorium-228	8.09E-10	2.49E-08	8.06E-09	1.68E-08	3.24E-07	1.05E-07	2.19E-07	1.29E-08	4.20E-09	8.75E-09	---	---	---	---	---	---
	Thorium-230	2.02E-10	2.57E-09	1.94E-09	6.30E-10	3.35E-08	2.53E-08	8.21E-09	1.34E-09	1.01E-09	3.28E-10	---	---	---	---	---	---
	Thorium-232	2.31E-10	7.15E-09	2.02E-09	5.13E-09	9.31E-08	2.63E-08	6.68E-08	3.72E-09	1.05E-09	2.67E-09	---	---	---	---	---	---
	Uranium-234	1.58E-10	3.77E-07	1.45E-09	3.76E-07	4.91E-06	1.89E-08	4.89E-06	1.97E-07	7.56E-10	1.96E-07	---	---	---	---	---	---
	Uranium-235	1.63E-10	2.23E-08	9.78E-11	2.22E-08	2.90E-07	1.27E-09	2.89E-07	1.16E-08	5.09E-11	1.16E-08	---	---	---	---	---	---
	Uranium-238	2.10E-10	5.64E-07	1.59E-09	5.63E-07	7.35E-06	2.07E-08	7.33E-06	2.94E-07	8.27E-10	2.93E-07	---	---	---	---	---	---
		ILCR:	**1.E-06**	**4.E-08**	**1.E-06**	**1.E-05**	**5.E-07**	**1.E-05**	**5.E-07**	**2.E-08**	**5.E-07**						
Surface Water	Radium-226	3.86E-10	4.63E-10	6.02E-10	0.00E+00	6.03E-09	7.84E-09	0.00E+00	2.41E-10	3.14E-10	0.00E+00	---	---	---	---	---	---
	Radium-228	1.04E-09	8.61E-09	4.12E-09	4.49E-09	1.12E-07	5.36E-08	5.85E-08	4.49E-09	2.15E-09	2.34E-09	---	---	---	---	---	---
	Thorium-228	3.00E-10	3.60E-10	7.20E-10	0.00E+00	4.69E-09	9.38E-09	0.00E+00	1.88E-10	3.75E-10	0.00E+00	---	---	---	---	---	---
	Thorium-230	9.10E-11	1.86E-10	2.18E-10	0.00E+00	2.42E-09	2.84E-09	0.00E+00	9.67E-11	1.14E-10	0.00E+00	---	---	---	---	---	---
	Thorium-232	1.01E-10	-7.27E-12	1.21E-11	0.00E+00	-9.47E-11	1.58E-10	0.00E+00	-3.79E-12	6.31E-12	0.00E+00	---	---	---	---	---	---
	Uranium-234	7.07E-11	1.09E-08	1.41E-10	1.08E-08	1.43E-07	1.83E-09	1.41E-07	5.70E-09	7.34E-11	5.63E-09	---	---	---	---	---	---
	Uranium-235	7.18E-11	5.17E-10	3.45E-11	4.82E-10	6.73E-09	4.49E-10	6.28E-09	2.69E-10	1.80E-11	2.51E-10	---	---	---	---	---	---
	Uranium-238	8.71E-11	1.38E-08	1.00E-10	1.37E-08	1.80E-07	1.31E-09	1.78E-07	7.19E-09	5.23E-11	7.13E-09	---	---	---	---	---	---
		ILCR:	**3.E-08**	**6.E-09**	**3.E-08**	**5.E-07**	**8.E-08**	**4.E-07**	**2.E-08**	**3.E-09**	**2.E-08**						

TABLE 6-10
COPC SEDIMENT, SURFACE WATER, AND GROUNDWATER INTAKES, RISKS, AND DOSES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Ingestion Intakes (pCi): Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU8:																			
Sediment	Radium-226	1.28	1.00	0.28	15.30	12.00	3.30	199.22	156.25	42.97	7.97	6.25	1.72	---	---	---	---	---	---
	Radium-228	1.21	0.60	0.61	14.48	7.20	7.28	188.59	93.75	94.84	7.54	3.75	3.79	---	---	---	---	---	---
	Thorium-228	1.44	0.83	0.61	17.29	9.96	7.33	225.16	129.69	95.47	9.01	5.19	3.82	---	---	---	---	---	---
	Thorium-230	0.86	0.80	0.06	10.32	9.60	0.72	134.38	125.00	9.37	5.38	5.00	0.38	---	---	---	---	---	---
	Thorium-232	1.72	0.73	0.99	20.58	8.76	11.82	267.97	114.06	153.91	10.72	4.56	6.16	---	---	---	---	---	---
	Uranium-234	21.96	0.77	21.19	263.52	9.19	254.33	3,431.25	119.69	3,311.56	137.25	4.79	132.46	---	---	---	---	---	---
	Uranium-235	1.05	0.05	1.00	12.64	0.60	12.04	164.53	7.81	156.72	6.58	0.31	6.27	---	---	---	---	---	---
	Uranium-238	22.44	0.63	21.81	269.28	7.56	261.72	3,506.25	98.44	3,407.81	140.25	3.94	136.31	---	---	---	---	---	---
	Total Intakes for EU8 Sediment:				**623.41**	**64.87**	**558.54**	**8,117.34**	**844.69**	**7,272.66**	**324.69**	**33.79**	**290.91**						
EU10:																			
Groundwater	Radium-226	0.20	1.35	0.00	---	---	---	---	---	---	10.00	67.50	0.00	4,830.00	32,602.50	0.00	210.00	1,417.50	0.00
	Radium-228	0.43	2.20	0.00	---	---	---	---	---	---	21.65	110.00	0.00	10,456.95	53,130.00	0.00	454.65	2,310.00	0.00
	Thorium-228	0.02	0.07	0.00	---	---	---	---	---	---	1.09	3.50	0.00	526.47	1,690.50	0.00	22.89	73.50	0.00
	Thorium-230	0.25	0.17	0.08	---	---	---	---	---	---	12.50	8.50	4.00	6,037.50	4,105.50	1,932.00	262.50	178.50	84.00
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.71	0.00	0.71	341	0	341	14.81	0.00	14.81
	Uranium-234	4.05	1.00	3.05	---	---	---	---	---	---	202	50	152	97,735	24,150	73,585	4,249	1,050	3,199
	Uranium-235	0.21	0.09	0.12	---	---	---	---	---	---	10.45	4.25	6.20	5,047	2,053	2,995	219	89	130
	Uranium-238	4.43	0.95	3.48	---	---	---	---	---	---	222	48	174	106,985	22,943	84,042	4,652	998	3,654
	Total Intakes for EU10 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**480.25**	**291.25**	**337.26**	**231,958**	**140,674**	**162,894**	**10,085**	**6,116**	**7,082**
EU11:																			
Sediment	Radium-226	0.75	1.00	0.00	9.05	12.00	0.00	117.81	156.25	0.00	4.71	6.25	0.00	---	---	---	---	---	---
	Radium-228	0.66	0.60	0.06	7.96	7.20	0.76	103.59	93.75	9.84	4.14	3.75	0.39	---	---	---	---	---	---
	Thorium-228	0.76	0.83	0.00	9.07	9.96	0.00	118.13	129.69	0.00	4.73	5.19	0.00	---	---	---	---	---	---
	Thorium-230	0.83	0.80	0.03	9.94	9.60	0.34	129.38	125.00	4.37	5.18	5.00	0.17	---	---	---	---	---	---
	Thorium-232	0.70	0.73	0.00	8.39	8.76	0.00	109.22	114.06	0.00	4.37	4.56	0.00	---	---	---	---	---	---
	Uranium-234	36.30	0.77	35.53	435.60	9.19	426.41	5,671.88	119.69	5,552.19	226.88	4.79	222.09	---	---	---	---	---	---
	Uranium-235	2.17	0.05	2.12	26.04	0.60	25.44	339.06	7.81	331.25	13.56	0.31	13.25	---	---	---	---	---	---
	Uranium-238	41.00	0.63	40.37	492.00	7.56	484.44	6,406.25	98.44	6,307.81	256.25	3.94	252.31	---	---	---	---	---	---
	Total Intakes for EU11 Sediment:				**998.04**	**64.87**	**937.38**	**12,995.31**	**844.69**	**12,205.47**	**519.81**	**33.79**	**488.22**						
Surface Water	Radium-226	0.17	0.13	0.04	2.00	1.56	0.44	26.09	20.31	5.78	1.04	0.81	0.23	---	---	---	---	---	---
	Radium-228	0.48	0.33	0.15	5.76	3.96	1.80	75.00	51.56	23.44	3.00	2.06	0.94	---	---	---	---	---	---
	Thorium-228	0.17	0.20	0.00	2.05	2.40	0.00	26.72	31.25	0.00	1.07	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.15	0.20	0.00	1.82	2.40	0.00	23.75	31.25	0.00	0.95	1.25	0.00	---	---	---	---	---	---
	Thorium-232	0.03	0.01	0.02	0.39	0.12	0.27	5.06	1.56	3.50	0.20	0.06	0.14	---	---	---	---	---	---
	Uranium-234	33.30	0.17	33.13	399.60	1.99	397.61	5,203.13	25.94	5,177.19	208.13	1.04	207.09	---	---	---	---	---	---
	Uranium-235	1.54	0.04	1.50	18.47	0.48	17.99	240.47	6.25	234.22	9.62	0.25	9.37	---	---	---	---	---	---
	Uranium-238	32.80	0.10	32.70	393.60	1.15	392.45	5,125.00	15.00	5,110.00	205.00	0.60	204.40	---	---	---	---	---	---
	Total Intakes for EU11 Surface Water:				**823.70**	**14.06**	**810.56**	**10,725.22**	**183.13**	**10,554.13**	**429.01**	**7.33**	**422.17**						
Groundwater	Radium-226	0.29	1.35	0.00	---	---	---	---	---	---	14.60	67.50	0.00	7,051.80	32,602.50	0.00	306.60	1,417.50	0.00
	Radium-228	0.21	2.20	0.00	---	---	---	---	---	---	10.60	110.00	0.00	5,119.80	53,130.00	0.00	222.60	2,310.00	0.00
	Thorium-228	0.07	0.07	0.00	---	---	---	---	---	---	3.45	3.50	-0.05	1,666.35	1,690.50	-24.15	72.45	73.50	-1.05
	Thorium-230	0.25	0.17	0.08	---	---	---	---	---	---	12.50	8.50	4.00	6,037.50	4,105.50	1,932.00	262.50	178.50	84.00
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.38	0.00	0.38	183	0	183	7.94	0.00	7.94
	Uranium-234	17.33	1.00	16.33	---	---	---	---	---	---	867	50	817	418,520	24,150	394,370	18,197	1,050	17,147
	Uranium-235	0.66	0.09	0.57	---	---	---	---	---	---	32.90	4.25	28.65	15,891	2,053	13,838	691	89	602
	Uranium-238	15.64	0.95	14.69	---	---	---	---	---	---	782	48	735	377,706	22,943	354,764	16,422	998	15,425
	Total Intakes for EU11 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1,722.93**	**291.25**	**1,583.98**	**832,174**	**140,674**	**765,061**	**36,181**	**6,116**	**33,264**
EU12:																			
Sediment	Radium-226	1.18	1.00	0.18	14.16	12.00	2.16	184.38	156.25	28.13	7.38	6.25	1.13	---	---	---	---	---	---
	Radium-228	0.91	0.60	0.31	10.92	7.20	3.72	142.19	93.75	48.44	5.69	3.75	1.94	---	---	---	---	---	---
	Thorium-228	0.87	0.83	0.04	10.44	9.96	0.48	135.94	129.69	6.25	5.44	5.19	0.25	---	---	---	---	---	---
	Thorium-230	1.23	0.80	0.43	14.74	9.60	5.14	191.88	125.00	66.88	7.68	5.00	2.68	---	---	---	---	---	---
	Thorium-232	0.91	0.73	0.18	10.88	8.76	2.12	141.72	114.06	27.66	5.67	4.56	1.11	---	---	---	---	---	---
	Uranium-234	2.47	0.77	1.70	29.64	9.19	20.45	385.94	119.69	266.25	15.44	4.79	10.65	---	---	---	---	---	---
	Uranium-235	0.14	0.05	0.09	1.66	0.60	1.06	21.56	7.81	13.75	0.86	0.31	0.55	---	---	---	---	---	---
	Uranium-238	2.76	0.63	2.13	33.08	7.56	25.52	430.78	98.44	332.34	17.23	3.94	13.29	---	---	---	---	---	---
	Total Intakes for EU12 Sediment:				**125.52**	**64.87**	**60.65**	**1,634.38**	**844.69**	**789.69**	**65.38**	**33.79**	**31.59**						
Groundwater	Radium-226	0.26	1.35	0.00	---	---	---	---	---	---	13.05	67.50	0.00	6,303.15	32,602.50	0.00	274.05	1,417.50	0.00
	Radium-228	0.22	2.20	0.00	---	---	---	---	---	---	11.00	110.00	0.00	5,313.00	53,130.00	0.00	231.00	2,310.00	0.00
	Thorium-228	0.10	0.07	0.03	---	---	---	---	---	---	5.05	3.50	1.55	2,439.15	1,690.50	748.65	106.05	73.50	32.55
	Thorium-230	0.22	0.17	0.05	---	---	---	---	---	---	10.80	8.50	2.30	5,216.40	4,105.50	1,110.90	226.80	178.50	48.30
	Thorium-232	0.03	0.00	0.03	---	---	---	---	---	---	1.59	0.00	1.59	768	0	768	33.39	0.00	33.39
	Uranium-234	11.83	1.00	10.83	---	---	---	---	---	---	592	50	542	285,695	24,150	261,545	12,422	1,050	11,372
	Uranium-235	0.62	0.09	0.53	---	---	---	---	---	---	30.90	4.25	26.65	14,925	2,053	12,872	649	89	560
	Uranium-238	13.90	0.95	12.95	---	---	---	---	---	---	695	48	648	335,685	22,943	312,743	14,595	998	13,598
	Total Intakes for EU12 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1,358.89**	**291.25**	**1,221.09**	**656,344**	**140,674**	**589,786**	**28,537**	**6,116**	**25,643**
EU13:																			
Sediment	Radium-226	0.88	1.00	0.00	10.56	12.00	0.00	137.50	156.25	0.00	5.50	6.25	0.00	---	---	---	---	---	---
	Radium-228	1.05	0.60	0.45	12.60	7.20	5.40	164.06	93.75	70.31	6.56	3.75	2.81	---	---	---	---	---	---
	Thorium-228	0.57	0.83	0.00	6.84	9.96	0.00	89.06	129.69	0.00	3.56	5.19	0.00	---	---	---	---	---	---
	Thorium-230	0.68	0.80	0.00	8.16	9.60	0.00	106.25	125.00	0.00	4.25	5.00	0.00	---	---	---	---	---	---
	Thorium-232	0.46	0.73	0.00	5.52	8.76	0.00	71.88	114.06	0.00	2.88	4.56	0.00	---	---	---	---	---	---
	Uranium-234	19.70	0.77	18.93	236.40	9.19	227.21	3,078.13	119.69	2,958.44	123.13	4.79	118.34	---	---	---	---	---	---
	Uranium-235	1.02	0.05	0.97	12.24	0.60	11.64	159.38	7.81	151.56	6.38	0.31	6.06	---	---	---	---	---	---
	Uranium-238	19.20	0.63	18.57	230.40	7.56	222.84	3,000.00	98.44	2,901.56	120.00	3.94	116.06	---	---	---	---	---	---
	Total Intakes for EU13 Sediment:				**522.72**	**64.87**	**467.09**	**6,806.25**	**844.69**	**6,081.88**	**272.25**	**33.79**	**243.28**						
Groundwater	Radium-226	0.21	1.35	0.00	---	---	---	---	---	---	10.70	67.50	0.00	5,168.10	32,602.50	0.00	224.70	1,417.50	0.00
	Radium-228	0.28	2.20	0.00	---	---	---	---	---	---	13.85	110.00	0.00	6,689.55	53,130.00	0.00	290.85	2,310.00	0.00
	Thorium-228	0.07	0.07	0.00	---	---	---	---	---	---	3.31	3.50	-0.19	1,598.73	1,690.50	-91.77	69.51	73.50	-3.99
	Thorium-230	0.20	0.17	0.03	---	---	---	---	---	---	9.80	8.50	1.30	4,733.40	4,105.50	627.90	205.80	178.50	27.30
	Thorium-232	0.03	0.00	0.03	---	---	---	---	---	---	1.75	0.00	1.75	843	0	843	36.65	0.00	36.65
	Uranium-234	14.77	1.00	13.77	---	---	---	---	---	---	739	50	689	356,696	24,150	332,546	15,509	1,050	14,459
	Uranium-235	0.73	0.09	0.65	---	---	---	---	---	---	36.50	4.25	32.25	17,630	2,053	15,577	767	89	677
	Uranium-238	12.99	0.95	12.04	---	---	---	---	---	---	650	48	602	313,709	22,943	290,766	13,640	998	12,642
	Total Intakes for EU13 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1,463.91**	**291.25**	**1,325.61**	**707,066**	**140,674**	**640,267**	**30,742**	**6,116**	**27,838**
EU14:																			
Groundwater	Radium-226	0.24	1.35	0.00	---	---	---	---	---	---	11.90	67.50	0.00	5,747.70	32,602.50	0.00	249.90	1,417.50	0.00
	Radium-228	0.35	2.20	0.00	---	---	---	---	---	---	17.45	110.00	0.00	8,428.35	53,130.00	0.00	366.45	2,310.00	0.00
	Thorium-228	0.05	0.07	0.00	---	---	---	---	---	---	2.74	3.50	0.00	1,323.42	1,690.50	0.00	57.54	73.50	0.00
	Thorium-230	0.19	0.17	0.02	---	---	---	---	---	---	9.25	8.50	0.75	4,467.75	4,105.50	362.25	194.25	178.50	15.75
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.51	0.00	0.51	246	0	246	10.71	0.00	10.71
	Uranium-234	71.84	1.00	70.84	---	---	---	---	---	---	3,592	50	3,542	1,734,936	24,150	1,710,786	75,432	1,050	74,382
	Uranium-235	3.45	0.09	3.37	---	---	---	---	---	---	172.70	4.25	168.45	83,414	2,053	81,361	3,627	89	3,537
	Uranium-238	70.84	0.95	69.89	---	---	---	---	---	---	3,542	48	3,495	1,710,786	22,943	1,687,844	74,382	998	73,385
	Total Intakes for EU14 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7,348.55**	**291.25**	**7,206.21**	**3,549,350**	**140,674**	**3,480,599**	**154,320**	**6,116**	**151,330**

Exposure Unit/ Sample Medium	COPC	Ingestion Slope Factor (1/pCi)	Ingestion Cancer Risk: Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU8:																	
Sediment	Radium-226	7.30E-10	1.12E-08	8.76E-09	2.41E-09	1.45E-07	1.14E-07	3.14E-08	5.82E-09	4.56E-09	1.25E-09	---	---	---	---	---	---
	Radium-228	2.29E-09	3.32E-08	1.65E-08	1.67E-08	4.32E-07	2.15E-07	2.17E-07	1.73E-08	8.59E-09	8.69E-09	---	---	---	---	---	---
	Thorium-228	8.09E-10	1.40E-08	8.06E-09	5.93E-09	1.82E-07	1.05E-07	7.72E-08	7.29E-09	4.20E-09	3.09E-09	---	---	---	---	---	---
	Thorium-230	2.02E-10	2.08E-09	1.94E-09	1.45E-10	2.71E-08	2.53E-08	1.89E-09	1.09E-09	1.01E-09	7.57E-11	---	---	---	---	---	---
	Thorium-232	2.31E-10	4.75E-09	2.02E-09	2.73E-09	6.19E-08	2.63E-08	3.56E-08	2.48E-09	1.05E-09	1.42E-09	---	---	---	---	---	---
	Uranium-234	1.58E-10	4.16E-08	1.45E-09	4.02E-08	5.42E-07	1.89E-08	5.23E-07	2.17E-08	7.56E-10	2.09E-08	---	---	---	---	---	---
	Uranium-235	1.63E-10	2.06E-09	9.78E-11	1.96E-09	2.68E-08	1.27E-09	2.55E-08	1.07E-09	5.09E-11	1.02E-09	---	---	---	---	---	---
	Uranium-238	2.10E-10	5.65E-08	1.59E-09	5.50E-08	7.36E-07	2.07E-08	7.16E-07	2.95E-08	8.27E-10	2.86E-08	---	---	---	---	---	---
		ILCR:	**2.E-07**	**4.E-08**	**1.E-07**	**2.E-06**	**5.E-07**	**2.E-06**	**9.E-08**	**2.E-08**	**7.E-08**						
EU10:																	
Groundwater	Radium-226	3.86E-10	---	---	---	---	---	---	3.86E-09	2.61E-08	0.00E+00	1.86E-06	1.26E-05	0.00E+00	8.11E-08	5.47E-07	0.00E+00
	Radium-228	1.04E-09	---	---	---	---	---	---	2.25E-08	1.14E-07	0.00E+00	1.09E-05	5.53E-05	0.00E+00	4.73E-07	2.40E-06	0.00E+00
	Thorium-228	3.00E-10	---	---	---	---	---	---	3.27E-10	1.05E-09	0.00E+00	1.58E-07	5.07E-07	0.00E+00	6.87E-09	2.21E-08	0.00E+00
	Thorium-230	9.10E-11	---	---	---	---	---	---	1.14E-09	7.74E-10	3.64E-10	5.49E-07	3.74E-07	1.76E-07	2.39E-08	1.62E-08	7.64E-09
	Thorium-232	1.01E-10	---	---	---	---	---	---	7.12E-11	0.00E+00	7.12E-11	3.44E-08	0.00E+00	3.44E-08	1.50E-09	0.00E+00	1.50E-09
	Uranium-234	7.07E-11	---	---	---	---	---	---	1.43E-08	3.54E-09	1.08E-08	6.91E-06	1.71E-06	5.20E-06	3.00E-07	7.42E-08	2.26E-07
	Uranium-235	7.18E-11	---	---	---	---	---	---	7.50E-10	3.05E-10	4.45E-10	3.62E-07	1.47E-07	2.15E-07	1.58E-08	6.41E-09	9.35E-09
	Uranium-238	8.71E-11	---	---	---	---	---	---	1.93E-08	4.14E-09	1.52E-08	9.32E-06	2.00E-06	7.32E-06	4.05E-07	8.69E-08	3.18E-07
		ILCR:	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**6.E-08**	**2.E-07**	**3.E-08**	**3.E-05**	**7.E-05**	**1.E-05**	**1.E-06**	**3.E-06**	**6.E-07**
EU11:																	
Sediment	Radium-226	7.30E-10	6.61E-09	8.76E-09	0.00E+00	8.60E-08	1.14E-07	0.00E+00	3.44E-09	4.56E-09	0.00E+00	---	---	---	---	---	---
	Radium-228	2.29E-09	1.82E-08	1.65E-08	1.73E-09	2.37E-07	2.15E-07	2.25E-08	9.49E-09	8.59E-09	9.02E-10	---	---	---	---	---	---
	Thorium-228	8.09E-10	7.34E-09	8.06E-09	0.00E+00	9.56E-08	1.05E-07	0.00E+00	3.82E-09	4.20E-09	0.00E+00	---	---	---	---	---	---
	Thorium-230	2.02E-10	2.01E-09	1.94E-09	6.79E-11	2.61E-08	2.53E-08	8.84E-10	1.05E-09	1.01E-09	3.53E-11	---	---	---	---	---	---
	Thorium-232	2.31E-10	1.94E-09	2.02E-09	0.00E+00	2.52E-08	2.63E-08	0.00E+00	1.01E-09	1.05E-09	0.00E+00	---	---	---	---	---	---
	Uranium-234	1.58E-10	6.88E-08	1.45E-09	6.74E-08	8.96E-07	1.89E-08	8.77E-07	3.58E-08	7.56E-10	3.51E-08	---	---	---	---	---	---
	Uranium-235	1.63E-10	4.24E-09	9.78E-11	4.15E-09	5.53E-08	1.27E-09	5.40E-08	2.21E-09	5.09E-11	2.16E-09	---	---	---	---	---	---
	Uranium-238	2.10E-10	1.03E-07	1.59E-09	1.02E-07	1.35E-06	2.07E-08	1.32E-06	5.38E-08	8.27E-10	5.30E-08	---	---	---	---	---	---
		ILCR:	**2.E-07**	**4.E-08**	**2.E-07**	**3.E-06**	**5.E-07**	**2.E-06**	**1.E-07**	**2.E-08**	**9.E-08**						
Surface Water	Radium-226	3.86E-10	7.74E-10	6.02E-10	1.71E-10	1.01E-08	7.84E-09	2.23E-09	4.03E-10	3.14E-10	8.93E-11	---	---	---	---	---	---
	Radium-228	1.04E-09	5.99E-09	4.12E-09	1.87E-09	7.80E-08	5.36E-08	2.44E-08	3.12E-09	2.15E-09	9.75E-10	---	---	---	---	---	---
	Thorium-228	3.00E-10	6.16E-10	7.20E-10	0.00E+00	8.02E-09	9.38E-09	0.00E+00	3.21E-10	3.75E-10	0.00E+00	---	---	---	---	---	---
	Thorium-230	9.10E-11	1.66E-10	2.18E-10	0.00E+00	2.16E-09	2.84E-09	0.00E+00	8.65E-11	1.14E-10	0.00E+00	---	---	---	---	---	---
	Thorium-232	1.01E-10	3.93E-11	1.21E-11	2.71E-11	5.11E-10	1.58E-10	3.54E-10	2.05E-11	6.31E-12	1.41E-11	---	---	---	---	---	---
	Uranium-234	7.07E-11	2.83E-08	1.41E-10	2.81E-08	3.68E-07	1.83E-09	3.66E-07	1.47E-08	7.34E-11	1.46E-08	---	---	---	---	---	---
	Uranium-235	7.18E-11	1.33E-09	3.45E-11	1.29E-09	1.73E-08	4.49E-10	1.68E-08	6.91E-10	1.80E-11	6.73E-10	---	---	---	---	---	---
	Uranium-238	8.71E-11	3.43E-08	1.00E-10	3.42E-08	4.46E-07	1.31E-09	4.45E-07	1.79E-08	5.23E-11	1.78E-08	---	---	---	---	---	---
		ILCR:	**7.E-08**	**6.E-09**	**7.E-08**	**9.E-07**	**8.E-08**	**9.E-07**	**4.E-08**	**3.E-09**	**3.E-08**						
Groundwater	Radium-226	3.86E-10	---	---	---	---	---	---	5.64E-09	2.61E-08	0.00E+00	2.72E-06	1.26E-05	0.00E+00	1.18E-07	5.47E-07	0.00E+00
	Radium-228	1.04E-09	---	---	---	---	---	---	1.10E-08	1.14E-07	0.00E+00	5.32E-06	5.53E-05	0.00E+00	2.32E-07	2.40E-06	0.00E+00
	Thorium-228	3.00E-10	---	---	---	---	---	---	1.04E-09	1.05E-09	-1.50E-11	5.00E-07	5.07E-07	-7.25E-09	2.17E-08	2.21E-08	-3.15E-10
	Thorium-230	9.10E-11	---	---	---	---	---	---	1.14E-09	7.74E-10	3.64E-10	5.49E-07	3.74E-07	1.76E-07	2.39E-08	1.62E-08	7.64E-09
	Thorium-232	1.01E-10	---	---	---	---	---	---	3.82E-11	0.00E+00	3.82E-11	1.84E-08	0.00E+00	1.84E-08	8.02E-10	0.00E+00	8.02E-10
	Uranium-234	7.07E-11	---	---	---	---	---	---	6.13E-08	3.54E-09	5.77E-08	2.96E-05	1.71E-06	2.79E-05	1.29E-06	7.42E-08	1.21E-06
	Uranium-235	7.18E-11	---	---	---	---	---	---	2.36E-09	3.05E-10	2.06E-09	1.14E-06	1.47E-07	9.94E-07	4.96E-08	6.41E-09	4.32E-08
	Uranium-238	8.71E-11	---	---	---	---	---	---	6.81E-08	4.14E-09	6.40E-08	3.29E-05	2.00E-06	3.09E-05	1.43E-06	8.69E-08	1.34E-06
		ILCR:	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**2.E-07**	**2.E-07**	**1.E-07**	**7.E-05**	**7.E-05**	**6.E-05**	**3.E-06**	**3.E-06**	**3.E-06**
EU12:																	
Sediment	Radium-226	7.30E-10	1.03E-08	8.76E-09	1.58E-09	1.35E-07	1.14E-07	2.05E-08	5.38E-09	4.56E-09	8.21E-10	---	---	---	---	---	---
	Radium-228	2.29E-09	2.50E-08	1.65E-08	8.52E-09	3.26E-07	2.15E-07	1.11E-07	1.30E-08	8.59E-09	4.44E-09	---	---	---	---	---	---
	Thorium-228	8.09E-10	8.45E-09	8.06E-09	3.88E-10	1.10E-07	1.05E-07	5.06E-09	4.40E-09	4.20E-09	2.02E-10	---	---	---	---	---	---
	Thorium-230	2.02E-10	2.98E-09	1.94E-09	1.04E-09	3.88E-08	2.53E-08	1.35E-08	1.55E-09	1.01E-09	5.40E-10	---	---	---	---	---	---
	Thorium-232	2.31E-10	2.51E-09	2.02E-09	4.91E-10	3.27E-08	2.63E-08	6.39E-09	1.31E-09	1.05E-09	2.56E-10	---	---	---	---	---	---
	Uranium-234	1.58E-10	4.68E-09	1.45E-09	3.23E-09	6.10E-08	1.89E-08	4.21E-08	2.44E-09	7.56E-10	1.68E-09	---	---	---	---	---	---
	Uranium-235	1.63E-10	2.70E-10	9.78E-11	1.72E-10	3.51E-09	1.27E-09	2.24E-09	1.41E-10	5.09E-11	8.97E-11	---	---	---	---	---	---
	Uranium-238	2.10E-10	6.95E-09	1.59E-09	5.36E-09	9.05E-08	2.07E-08	6.98E-08	3.62E-09	8.27E-10	2.79E-09	---	---	---	---	---	---
		ILCR:	**6.E-08**	**4.E-08**	**2.E-08**	**8.E-07**	**5.E-07**	**3.E-07**	**3.E-08**	**2.E-08**	**1.E-08**						
Groundwater	Radium-226	3.86E-10	---	---	---	---	---	---	5.04E-09	2.61E-08	0.00E+00	2.43E-06	1.26E-05	0.00E+00	1.06E-07	5.47E-07	0.00E+00
	Radium-228	1.04E-09	---	---	---	---	---	---	1.14E-08	1.14E-07	0.00E+00	5.53E-06	5.53E-05	0.00E+00	2.40E-07	2.40E-06	0.00E+00
	Thorium-228	3.00E-10	---	---	---	---	---	---	1.52E-09	1.05E-09	4.65E-10	7.32E-07	5.07E-07	2.25E-07	3.18E-08	2.21E-08	9.77E-09
	Thorium-230	9.10E-11	---	---	---	---	---	---	9.83E-10	7.74E-10	2.09E-10	4.75E-07	3.74E-07	1.01E-07	2.06E-08	1.62E-08	4.40E-09
	Thorium-232	1.01E-10	---	---	---	---	---	---	1.61E-10	0.00E+00	1.61E-10	7.76E-08	0.00E+00	7.76E-08	3.37E-09	0.00E+00	3.37E-09
	Uranium-234	7.07E-11	---	---	---	---	---	---	4.18E-08	3.54E-09	3.83E-08	2.02E-05	1.71E-06	1.85E-05	8.78E-07	7.42E-08	8.04E-07
	Uranium-235	7.18E-11	---	---	---	---	---	---	2.22E-09	3.05E-10	1.91E-09	1.07E-06	1.47E-07	9.24E-07	4.66E-08	6.41E-09	4.02E-08
	Uranium-238	8.71E-11	---	---	---	---	---	---	6.05E-08	4.14E-09	5.64E-08	2.92E-05	2.00E-06	2.72E-05	1.27E-06	8.69E-08	1.18E-06
		ILCR:	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**1.E-07**	**2.E-07**	**1.E-07**	**6.E-05**	**7.E-05**	**5.E-05**	**3.E-06**	**3.E-06**	**2.E-06**
EU13:																	
Sediment	Radium-226	7.30E-10	7.71E-09	8.76E-09	0.00E+00	1.00E-07	1.14E-07	0.00E+00	4.02E-09	4.56E-09	0.00E+00	---	---	---	---	---	---
	Radium-228	2.29E-09	2.89E-08	1.65E-08	1.24E-08	3.76E-07	2.15E-07	1.61E-07	1.50E-08	8.59E-09	6.44E-09	---	---	---	---	---	---
	Thorium-228	8.09E-10	5.53E-09	8.06E-09	0.00E+00	7.21E-08	1.05E-07	0.00E+00	2.88E-09	4.20E-09	0.00E+00	---	---	---	---	---	---
	Thorium-230	2.02E-10	1.65E-09	1.94E-09	0.00E+00	2.15E-08	2.53E-08	0.00E+00	8.59E-10	1.01E-09	0.00E+00	---	---	---	---	---	---
	Thorium-232	2.31E-10	1.28E-09	2.02E-09	0.00E+00	1.66E-08	2.63E-08	0.00E+00	6.64E-10	1.05E-09	0.00E+00	---	---	---	---	---	---
	Uranium-234	1.58E-10	3.74E-08	1.45E-09	3.59E-08	4.86E-07	1.89E-08	4.67E-07	1.95E-08	7.56E-10	1.87E-08	---	---	---	---	---	---
	Uranium-235	1.63E-10	2.00E-09	9.78E-11	1.90E-09	2.60E-08	1.27E-09	2.47E-08	1.04E-09	5.09E-11	9.88E-10	---	---	---	---	---	---
	Uranium-238	2.10E-10	4.84E-08	1.59E-09	4.68E-08	6.30E-07	2.07E-08	6.09E-07	2.52E-08	8.27E-10	2.44E-08	---	---	---	---	---	---
		ILCR:	**1.E-07**	**4.E-08**	**1.E-07**	**2.E-06**	**5.E-07**	**1.E-06**	**7.E-08**	**2.E-08**	**5.E-08**						
Groundwater	Radium-226	3.86E-10	---	---	---	---	---	---	4.13E-09	2.61E-08	0.00E+00	1.99E-06	1.26E-05	0.00E+00	8.67E-08	5.47E-07	0.00E+00
	Radium-228	1.04E-09	---	---	---	---	---	---	1.44E-08	1.14E-07	0.00E+00	6.96E-06	5.53E-05	0.00E+00	3.02E-07	2.40E-06	0.00E+00
	Thorium-228	3.00E-10	---	---	---	---	---	---	9.93E-10	1.05E-09	-5.70E-11	4.80E-07	5.07E-07	-2.75E-08	2.09E-08	2.21E-08	-1.20E-09
	Thorium-230	9.10E-11	---	---	---	---	---	---	8.92E-10	7.74E-10	1.18E-10	4.31E-07	3.74E-07	5.71E-08	1.87E-08	1.62E-08	2.48E-09
	Thorium-232	1.01E-10	---	---	---	---	---	---	1.76E-10	0.00E+00	1.76E-10	8.51E-08	0.00E+00	8.51E-08	3.70E-09	0.00E+00	3.70E-09
	Uranium-234	7.07E-11	---	---	---	---	---	---	5.22E-08	3.54E-09	4.87E-08	2.52E-05	1.71E-06	2.35E-05	1.10E-06	7.42E-08	1.02E-06
	Uranium-235	7.18E-11	---	---	---	---	---	---	2.62E-09	3.05E-10	2.32E-09	1.27E-06	1.47E-07	1.12E-06	5.50E-08	6.41E-09	4.86E-08
	Uranium-238	8.71E-11	---	---	---	---	---	---	5.66E-08	4.14E-09	5.24E-08	2.73E-05	2.00E-06	2.53E-05	1.19E-06	8.69E-08	1.10E-06
		ILCR:	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**1.E-07**	**2.E-07**	**1.E-07**	**6.E-05**	**7.E-05**	**5.E-05**	**3.E-06**	**3.E-06**	**2.E-06**
EU14:																	
Groundwater	Radium-226	3.86E-10	---	---	---	---	---	---	4.59E-09	2.61E-08	0.00E+00	2.22E-06	1.26E-05	0.00E+00	9.65E-08	5.47E-07	0.00E+00
	Radium-228	1.04E-09	---	---	---	---	---	---	1.81E-08	1.14E-07	0.00E+00	8.77E-06	5.53E-05	0.00E+00	3.81E-07	2.40E-06	0.00E+00
	Thorium-228	3.00E-10	---	---	---	---	---	---	8.22E-10	1.05E-09	0.00E+00	3.97E-07	5.07E-07	0.00E+00	1.73E-08	2.21E-08	0.00E+00
	Thorium-230	9.10E-11	---	---	---	---	---	---	8.42E-10	7.74E-10	6.82E-11	4.07E-07	3.74E-07	3.30E-08	1.77E-08	1.62E-08	1.43E-09
	Thorium-232	1.01E-10	---	---	---	---	---	---	5.15E-11	0.00E+00	5.15E-11	2.49E-08	0.00E+00	2.49E-08	1.08E-09	0.00E+00	1.08E-09
	Uranium-234	7.07E-11	---	---	---	---	---	---	2.54E-07	3.54E-09	2.50E-07	1.23E-04	1.71E-06	1.21E-04	5.33E-06	7.42E-08	5.26E-06
	Uranium-235	7.18E-11	---	---	---	---	---	---	1.24E-08	3.05E-10	1.21E-08	5.99E-06	1.47E-07	5.84E-06	2.60E-07	6.41E-09	2.54E-07
	Uranium-238	8.71E-11	---	---	---	---	---	---	3.09E-07	4.14E-09	3.04E-07	1.49E-04	2.00E-06	1.47E-04	6.48E-06	8.69E-08	6.39E-06
		ILCR:	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**6.E-07**	**2.E-07**	**6.E-07**	**3.E-04**	**7.E-05**	**3.E-04**	**1.E-05**	**3.E-06**	**1.E-05**

TABLE 6-10
COPC SEDIMENT, SURFACE WATER, AND GROUNDWATER INTAKES, RISKS, AND DOSES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Ingestion Intakes (pCi)															Ingestion Slope Factor (1/pCi)	Ingestion Cancer Risk											
					Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child		Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU15:																																
Sediment	Radium-226	0.82	1.00	0.00	9.84	12.00	0.00	128.13	156.25	0.00	5.13	6.25	0.00	---	---	---	---	---	---	7.30E-10	7.18E-09	8.76E-09	0.00E+00	9.35E-08	1.14E-07	0.00E+00	3.74E-09	4.56E-09	0.00E+00	---	---	---	---	---	---
	Radium-228	0.99	0.60	0.39	11.88	7.20	4.68	154.69	93.75	60.94	6.19	3.75	2.44	---	---	---	---	---	---	2.29E-09	2.72E-08	1.65E-08	1.07E-08	3.54E-07	2.15E-07	1.40E-07	1.42E-08	8.59E-09	5.58E-09	---	---	---	---	---	---
	Thorium-228	0.64	0.83	0.00	7.68	9.96	0.00	100.00	129.69	0.00	4.00	5.19	0.00	---	---	---	---	---	---	8.09E-10	6.21E-09	8.06E-09	0.00E+00	8.09E-08	1.05E-07	0.00E+00	3.24E-09	4.20E-09	0.00E+00	---	---	---	---	---	---
	Thorium-230	0.87	0.80	0.07	10.44	9.60	0.84	135.94	125.00	10.94	5.44	5.00	0.44	---	---	---	---	---	---	2.02E-10	2.11E-09	1.94E-09	1.70E-10	2.75E-08	2.53E-08	2.21E-09	1.10E-09	1.01E-09	8.84E-11	---	---	---	---	---	---
	Thorium-232	0.50	0.73	0.00	6.00	8.76	0.00	78.13	114.06	0.00	3.13	4.56	0.00	---	---	---	---	---	---	2.31E-10	1.39E-09	2.02E-09	0.00E+00	1.80E-08	2.63E-08	0.00E+00	7.22E-10	1.05E-09	0.00E+00	---	---	---	---	---	---
	Uranium-234	10.30	0.77	9.53	123.60	9.19	114.41	1,609.38	119.69	1,489.69	64.38	4.79	59.59	---	---	---	---	---	---	1.58E-10	1.95E-08	1.45E-09	1.81E-08	2.54E-07	1.89E-08	2.35E-07	1.02E-08	7.56E-10	9.41E-09	---	---	---	---	---	---
	Uranium-235	0.71	0.05	0.66	8.52	0.60	7.92	110.94	7.81	103.13	4.44	0.31	4.13	---	---	---	---	---	---	1.63E-10	1.39E-09	9.78E-11	1.29E-09	1.81E-08	1.27E-09	1.68E-08	7.23E-10	5.09E-11	6.72E-10	---	---	---	---	---	---
	Uranium-238	10.70	0.63	10.07	128.40	7.56	120.84	1,671.88	98.44	1,573.44	66.88	3.94	62.94	---	---	---	---	---	---	2.10E-10	2.70E-08	1.59E-09	2.54E-08	3.51E-07	2.07E-08	3.30E-07	1.40E-08	8.27E-10	1.32E-08	---	---	---	---	---	---
	Total Intakes for EU15 Sediment:				**306.36**	**64.87**	**248.69**	**3,989.06**	**844.69**	**3,238.13**	**159.56**	**33.79**	**129.53**							**ILCR:**	**9.E-08**	**4.E-08**	**6.E-08**	**1.E-06**	**5.E-07**	**7.E-07**	**5.E-08**	**2.E-08**	**3.E-08**						
EU16:																																
Sediment	Radium-226	0.31	1.00	0.00	3.73	12.00	0.00	48.55	156.25	0.00	1.94	6.25	0.00	---	---	---	---	---	---	7.30E-10	2.72E-09	8.76E-09	0.00E+00	3.54E-08	1.14E-07	0.00E+00	1.42E-09	4.56E-09	0.00E+00	---	---	---	---	---	---
	Radium-228	0.57	0.60	0.00	6.84	7.20	0.00	89.06	93.75	0.00	3.56	3.75	0.00	---	---	---	---	---	---	2.29E-09	1.57E-08	1.65E-08	0.00E+00	2.04E-07	2.15E-07	0.00E+00	8.16E-09	8.59E-09	0.00E+00	---	---	---	---	---	---
	Thorium-228	0.35	0.83	0.00	4.20	9.96	0.00	54.69	129.69	0.00	2.19	5.19	0.00	---	---	---	---	---	---	8.09E-10	3.40E-09	8.06E-09	0.00E+00	4.42E-08	1.05E-07	0.00E+00	1.77E-09	4.20E-09	0.00E+00	---	---	---	---	---	---
	Thorium-230	0.40	0.80	0.00	4.77	9.60	0.00	62.06	125.00	0.00	2.48	5.00	0.00	---	---	---	---	---	---	2.02E-10	9.63E-10	1.94E-09	0.00E+00	1.25E-08	2.53E-08	0.00E+00	5.01E-10	1.01E-09	0.00E+00	---	---	---	---	---	---
	Thorium-232	0.26	0.73	0.00	3.12	8.76	0.00	40.63	114.06	0.00	1.63	4.56	0.00	---	---	---	---	---	---	2.31E-10	7.21E-10	2.02E-09	0.00E+00	9.38E-09	2.63E-08	0.00E+00	3.75E-10	1.05E-09	0.00E+00	---	---	---	---	---	---
	Uranium-234	6.19	0.77	5.42	74.23	9.19	65.04	966.51	119.69	846.83	38.66	4.79	33.87	---	---	---	---	---	---	1.58E-10	1.17E-08	1.45E-09	1.03E-08	1.53E-07	1.89E-08	1.34E-07	6.11E-09	7.56E-10	5.35E-09	---	---	---	---	---	---
	Uranium-235	0.31	0.05	0.26	3.66	0.60	3.06	47.72	7.81	39.91	1.91	0.31	1.60	---	---	---	---	---	---	1.63E-10	5.97E-10	9.78E-11	5.00E-10	7.78E-09	1.27E-09	6.51E-09	3.11E-10	5.09E-11	2.60E-10	---	---	---	---	---	---
	Uranium-238	6.71	0.63	6.08	80.56	7.56	73.00	1,048.90	98.44	950.46	41.96	3.94	38.02	---	---	---	---	---	---	2.10E-10	1.69E-08	1.59E-09	1.53E-08	2.20E-07	2.07E-08	2.00E-07	8.81E-09	8.27E-10	7.98E-09	---	---	---	---	---	---
	Total Intakes for EU16 Sediment:				**181.10**	**64.87**	**141.10**	**2,358.12**	**844.69**	**1,837.20**	**94.32**	**33.79**	**73.49**							**ILCR:**	**5.E-08**	**4.E-08**	**3.E-08**	**7.E-07**	**5.E-07**	**3.E-07**	**3.E-08**	**2.E-08**	**1.E-08**						
Groundwater	Radium-226	0.21	1.35	0.00	---	---	---	---	---	---	10.25	67.50	0.00	4,950.75	32,602.50	0.00	215.25	1,417.50	0.00	3.86E-10	---	---	---	---	---	---	3.96E-09	2.61E-08	0.00E+00	1.91E-06	1.26E-05	0.00E+00	8.31E-08	5.47E-07	0.00E+00
	Radium-228	0.42	2.20	0.00	---	---	---	---	---	---	21.10	110.00	0.00	10,189.56	53,130.00	0.00	443.02	2,310.00	0.00	1.04E-09	---	---	---	---	---	---	2.19E-08	1.14E-07	0.00E+00	1.06E-05	5.53E-05	0.00E+00	4.61E-07	2.40E-06	0.00E+00
	Thorium-228	0.09	0.07	0.02	---	---	---	---	---	---	4.31	3.50	0.81	2,081.68	1,690.50	391.18	90.51	73.50	17.01	3.00E-10	---	---	---	---	---	---	1.29E-09	1.05E-09	2.43E-10	6.25E-07	5.07E-07	1.17E-07	2.72E-08	2.21E-08	5.10E-09
	Thorium-230	0.20	0.17	0.03	---	---	---	---	---	---	9.83	8.50	1.33	4,746.34	4,105.50	640.84	206.36	178.50	27.86	9.10E-11	---	---	---	---	---	---	8.94E-10	7.74E-10	1.21E-10	4.32E-07	3.74E-07	5.83E-08	1.88E-08	1.62E-08	2.54E-09
	Thorium-232	0.06	0.00	0.06	---	---	---	---	---	---	2.90	0.00	2.90	1,401	0	1,401	60.90	0.00	60.90	1.01E-10	---	---	---	---	---	---	2.93E-10	0.00E+00	2.93E-10	1.41E-07	0.00E+00	1.41E-07	6.15E-09	0.00E+00	6.15E-09
	Uranium-234	28.60	1.00	27.60	---	---	---	---	---	---	1,430	50	1,380	690,625	24,150	666,475	30,027	1,050	28,977	7.07E-11	---	---	---	---	---	---	1.01E-07	3.54E-09	9.76E-08	4.88E-05	1.71E-06	4.71E-05	2.12E-06	7.42E-08	2.05E-06
	Uranium-235	1.70	0.09	1.62	---	---	---	---	---	---	85.07	4.25	80.82	41,087	2,053	39,034	1,786	89	1,697	7.18E-11	---	---	---	---	---	---	6.11E-09	3.05E-10	5.80E-09	2.95E-06	1.47E-07	2.80E-06	1.28E-07	6.41E-09	1.22E-07
	Uranium-238	29.98	0.95	29.03	---	---	---	---	---	---	1,499	48	1,451	723,987	22,943	701,045	31,478	998	30,480	8.71E-11	---	---	---	---	---	---	1.31E-07	4.14E-09	1.26E-07	6.31E-05	2.00E-06	6.11E-05	2.74E-06	8.69E-08	2.65E-06
	Total Intakes for EU16 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3,062.25**	**291.25**	**2,917.16**	**1,479,069**	**140,674**	**1,408,987**	**64,307**	**6,116**	**61,260**	**ILCR:**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**3.E-07**	**2.E-07**	**2.E-07**	**1.E-04**	**7.E-05**	**1.E-04**	**6.E-06**	**3.E-06**	**5.E-06**
EU18:																																
Groundwater	Radium-226	1.36	1.35	0.01	---	---	---	---	---	---	67.99	67.50	0.49	32,837.59	32,602.50	235.09	1,427.72	1,417.50	10.22	3.86E-10	---	---	---	---	---	---	2.62E-08	2.61E-08	1.88E-10	1.27E-05	1.26E-05	9.07E-08	5.51E-07	5.47E-07	3.95E-09
	Radium-228	2.35	2.20	0.15	---	---	---	---	---	---	117.58	110.00	7.58	56,790.00	53,130.00	3,660.00	2,469.13	2,310.00	159.13	1.04E-09	---	---	---	---	---	---	1.22E-07	1.14E-07	7.88E-09	5.91E-05	5.53E-05	3.81E-06	2.57E-06	2.40E-06	1.65E-07
	Thorium-228	0.12	0.07	0.05	---	---	---	---	---	---	6.24	3.50	2.74	3,014.45	1,690.50	1,323.95	131.06	73.50	57.56	3.00E-10	---	---	---	---	---	---	1.87E-09	1.05E-09	8.22E-10	9.04E-07	5.07E-07	3.97E-07	3.93E-08	2.21E-08	1.73E-08
	Thorium-230	0.25	0.17	0.08	---	---	---	---	---	---	12.32	8.50	3.82	5,951.12	4,105.50	1,845.62	258.74	178.50	80.24	9.10E-11	---	---	---	---	---	---	1.12E-09	7.74E-10	3.48E-10	5.42E-07	3.74E-07	1.68E-07	2.35E-08	1.62E-08	7.30E-09
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.25	0.00	0.25	121	0	121	5.27	0.00	5.27	1.01E-10	---	---	---	---	---	---	2.53E-11	0.00E+00	2.53E-11	1.22E-08	0.00E+00	1.22E-08	5.32E-10	0.00E+00	5.32E-10
	Uranium-234	1.23	1.00	0.23	---	---	---	---	---	---	62	50	12	29,732	24,150	5,582	1,293	1,050	243	7.07E-11	---	---	---	---	---	---	4.35E-09	3.54E-09	8.17E-10	2.10E-06	1.71E-06	3.95E-07	9.14E-08	7.42E-08	1.72E-08
	Uranium-235	0.08	0.09	0.00	---	---	---	---	---	---	4.00	4.25	0.00	1,932	2,053	0	84	89	0	7.18E-11	---	---	---	---	---	---	2.87E-10	3.05E-10	0.00E+00	1.39E-07	1.47E-07	0.00E+00	6.03E-09	6.41E-09	0.00E+00
	Uranium-238	1.23	0.95	0.28	---	---	---	---	---	---	61	48	14	29,615	22,943	6,673	1,288	998	290	8.71E-11	---	---	---	---	---	---	5.34E-09	4.14E-09	1.20E-09	2.58E-06	2.00E-06	5.81E-07	1.12E-07	8.69E-08	2.53E-08
	Total Intakes for EU18 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**331.25**	**291.25**	**40.25**	**159,993**	**140,674**	**19,440**	**6,956**	**6,116**	**845**	**ILCR:**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**0.E+00**	**2.E-07**	**2.E-07**	**1.E-08**	**8.E-05**	**7.E-05**	**5.E-06**	**3.E-06**	**3.E-06**	**2.E-07**
EU19:																																
Sediment	Radium-226	1.06	1.00	0.06	12.71	12.00	0.71	---	---	---	---	---	---	19.06	18.00	1.06	91.50	86.40	5.10	7.30E-10	9.28E-09	8.76E-09	5.17E-10	---	---	---	---	---	---	1.39E-08	1.31E-08	7.75E-10	6.68E-08	6.31E-08	3.72E-09
	Radium-228	0.82	0.60	0.22	9.89	7.20	2.69	---	---	---	---	---	---	14.83	10.80	4.03	71.19	51.84	19.35	2.29E-09	2.26E-08	1.65E-08	6.16E-09	---	---	---	---	---	---	3.40E-08	2.47E-08	9.23E-09	1.63E-07	1.19E-07	4.43E-08
	Thorium-228	0.85	0.83	0.02	10.18	9.96	0.22	---	---	---	---	---	---	15.26	14.94	0.32	73.27	71.71	1.56	8.09E-10	8.23E-09	8.06E-09	1.75E-10	---	---	---	---	---	---	1.23E-08	1.21E-08	2.62E-10	5.93E-08	5.80E-08	1.26E-09
	Thorium-230	0.90	0.80	0.10	10.76	9.60	1.16	---	---	---	---	---	---	16.15	14.40	1.75	77.50	69.12	8.38	2.02E-10	2.17E-09	1.94E-09	2.35E-10	---	---	---	---	---	---	3.26E-09	2.91E-09	3.53E-10	1.57E-08	1.40E-08	1.69E-09
	Thorium-232	0.78	0.73	0.05	9.40	8.76	0.64	---	---	---	---	---	---	14.09	13.14	0.95	67.65	63.07	4.58	2.31E-10	2.17E-09	2.02E-09	1.47E-10	---	---	---	---	---	---	3.26E-09	3.04E-09	2.20E-10	1.56E-08	1.46E-08	1.06E-09
	Uranium-234	0.74	0.77	0.00	8.87	9.19	0.00	---	---	---	---	---	---	13.30	13.79	0.00	63.85	66.18	0.00	1.58E-10	1.40E-09	1.45E-09	0.00E+00	---	---	---	---	---	---	2.10E-09	2.18E-09	0.00E+00	1.01E-08	1.05E-08	0.00E+00
	Uranium-235	0.06	0.05	0.01	0.73	0.60	0.13	---	---	---	---	---	---	1.10	0.90	0.20	5.28	4.32	0.96	1.63E-10	1.20E-10	9.78E-11	2.17E-11	---	---	---	---	---	---	1.79E-10	1.47E-10	3.26E-11	8.60E-10	7.04E-10	1.56E-10
	Uranium-238	0.68	0.63	0.05	8.14	7.56	0.58	---	---	---	---	---	---	12.20	11.34	0.86	58.58	54.43	4.15	2.10E-10	1.71E-09	1.59E-09	1.21E-10	---	---	---	---	---	---	2.56E-09	2.38E-09	1.81E-10	1.23E-08	1.14E-08	8.71E-10
	Total Intakes for EU19 Sediment:				**70.67**	**64.87**	**6.12**							**106.00**	**97.31**	**9.18**	**508.82**	**467.08**	**44.07**	**ILCR:**	**4.77E-08**	**4.04E-08**	**7.37E-09**							**7.16E-08**	**6.06E-08**	**1.11E-08**	**3.44E-07**	**2.91E-07**	**5.31E-08**
Surface Water	Radium-226	0.14	0.13	0.01	1.66	1.56	0.10	---	---	---	---	---	---	2.48	2.34	0.14	11.92	11.23	0.69	3.86E-10	6.39E-10	6.02E-10	3.71E-11	---	---	---	---	---	---	9.59E-10	9.03E-10	5.56E-11	4.60E-09	4.34E-09	2.67E-10
	Radium-228	0.61	0.33	0.28	7.34	3.96	3.38	---	---	---	---	---	---	11.02	5.94	5.08	52.88	28.51	24.36	1.04E-09	7.64E-09	4.12E-09	3.52E-09	---	---	---	---	---	---	1.15E-08	6.18E-09	5.28E-09	5.50E-08	2.97E-08	2.53E-08
	Thorium-228	0.26	0.20	0.06	3.07	2.40	0.67	---	---	---	---	---	---	4.61	3.60	1.01	22.12	17.28	4.84	3.00E-10	9.22E-10	7.20E-10	2.02E-10	---	---	---	---	---	---	1.38E-09	1.08E-09	3.02E-10	6.64E-09	5.18E-09	1.45E-09
	Thorium-230	0.26	0.20	0.06	3.07	2.40	0.67	---	---	---	---	---	---	4.61	3.60	1.01	22.12	17.28	4.84	9.10E-11	2.80E-10	2.18E-10	6.12E-11	---	---	---	---	---	---	4.19E-10	3.28E-10	9.17E-11	2.01E-09	1.57E-09	4.40E-10
	Thorium-232	0.03	0.01	0.02	0.31	0.12	0.19	---	---	---	---	---	---	0.47	0.18	0.29	2.26	0.86	1.39	1.01E-10	3.16E-11	1.21E-11	1.95E-11	---	---	---	---	---	---	4.74E-11	1.82E-11	2.93E-11	2.28E-10	8.73E-11	1.40E-10
	Uranium-234	0.20	0.17	0.04	2.42	1.99	0.43	---	---	---	---	---	---	3.64	2.99	0.65	17.45	14.34	3.11	7.07E-11	1.71E-10	1.41E-10	3.05E-11	---	---	---	---	---	---	2.57E-10	2.11E-10	4.58E-11	1.22E-09	1.01E-09	2.20E-10
	Uranium-235	0.05	0.04	0.01	0.57	0.48	0.09	---	---	---	---	---	---	0.85	0.72	0.13	4.09	3.46	0.63	7.18E-11	4.08E-11	3.45E-11	6.29E-12	---	---	---	---	---	---	6.11E-11	5.17E-11	9.43E-12	2.93E-10	2.48E-10	4.53E-11
	Uranium-238	0.17	0.10	0.07	2.04	1.15	0.89	---	---	---	---	---	---	3.06	1.73	1.33	14.69	8.29	6.39	8.71E-11	1.78E-10	1.00E-10	7.73E-11	---	---	---	---	---	---	2.67E-10	1.51E-10	1.16E-10	1.28E-09	7.22E-10	5.57E-10
	Total Intakes for EU19 Surface Water:				**20.49**	**14.06**	**6.42**							**30.73**	**21.10**	**9.64**	**147.52**	**101.26**	**46.26**	**ILCR:**	**9.90E-09**	**5.95E-09**	**3.95E-09**							**1.48E-08**	**8.92E-09**	**5.93E-09**	**7.13E-08**	**4.28E-08**	**2.85E-08**

Notes:
COPC = chomical of potential concern
EU = exposure unit
EPC = exposure point concentration
ILCR = incremental lifetime cancer risk
mrem = millirem
mrem/pCi = millirem per picocurie
1/pCi = quantity per picocurie
pCi/g = picocurie per gram
pCi/L = piccocurie per liter
pCi = picocurie

TABLE 6-10
COPC SEDIMENT, SURFACE WATER, AND GROUNDWATER INTAKES, RISKS, AND DOSES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Ingestion Intakes (pCi): Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU1:																			
Sediment	Radium-226	1.09	1.00	0.09	13.06	12.00	1.06	170.00	156.25	13.75	6.80	6.25	0.55	---	---	---	---	---	---
	Radium-228	0.91	0.60	0.31	10.87	7.20	3.67	141.56	93.75	47.81	5.66	3.75	1.91	---	---	---	---	---	---
	Thorium-228	1.03	0.83	0.20	12.35	9.96	2.39	160.78	129.69	31.09	6.43	5.19	1.24	---	---	---	---	---	---
	Thorium-230	0.56	0.80	0.00	6.76	9.60	0.00	87.97	125.00	0.00	3.52	5.00	0.00	---	---	---	---	---	---
	Thorium-232	0.51	0.73	0.00	6.11	8.76	0.00	79.53	114.06	0.00	3.18	4.56	0.00	---	---	---	---	---	---
	Uranium-234	42.19	0.77	41.42	506.28	9.19	497.09	6,592.19	119.69	6,472.50	263.69	4.79	258.90	---	---	---	---	---	---
	Uranium-235	2.17	0.05	2.12	26.09	0.60	25.49	339.69	7.81	331.88	13.59	0.31	13.28	---	---	---	---	---	---
	Uranium-238	47.00	0.63	46.37	564.00	7.56	556.44	7,343.75	98.44	7,245.31	293.75	3.94	289.81	---	---	---	---	---	---
	Total Intakes for EU1 Sediment:				**1,145.51**	**64.87**	**1,086.13**	**14,915.47**	**844.69**	**14,142.34**	**596.62**	**33.79**	**565.69**						
Surface Water	Radium-226	0.10	0.13	0.00	1.22	1.56	0.00	15.94	20.31	0.00	0.64	0.81	0.00	---	---	---	---	---	---
	Radium-228	0.44	0.33	0.11	5.27	3.96	1.31	68.59	51.56	17.03	2.74	2.06	0.68	---	---	---	---	---	---
	Thorium-228	0.33	0.20	0.13	3.96	2.40	1.56	51.56	31.25	20.31	2.06	1.25	0.81	---	---	---	---	---	---
	Thorium-230	0.47	0.20	0.27	5.59	2.40	3.19	72.81	31.25	41.56	2.91	1.25	1.66	---	---	---	---	---	---
	Thorium-232	0.04	0.01	0.03	0.48	0.12	0.36	6.27	1.56	4.70	0.25	0.06	0.19	---	---	---	---	---	---
	Uranium-234	25.92	0.17	25.75	311.04	1.99	309.05	4,050.00	25.94	4,024.06	162.00	1.04	160.96	---	---	---	---	---	---
	Uranium-235	1.11	0.04	1.07	13.28	0.48	12.80	172.97	6.25	166.72	6.92	0.25	6.67	---	---	---	---	---	---
	Uranium-238	26.01	0.10	25.91	312.12	1.15	310.97	4,064.06	15.00	4,049.06	162.56	0.60	161.96	---	---	---	---	---	---
	Total Intakes for EU1 Surface Water:				**652.97**	**14.06**	**639.24**	**8,502.20**	**183.13**	**8,323.45**	**340.09**	**7.33**	**332.94**						
EU2:																			
Sediment	Radium-226	1.02	1.00	0.02	12.24	12.00	0.24	159.38	156.25	3.13	6.38	6.25	0.13	---	---	---	---	---	---
	Radium-228	1.06	0.60	0.46	12.72	7.20	5.52	165.63	93.75	71.88	6.63	3.75	2.88	---	---	---	---	---	---
	Thorium-228	1.54	0.83	0.71	18.42	9.96	8.46	239.84	129.69	110.16	9.59	5.19	4.41	---	---	---	---	---	---
	Thorium-230	0.84	0.80	0.04	10.04	9.60	0.44	130.79	125.00	5.79	5.23	5.00	0.23	---	---	---	---	---	---
	Thorium-232	1.37	0.73	0.64	16.48	8.76	7.72	214.64	114.06	100.58	8.59	4.56	4.02	---	---	---	---	---	---
	Uranium-234	5.64	0.77	4.87	67.68	9.19	58.49	881.25	119.69	761.56	35.25	4.79	30.46	---	---	---	---	---	---
	Uranium-235	0.24	0.05	0.19	2.88	0.60	2.28	37.50	7.81	29.69	1.50	0.31	1.19	---	---	---	---	---	---
	Uranium-238	5.70	0.63	5.07	68.40	7.56	60.84	890.63	98.44	792.19	35.63	3.94	31.69	---	---	---	---	---	---
	Total Intakes for EU2 Sediment:				**208.87**	**64.87**	**144.00**	**2,719.64**	**844.69**	**1,874.96**	**108.79**	**33.79**	**75.00**						
Surface Water	Radium-226	0.44	0.13	0.31	5.28	1.56	3.72	68.75	20.31	48.44	2.75	0.81	1.94	---	---	---	---	---	---
	Radium-228	0.52	0.33	0.19	6.24	3.96	2.28	81.25	51.56	29.69	3.25	2.06	1.19	---	---	---	---	---	---
	Thorium-228	1.15	0.20	0.95	13.80	2.40	11.40	179.69	31.25	148.44	7.19	1.25	5.94	---	---	---	---	---	---
	Thorium-230	0.69	0.20	0.49	8.28	2.40	5.88	107.81	31.25	76.56	4.31	1.25	3.06	---	---	---	---	---	---
	Thorium-232	0.61	0.01	0.60	7.32	0.12	7.20	95.31	1.56	93.75	3.81	0.06	3.75	---	---	---	---	---	---
	Uranium-234	105.00	0.17	104.83	1,260.00	1.99	1,258.01	16,406.25	25.94	16,380.31	656.25	1.04	655.21	---	---	---	---	---	---
	Uranium-235	4.50	0.04	4.46	54.00	0.48	53.52	703.13	6.25	696.88	28.13	0.25	27.88	---	---	---	---	---	---
	Uranium-238	105.00	0.10	104.90	1,260.00	1.15	1,258.85	16,406.25	15.00	16,391.25	656.25	0.60	655.65	---	---	---	---	---	---
	Total Intakes for EU2 Surface Water:				**2,614.92**	**14.06**	**2,600.86**	**34,048.44**	**183.13**	**33,865.31**	**1,361.94**	**7.33**	**1,354.61**						
EU3:																			
Sediment	Radium-226	2.19	1.00	1.19	26.32	12.00	14.32	342.66	156.25	186.41	13.71	6.25	7.46	---	---	---	---	---	---
	Radium-228	1.31	0.60	0.71	15.74	7.20	8.54	205.00	93.75	111.25	8.20	3.75	4.45	---	---	---	---	---	---
	Thorium-228	1.16	0.83	0.33	13.97	9.96	4.01	181.88	129.69	52.19	7.28	5.19	2.09	---	---	---	---	---	---
	Thorium-230	1.26	0.80	0.46	15.10	9.60	5.50	196.56	125.00	71.56	7.86	5.00	2.86	---	---	---	---	---	---
	Thorium-232	1.16	0.73	0.43	13.88	8.76	5.12	180.78	114.06	66.72	7.23	4.56	2.67	---	---	---	---	---	---
	Uranium-234	52.97	0.77	52.20	635.64	9.19	626.45	8,276.56	119.69	8,156.88	331.06	4.79	326.28	---	---	---	---	---	---
	Uranium-235	2.84	0.05	2.79	34.12	0.60	33.52	444.22	7.81	436.41	17.77	0.31	17.46	---	---	---	---	---	---
	Uranium-238	57.67	0.63	57.04	692.04	7.56	684.48	9,010.94	98.44	8,912.50	360.44	3.94	356.50	---	---	---	---	---	---
	Total Intakes for EU3 Sediment:				**1,446.80**	**64.87**	**1,381.93**	**18,838.59**	**844.69**	**17,993.91**	**753.54**	**33.79**	**719.76**						
Surface Water	Radium-226	0.15	0.13	0.02	1.76	1.56	0.20	22.97	20.31	2.66	0.92	0.81	0.11	---	---	---	---	---	---
	Radium-228	0.39	0.33	0.06	4.62	3.96	0.66	60.16	51.56	8.59	2.41	2.06	0.34	---	---	---	---	---	---
	Thorium-228	0.10	0.20	0.00	1.18	2.40	0.00	15.42	31.25	0.00	0.62	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.24	0.20	0.04	2.90	2.40	0.50	37.81	31.25	6.56	1.51	1.25	0.26	---	---	---	---	---	---
	Thorium-232	0.06	0.01	0.05	0.67	0.12	0.55	8.72	1.56	7.16	0.35	0.06	0.29	---	---	---	---	---	---
	Uranium-234	16.16	0.17	15.99	193.92	1.99	191.93	2,525.00	25.94	2,499.06	101.00	1.04	99.96	---	---	---	---	---	---
	Uranium-235	1.05	0.04	1.01	12.65	0.48	12.17	164.69	6.25	158.44	6.59	0.25	6.34	---	---	---	---	---	---
	Uranium-238	16.79	0.10	16.69	201.48	1.15	200.33	2,623.44	15.00	2,608.44	104.94	0.60	104.34	---	---	---	---	---	---
	Total Intakes for EU3 Surface Water:				**419.19**	**14.06**	**406.34**	**5,458.20**	**183.13**	**5,290.91**	**218.33**	**7.33**	**211.64**						
EU4:																			
Sediment	Radium-226	0.54	1.00	0.00	6.49	12.00	0.00	84.53	156.25	0.00	3.38	6.25	0.00	---	---	---	---	---	---
	Radium-228	0.57	0.60	0.00	6.78	7.20	0.00	88.28	93.75	0.00	3.53	3.75	0.00	---	---	---	---	---	---
	Thorium-228	0.33	0.83	0.00	3.96	9.96	0.00	51.56	129.69	0.00	2.06	5.19	0.00	---	---	---	---	---	---
	Thorium-230	0.41	0.80	0.00	4.93	9.60	0.00	64.22	125.00	0.00	2.57	5.00	0.00	---	---	---	---	---	---
	Thorium-232	0.24	0.73	0.00	2.89	8.76	0.00	37.66	114.06	0.00	1.51	4.56	0.00	---	---	---	---	---	---
	Uranium-234	15.94	0.77	15.17	191.28	9.19	182.09	2,490.63	119.69	2,370.94	99.63	4.79	94.84	---	---	---	---	---	---
	Uranium-235	0.78	0.05	0.73	9.40	0.60	8.80	122.34	7.81	114.53	4.89	0.31	4.58	---	---	---	---	---	---
	Uranium-238	18.03	0.63	17.40	216.36	7.56	208.80	2,817.19	98.44	2,718.75	112.69	3.94	108.75	---	---	---	---	---	---
	Total Intakes for EU4 Sediment:				**442.09**	**64.87**	**399.68**	**5,756.41**	**844.69**	**5,204.22**	**230.26**	**33.79**	**208.17**						
Surface Water	Radium-226	0.15	0.13	0.02	1.82	1.56	0.26	23.75	20.31	3.44	0.95	0.81	0.14	---	---	---	---	---	---
	Radium-228	0.63	0.33	0.30	7.56	3.96	3.60	98.44	51.56	46.88	3.94	2.06	1.88	---	---	---	---	---	---
	Thorium-228	0.11	0.20	0.00	1.28	2.40	0.00	16.72	31.25	0.00	0.67	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.30	0.20	0.10	3.60	2.40	1.20	46.88	31.25	15.63	1.88	1.25	0.63	---	---	---	---	---	---
	Thorium-232	0.03	0.01	0.02	0.36	0.12	0.24	4.70	1.56	3.14	0.19	0.06	0.13	---	---	---	---	---	---
	Uranium-234	3.71	0.17	3.54	44.52	1.99	42.53	579.69	25.94	553.75	23.19	1.04	22.15	---	---	---	---	---	---
	Uranium-235	0.19	0.04	0.15	2.23	0.48	1.75	29.06	6.25	22.81	1.16	0.25	0.91	---	---	---	---	---	---
	Uranium-238	8.90	0.10	8.80	106.80	1.15	105.65	1,390.63	15.00	1,375.63	55.63	0.60	55.03	---	---	---	---	---	---
	Total Intakes for EU4 Surface Water:				**168.18**	**14.06**	**155.23**	**2,189.86**	**183.13**	**2,021.27**	**87.59**	**7.33**	**80.85**						
EU6:																			
Sediment	Radium-226	0.68	1.00	0.00	8.18	12.00	0.00	106.51	156.25	0.00	4.26	6.25	0.00	---	---	---	---	---	---
	Radium-228	1.26	0.60	0.66	15.15	7.20	7.95	197.24	93.75	103.49	7.89	3.75	4.14	---	---	---	---	---	---
	Thorium-228	2.06	0.83	1.23	24.76	9.96	14.80	322.37	129.69	192.69	12.89	5.19	7.71	---	---	---	---	---	---
	Thorium-230	0.72	0.80	0.00	8.64	9.60	0.00	112.50	125.00	0.00	4.50	5.00	0.00	---	---	---	---	---	---
	Thorium-232	2.00	0.73	1.27	23.98	8.76	15.22	312.30	114.06	198.24	12.49	4.56	7.93	---	---	---	---	---	---
	Uranium-234	48.84	0.77	48.07	586.06	9.19	576.87	7,630.96	119.69	7,511.27	305.24	4.79	300.45	---	---	---	---	---	---
	Uranium-235	2.63	0.05	2.58	31.56	0.60	30.96	410.94	7.81	403.13	16.44	0.31	16.13	---	---	---	---	---	---
	Uranium-238	50.81	0.63	50.18	609.74	7.56	602.18	7,939.37	98.44	7,840.93	317.57	3.94	313.64	---	---	---	---	---	---
	Total Intakes for EU6 Sediment:				**1,308.07**	**64.87**	**1,247.98**	**17,032.19**	**844.69**	**16,249.75**	**681.29**	**33.79**	**649.99**						
EU7:																			
Sediment	Radium-226	0.71	1.00	0.00	8.53	12.00	0.00	111.02	156.25	0.00	4.44	6.25	0.00	---	---	---	---	---	---
	Radium-228	1.08	0.60	0.48	12.96	7.20	5.76	168.75	93.75	75.00	6.75	3.75	3.00	---	---	---	---	---	---
	Thorium-228	2.56	0.83	1.73	30.72	9.96	20.76	400.00	129.69	270.31	16.00	5.19	10.81	---	---	---	---	---	---
	Thorium-230	1.06	0.80	0.26	12.72	9.60	3.12	165.63	125.00	40.63	6.63	5.00	1.63	---	---	---	---	---	---
	Thorium-232	2.58	0.73	1.85	30.96	8.76	22.20	403.13	114.06	289.06	16.13	4.56	11.56	---	---	---	---	---	---
	Uranium-234	199.00	0.77	198.23	2,388.00	9.19	2,378.81	31,093.75	119.69	30,974.06	1,243.75	4.79	1,238.96	---	---	---	---	---	---
	Uranium-235	11.40	0.05	11.35	136.80	0.60	136.20	1,781.25	7.81	1,773.44	71.25	0.31	70.94	---	---	---	---	---	---
	Uranium-238	224.00	0.63	223.37	2,688.00	7.56	2,680.44	35,000.00	98.44	34,901.56	1,400.00	3.94	1,396.06	---	---	---	---	---	---
	Total Intakes for EU7 Sediment:				**5,308.69**	**64.87**	**5,247.29**	**69,123.52**	**844.69**	**68,324.06**	**2,764.94**	**33.79**	**2,732.96**						
Surface Water	Radium-226	0.10	0.13	0.00	1.20	1.56	0.00	15.63	20.31	0.00	0.63	0.81	0.00	---	---	---	---	---	---
	Radium-228	0.69	0.33	0.36	8.28	3.96	4.32	107.81	51.56	56.25	4.31	2.06	2.25	---	---	---	---	---	---
	Thorium-228	0.10	0.20	0.00	1.20	2.40	0.00	15.63	31.25	0.00	0.63	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.17	0.20	0.00	2.04	2.40	0.00	26.56	31.25	0.00	1.06	1.25	0.00	---	---	---	---	---	---
	Thorium-232	-0.01	0.01	0.00	-0.07	0.12	0.00	-0.94	1.56	0.00	-0.04	0.06	0.00	---	---	---	---	---	---
	Uranium-234	12.90	0.17	12.73	154.80	1.99	152.81	2,015.63	25.94	1,989.69	80.63	1.04	79.59	---	---	---	---	---	---
	Uranium-235	0.60	0.04	0.56	7.20	0.48	6.72	93.75	6.25	87.50	3.75	0.25	3.50	---	---	---	---	---	---
	Uranium-238	13.20	0.10	13.10	158.40	1.15	157.25	2,062.50	15.00	2,047.50	82.50	0.60	81.90	---	---	---	---	---	---
	Total Intakes for EU7 Surface Water:				**333.05**	**14.06**	**321.10**	**4,336.56**	**183.13**	**4,180.94**	**173.46**	**7.33**	**167.24**						

Exposure Unit/ Sample Medium	COPC	Ingestion Dose Conversion Factor (mrem/pCi)	Dose (mrem): Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU1:																	
Sediment	Radium-226	1.321E-03	0.02	0.02	0.00	0.22	0.21	0.02	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.02	0.01	0.01	0.20	0.14	0.07	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.01	0.01	0.00	0.13	0.10	0.03	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.01	0.00	0.05	0.07	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.02	0.02	0.00	0.22	0.31	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.14	0.00	0.14	1.87	0.03	1.83	0.07	0.00	0.07	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.01	0.00	0.01	0.09	0.00	0.09	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.15	0.00	0.15	1.97	0.03	1.95	0.08	0.00	0.08	---	---	---	---	---	---
		Dose:	**0.37**	**0.07**	**0.31**	**4.75**	**0.89**	**3.98**	**0.19**	**0.04**	**0.16**						
Surface Water	Radium-226	1.321E-03	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.01	0.01	0.00	0.10	0.07	0.02	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.04	0.03	0.02	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.04	0.02	0.02	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.09	0.00	0.09	1.15	0.01	1.14	0.05	0.00	0.05	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.05	0.00	0.04	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.08	0.00	0.08	1.09	0.00	1.09	0.04	0.00	0.04	---	---	---	---	---	---
		Dose:	**0.19**	**0.01**	**0.18**	**2.50**	**0.16**	**2.35**	**0.10**	**0.01**	**0.09**						
EU2:																	
Sediment	Radium-226	1.321E-03	0.02	0.02	0.00	0.21	0.21	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.02	0.01	0.01	0.24	0.14	0.10	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.01	0.01	0.01	0.19	0.10	0.09	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.01	0.01	0.00	0.07	0.07	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.05	0.02	0.02	0.59	0.31	0.27	0.02	0.01	0.01	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.02	0.00	0.02	0.25	0.03	0.22	0.01	0.00	0.01	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.02	0.00	0.02	0.24	0.03	0.21	0.01	0.00	0.01	---	---	---	---	---	---
		Dose:	**0.14**	**0.07**	**0.07**	**1.80**	**0.89**	**0.91**	**0.07**	**0.04**	**0.04**						
Surface Water	Radium-226	1.321E-03	0.01	0.00	0.00	0.09	0.03	0.06	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.01	0.01	0.00	0.12	0.07	0.04	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.01	0.00	0.01	0.15	0.03	0.12	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.06	0.02	0.04	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.02	0.00	0.02	0.26	0.00	0.26	0.01	0.00	0.01	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.36	0.00	0.36	4.64	0.01	4.64	0.19	0.00	0.19	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.01	0.00	0.01	0.19	0.00	0.19	0.01	0.00	0.01	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.34	0.00	0.34	4.41	0.00	4.40	0.18	0.00	0.18	---	---	---	---	---	---
		Dose:	**0.76**	**0.01**	**0.75**	**9.91**	**0.16**	**9.75**	**0.40**	**0.01**	**0.39**						
EU3:																	
Sediment	Radium-226	1.321E-03	0.03	0.02	0.02	0.45	0.21	0.25	0.02	0.01	0.01	---	---	---	---	---	---
	Radium-228	1.442E-03	0.02	0.01	0.01	0.30	0.14	0.16	0.01	0.01	0.01	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.01	0.01	0.00	0.15	0.10	0.04	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.01	0.01	0.00	0.11	0.07	0.04	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.04	0.02	0.01	0.49	0.31	0.18	0.02	0.01	0.01	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.18	0.00	0.18	2.34	0.03	2.31	0.09	0.00	0.09	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.01	0.00	0.01	0.12	0.00	0.12	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.19	0.00	0.18	2.42	0.03	2.39	0.10	0.00	0.10	---	---	---	---	---	---
		Dose:	**0.49**	**0.07**	**0.42**	**6.38**	**0.89**	**5.49**	**0.26**	**0.04**	**0.22**						
Surface Water	Radium-226	1.321E-03	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.01	0.01	0.00	0.09	0.07	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.05	0.00	0.05	0.71	0.01	0.71	0.03	0.00	0.03	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.04	0.00	0.04	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.05	0.00	0.05	0.70	0.00	0.70	0.03	0.00	0.03	---	---	---	---	---	---
		Dose:	**0.13**	**0.01**	**0.11**	**1.64**	**0.16**	**1.49**	**0.07**	**0.01**	**0.06**						
EU4:																	
Sediment	Radium-226	1.321E-03	0.01	0.02	0.00	0.11	0.21	0.00	0.00	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.01	0.01	0.00	0.13	0.14	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.01	0.00	0.04	0.10	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.01	0.00	0.04	0.07	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.01	0.02	0.00	0.10	0.31	0.00	0.00	0.01	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.05	0.00	0.05	0.70	0.03	0.67	0.03	0.00	0.03	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.06	0.00	0.06	0.76	0.03	0.73	0.03	0.00	0.03	---	---	---	---	---	---
		Dose:	**0.15**	**0.07**	**0.11**	**1.91**	**0.89**	**1.43**	**0.08**	**0.04**	**0.06**						
Surface Water	Radium-226	1.321E-03	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.01	0.01	0.01	0.14	0.07	0.07	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.03	0.02	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.01	0.00	0.01	0.16	0.01	0.16	0.01	0.00	0.01	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.03	0.00	0.03	0.37	0.00	0.37	0.01	0.00	0.01	---	---	---	---	---	---
		Dose:	**0.06**	**0.01**	**0.05**	**0.77**	**0.16**	**0.62**	**0.03**	**0.01**	**0.02**						
EU6:																	
Sediment	Radium-226	1.321E-03	0.01	0.02	0.00	0.14	0.21	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.02	0.01	0.01	0.28	0.14	0.15	0.01	0.01	0.01	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.02	0.01	0.01	0.26	0.10	0.16	0.01	0.00	0.01	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.01	0.00	0.06	0.07	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.07	0.02	0.04	0.85	0.31	0.54	0.03	0.01	0.02	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.17	0.00	0.16	2.16	0.03	2.13	0.09	0.00	0.09	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.01	0.00	0.01	0.11	0.00	0.11	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.16	0.00	0.16	2.13	0.03	2.11	0.09	0.00	0.08	---	---	---	---	---	---
		Dose:	**0.46**	**0.07**	**0.40**	**6.00**	**0.89**	**5.19**	**0.24**	**0.04**	**0.21**						
EU7:																	
Sediment	Radium-226	1.321E-03	0.01	0.02	0.00	0.15	0.21	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.02	0.01	0.01	0.24	0.14	0.11	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.02	0.01	0.02	0.32	0.10	0.22	0.01	0.00	0.01	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.01	0.01	0.00	0.09	0.07	0.02	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.08	0.02	0.06	1.10	0.31	0.79	0.04	0.01	0.03	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.68	0.00	0.67	8.80	0.03	8.77	0.35	0.00	0.35	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.04	0.00	0.04	0.48	0.00	0.47	0.02	0.00	0.02	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.72	0.00	0.72	9.40	0.03	9.38	0.38	0.00	0.38	---	---	---	---	---	---
		Dose:	**1.58**	**0.07**	**1.52**	**20.58**	**0.89**	**19.76**	**0.82**	**0.04**	**0.79**						
Surface Water	Radium-226	1.321E-03	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.01	0.01	0.01	0.16	0.07	0.08	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.04	0.00	0.04	0.57	0.01	0.56	0.02	0.00	0.02	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.03	0.00	0.02	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.04	0.00	0.04	0.55	0.00	0.55	0.02	0.00	0.02	---	---	---	---	---	---
		Dose:	**0.10**	**0.01**	**0.09**	**1.35**	**0.16**	**1.22**	**0.05**	**0.01**	**0.05**						

TABLE 6-10
COPC SEDIMENT, SURFACE WATER, AND GROUNDWATER INTAKES, RISKS, AND DOSES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Ingestion Intakes (pCi)															Ingestion Dose Conversion Factor (mrem/pCi)	Dose (mrem)														
					Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child		Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU8:																																			
Sediment	Radium-226	1.28	1.00	0.28	15.30	12.00	3.30	199.22	156.25	42.97	7.97	6.25	1.72	---	---	---	---	---	---	1.321E-03	0.02	0.02	0.00	0.26	0.21	0.06	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.21	0.60	0.61	14.48	7.20	7.28	188.59	93.75	94.84	7.54	3.75	3.79	---	---	---	---	---	---	1.442E-03	0.02	0.01	0.01	0.27	0.14	0.14	0.01	0.01	0.01	---	---	---	---	---	---
	Thorium-228	1.44	0.83	0.61	17.29	9.96	7.33	225.16	129.69	95.47	9.01	5.19	3.82	---	---	---	---	---	---	8.086E-04	0.01	0.01	0.01	0.18	0.10	0.08	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-230	0.86	0.80	0.06	10.32	9.60	0.72	134.38	125.00	9.37	5.38	5.00	0.38	---	---	---	---	---	---	5.480E-04	0.01	0.01	0.00	0.07	0.07	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	1.72	0.73	0.99	20.58	8.76	11.82	267.97	114.06	153.91	10.72	4.56	6.16	---	---	---	---	---	---	2.730E-03	0.06	0.02	0.03	0.73	0.31	0.42	0.03	0.01	0.02	---	---	---	---	---	---
	Uranium-234	21.96	0.77	21.19	263.52	9.19	254.33	3,431.25	119.69	3,311.56	137.25	4.79	132.46	---	---	---	---	---	---	2.830E-04	0.07	0.00	0.07	0.97	0.03	0.94	0.04	0.00	0.04	---	---	---	---	---	---
	Uranium-235	1.05	0.05	1.00	12.64	0.60	12.04	164.53	7.81	156.72	6.58	0.31	6.27	---	---	---	---	---	---	2.673E-04	0.00	0.00	0.00	0.04	0.00	0.04	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	22.44	0.63	21.81	269.28	7.56	261.72	3,506.25	98.44	3,407.81	140.25	3.94	136.31	---	---	---	---	---	---	2.687E-04	0.07	0.00	0.07	0.94	0.03	0.92	0.04	0.00	0.04	---	---	---	---	---	---
	Total Intakes for EU8 Sediment:				**623.41**	**64.87**	**558.54**	**8,117.34**	**844.69**	**7,272.66**	**324.69**	**33.79**	**290.91**							**Dose:**	**0.27**	**0.07**	**0.20**	**3.48**	**0.89**	**2.59**	**0.14**	**0.04**	**0.10**						
EU10:																																			
Groundwater	Radium-226	0.20	1.35	0.00	---	---	---	---	---	---	10.00	67.50	0.00	4,830.00	32,602.50	0.00	210.00	1,417.50	0.00	1.321E-03	---	---	---	---	---	---	0.01	0.09	0.00	6.38	43.07	0.00	0.28	1.87	0.00
	Radium-228	0.43	2.20	0.00	---	---	---	---	---	---	21.65	110.00	0.00	10,456.95	53,130.00	0.00	454.65	2,310.00	0.00	1.442E-03	---	---	---	---	---	---	0.03	0.16	0.00	15.08	76.61	0.00	0.66	3.33	0.00
	Thorium-228	0.02	0.07	0.00	---	---	---	---	---	---	1.09	3.50	0.00	526.47	1,690.50	0.00	22.89	73.50	0.00	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	0.43	1.37	0.00	0.02	0.06	0.00
	Thorium-230	0.25	0.17	0.08	---	---	---	---	---	---	12.50	8.50	4.00	6,037.50	4,105.50	1,932.00	262.50	178.50	84.00	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	3.31	2.25	1.06	0.14	0.10	0.05
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.71	0.00	0.71	341	0	341	14.81	0.00	14.81	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	0.93	0.00	0.93	0.04	0.00	0.04
	Uranium-234	4.05	1.00	3.05	---	---	---	---	---	---	202	50	152	97,735	24,150	73,585	4,249	1,050	3,199	2.830E-04	---	---	---	---	---	---	0.06	0.01	0.04	27.66	6.83	20.82	1.20	0.30	0.91
	Uranium-235	0.21	0.09	0.12	---	---	---	---	---	---	10.45	4.25	6.20	5,047	2,053	2,995	219	89	130	2.673E-04	---	---	---	---	---	---	0.00	0.00	0.00	1.35	0.55	0.80	0.06	0.02	0.03
	Uranium-238	4.43	0.95	3.48	---	---	---	---	---	---	222	48	174	106,985	22,943	84,042	4,652	998	3,654	2.687E-04	---	---	---	---	---	---	0.06	0.01	0.05	28.75	6.16	22.58	1.25	0.27	0.98
	Total Intakes for EU10 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**480.25**	**291.25**	**337.26**	**231,958**	**140,674**	**162,894**	**10,085**	**6,116**	**7,082**	**Dose:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.17**	**0.28**	**0.10**	**83.88**	**136.85**	**46.20**	**3.65**	**5.95**	**2.01**
EU11:																																			
Sediment	Radium-226	0.75	1.00	0.00	9.05	12.00	0.00	117.81	156.25	0.00	4.71	6.25	0.00	---	---	---	---	---	---	1.321E-03	0.01	0.02	0.00	0.16	0.21	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	0.66	0.60	0.06	7.96	7.20	0.76	103.59	93.75	9.84	4.14	3.75	0.39	---	---	---	---	---	---	1.442E-03	0.01	0.01	0.00	0.15	0.14	0.01	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	0.76	0.83	0.00	9.07	9.96	0.00	118.13	129.69	0.00	4.73	5.19	0.00	---	---	---	---	---	---	8.086E-04	0.01	0.01	0.00	0.10	0.10	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	0.83	0.80	0.03	9.94	9.60	0.34	129.38	125.00	4.37	5.18	5.00	0.17	---	---	---	---	---	---	5.480E-04	0.01	0.01	0.00	0.07	0.07	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	0.70	0.73	0.00	8.39	8.76	0.00	109.22	114.06	0.00	4.37	4.56	0.00	---	---	---	---	---	---	2.730E-03	0.02	0.02	0.00	0.30	0.31	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Uranium-234	36.30	0.77	35.53	435.60	9.19	426.41	5,671.88	119.69	5,552.19	226.88	4.79	222.09	---	---	---	---	---	---	2.830E-04	0.12	0.00	0.12	1.61	0.03	1.57	0.06	0.00	0.06	---	---	---	---	---	---
	Uranium-235	2.17	0.05	2.12	26.04	0.60	25.44	339.06	7.81	331.25	13.56	0.31	13.25	---	---	---	---	---	---	2.673E-04	0.01	0.00	0.01	0.09	0.00	0.09	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	41.00	0.63	40.37	492.00	7.56	484.44	6,406.25	98.44	6,307.81	256.25	3.94	252.31	---	---	---	---	---	---	2.687E-04	0.13	0.00	0.13	1.72	0.03	1.69	0.07	0.00	0.07	---	---	---	---	---	---
	Total Intakes for EU11 Sediment:				**998.04**	**64.87**	**937.38**	**12,995.31**	**844.69**	**12,205.47**	**519.81**	**33.79**	**488.22**							**Dose:**	**0.32**	**0.07**	**0.26**	**4.19**	**0.89**	**3.37**	**0.17**	**0.04**	**0.13**						
Surface Water	Radium-226	0.17	0.13	0.04	2.00	1.56	0.44	26.09	20.31	5.78	1.04	0.81	0.23	---	---	---	---	---	---	1.321E-03	0.00	0.00	0.00	0.03	0.03	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	0.48	0.33	0.15	5.76	3.96	1.80	75.00	51.56	23.44	3.00	2.06	0.94	---	---	---	---	---	---	1.442E-03	0.01	0.01	0.00	0.11	0.07	0.03	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-228	0.17	0.20	0.00	2.05	2.40	0.00	26.72	31.25	0.00	1.07	1.25	0.00	---	---	---	---	---	---	8.086E-04	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	0.15	0.20	0.00	1.82	2.40	0.00	23.75	31.25	0.00	0.95	1.25	0.00	---	---	---	---	---	---	5.480E-04	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	0.03	0.01	0.02	0.39	0.12	0.27	5.06	1.56	3.50	0.20	0.06	0.14	---	---	---	---	---	---	2.730E-03	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-234	33.30	0.17	33.13	399.60	1.99	397.61	5,203.13	25.94	5,177.19	208.13	1.04	207.09	---	---	---	---	---	---	2.830E-04	0.11	0.00	0.11	1.47	0.01	1.47	0.06	0.00	0.06	---	---	---	---	---	---
	Uranium-235	1.54	0.04	1.50	18.47	0.48	17.99	240.47	6.25	234.22	9.62	0.25	9.37	---	---	---	---	---	---	2.673E-04	0.00	0.00	0.00	0.06	0.00	0.06	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	32.80	0.10	32.70	393.60	1.15	392.45	5,125.00	15.00	5,110.00	205.00	0.60	204.40	---	---	---	---	---	---	2.687E-04	0.11	0.00	0.11	1.38	0.00	1.37	0.06	0.00	0.05	---	---	---	---	---	---
	Total Intakes for EU11 Surface Water:				**823.70**	**14.06**	**810.56**	**10,725.22**	**183.13**	**10,554.13**	**429.01**	**7.33**	**422.17**							**Dose:**	**0.24**	**0.01**	**0.23**	**3.10**	**0.16**	**2.95**	**0.12**	**0.01**	**0.12**						
Groundwater	Radium-226	0.29	1.35	0.00	---	---	---	---	---	---	14.60	67.50	0.00	7,051.80	32,602.50	0.00	306.60	1,417.50	0.00	1.321E-03	---	---	---	---	---	---	0.02	0.09	0.00	9.32	43.07	0.00	0.41	1.87	0.00
	Radium-228	0.21	2.20	0.00	---	---	---	---	---	---	10.60	110.00	0.00	5,119.80	53,130.00	0.00	222.60	2,310.00	0.00	1.442E-03	---	---	---	---	---	---	0.02	0.16	0.00	7.38	76.61	0.00	0.32	3.33	0.00
	Thorium-228	0.07	0.07	0.00	---	---	---	---	---	---	3.45	3.50	-0.05	1,666.35	1,690.50	-24.15	72.45	73.50	-1.05	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	1.35	1.37	-0.02	0.06	0.06	0.00
	Thorium-230	0.25	0.17	0.08	---	---	---	---	---	---	12.50	8.50	4.00	6,037.50	4,105.50	1,932.00	262.50	178.50	84.00	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	3.31	2.25	1.06	0.14	0.10	0.05
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.38	0.00	0.38	183	0	183	7.94	0.00	7.94	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	0.50	0.00	0.50	0.02	0.00	0.02
	Uranium-234	17.33	1.00	16.33	---	---	---	---	---	---	867	50	817	418,520	24,150	394,370	18,197	1,050	17,147	2.830E-04	---	---	---	---	---	---	0.25	0.01	0.23	118.44	6.83	111.61	5.15	0.30	4.85
	Uranium-235	0.66	0.09	0.57	---	---	---	---	---	---	32.90	4.25	28.65	15,891	2,053	13,838	691	89	602	2.673E-04	---	---	---	---	---	---	0.01	0.00	0.01	4.25	0.55	3.70	0.18	0.02	0.16
	Uranium-238	15.64	0.95	14.69	---	---	---	---	---	---	782	48	735	377,706	22,943	354,764	16,422	998	15,425	2.687E-04	---	---	---	---	---	---	0.21	0.01	0.20	101.49	6.16	95.32	4.41	0.27	4.14
	Total Intakes for EU11 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1,722.93**	**291.25**	**1,583.98**	**832,174**	**140,674**	**765,061**	**36,181**	**6,116**	**33,264**	**Dose:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.51**	**0.28**	**0.44**	**246.03**	**136.85**	**212.17**	**10.70**	**5.95**	**9.22**
EU12:																																			
Sediment	Radium-226	1.18	1.00	0.18	14.16	12.00	2.16	184.38	156.25	28.13	7.38	6.25	1.13	---	---	---	---	---	---	1.321E-03	0.02	0.02	0.00	0.24	0.21	0.04	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	0.91	0.60	0.31	10.92	7.20	3.72	142.19	93.75	48.44	5.69	3.75	1.94	---	---	---	---	---	---	1.442E-03	0.02	0.01	0.01	0.21	0.14	0.07	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	0.87	0.83	0.04	10.44	9.96	0.48	135.94	129.69	6.25	5.44	5.19	0.25	---	---	---	---	---	---	8.086E-04	0.01	0.01	0.00	0.11	0.10	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	1.23	0.80	0.43	14.74	9.60	5.14	191.88	125.00	66.88	7.68	5.00	2.68	---	---	---	---	---	---	5.480E-04	0.01	0.01	0.00	0.11	0.07	0.04	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	0.91	0.73	0.18	10.88	8.76	2.12	141.72	114.06	27.66	5.67	4.56	1.11	---	---	---	---	---	---	2.730E-03	0.03	0.02	0.01	0.39	0.31	0.08	0.02	0.01	0.00	---	---	---	---	---	---
	Uranium-234	2.47	0.77	1.70	29.64	9.19	20.45	385.94	119.69	266.25	15.44	4.79	10.65	---	---	---	---	---	---	2.830E-04	0.01	0.00	0.01	0.11	0.03	0.08	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-235	0.14	0.05	0.09	1.66	0.60	1.06	21.56	7.81	13.75	0.86	0.31	0.55	---	---	---	---	---	---	2.673E-04	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.76	0.63	2.13	33.08	7.56	25.52	430.78	98.44	332.34	17.23	3.94	13.29	---	---	---	---	---	---	2.687E-04	0.01	0.00	0.01	0.12	0.03	0.09	0.00	0.00	0.00	---	---	---	---	---	---
	Total Intakes for EU12 Sediment:				**125.52**	**64.87**	**60.65**	**1,634.38**	**844.69**	**789.69**	**65.38**	**33.79**	**31.59**							**Dose:**	**0.10**	**0.07**	**0.03**	**1.28**	**0.89**	**0.39**	**0.05**	**0.04**	**0.02**						
Groundwater	Radium-226	0.26	1.35	0.00	---	---	---	---	---	---	13.05	67.50	0.00	6,303.15	32,602.50	0.00	274.05	1,417.50	0.00	1.321E-03	---	---	---	---	---	---	0.02	0.09	0.00	8.33	43.07	0.00	0.36	1.87	0.00
	Radium-228	0.22	2.20	0.00	---	---	---	---	---	---	11.00	110.00	0.00	5,313.00	53,130.00	0.00	231.00	2,310.00	0.00	1.442E-03	---	---	---	---	---	---	0.02	0.16	0.00	7.66	76.61	0.00	0.33	3.33	0.00
	Thorium-228	0.10	0.07	0.03	---	---	---	---	---	---	5.05	3.50	1.55	2,439.15	1,690.50	748.65	106.05	73.50	32.55	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	1.97	1.37	0.61	0.09	0.06	0.03
	Thorium-230	0.22	0.17	0.05	---	---	---	---	---	---	10.80	8.50	2.30	5,216.40	4,105.50	1,110.90	226.80	178.50	48.30	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	2.86	2.25	0.61	0.12	0.10	0.03
	Thorium-232	0.03	0.00	0.03	---	---	---	---	---	---	1.59	0.00	1.59	768	0	768	33.39	0.00	33.39	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	2.10	0.00	2.10	0.09	0.00	0.09
	Uranium-234	11.83	1.00	10.83	---	---	---	---	---	---	592	50	542	285,695	24,150	261,545	12,422	1,050	11,372	2.830E-04	---	---	---	---	---	---	0.17	0.01	0.15	80.85	6.83	74.02	3.52	0.30	3.22
	Uranium-235	0.62	0.09	0.53	---	---	---	---	---	---	30.90	4.25	26.65	14,925	2,053	12,872	649	89	560	2.673E-04	---	---	---	---	---	---	0.01	0.00	0.01	3.99	0.55	3.44	0.17	0.02	0.15
	Uranium-238	13.90	0.95	12.95	---	---	---	---	---	---	695	48	648	335,685	22,943	312,743	14,595	998	13,598	2.687E-04	---	---	---	---	---	---	0.19	0.01	0.17	90.20	6.16	84.03	3.92	0.27	3.65
	Total Intakes for EU12 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1,358.89**	**291.25**	**1,221.09**	**656,344**	**140,674**	**589,786**	**28,537**	**6,116**	**25,643**	**Dose:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.41**	**0.28**	**0.34**	**197.95**	**136.85**	**164.80**	**8.61**	**5.95**	**7.17**
EU13:																																			
Sediment	Radium-226	0.88	1.00	0.00	10.56	12.00	0.00	137.50	156.25	0.00	5.50	6.25	0.00	---	---	---	---	---	---	1.321E-03	0.01	0.02	0.00	0.18	0.21	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.05	0.60	0.45	12.60	7.20	5.40	164.06	93.75	70.31	6.56	3.75	2.81	---	---	---	---	---	---	1.442E-03	0.02	0.01	0.01	0.24	0.14	0.10	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	0.57	0.83	0.00	6.84	9.96	0.00	89.06	129.69	0.00	3.56	5.19	0.00	---	---	---	---	---	---	8.086E-04	0.01	0.01	0.00	0.07	0.10	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	0.68	0.80	0.00	8.16	9.60	0.00	106.25	125.00	0.00	4.25	5.00	0.00	---	---	---	---	---	---	5.480E-04	0.00	0.01	0.00	0.06	0.07	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	0.46	0.73	0.00	5.52	8.76	0.00	71.88	114.06	0.00	2.88	4.56	0.00	---	---	---	---	---	---	2.730E-03	0.02	0.02	0.00	0.20	0.31	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Uranium-234	19.70	0.77	18.93	236.40	9.19	227.21	3,078.13	119.69	2,958.44	123.13	4.79	118.34	---	---	---	---	---	---	2.830E-04	0.07	0.00	0.06	0.87	0.03	0.84	0.03	0.00	0.03	---	---	---	---	---	---
	Uranium-235	1.02	0.05	0.97	12.24	0.60	11.64	159.38	7.81	151.56	6.38	0.31	6.06	---	---	---	---	---	---	2.673E-04	0.00	0.00	0.00	0.04	0.00	0.04	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	19.20	0.63	18.57	230.40	7.56	222.84	3,000.00	98.44	2,901.56	120.00	3.94	116.06	---	---	---	---	---	---	2.687E-04	0.06	0.00	0.06	0.81	0.03	0.78	0.03	0.00	0.03	---	---	---	---	---	---
	Total Intakes for EU13 Sediment:				**522.72**	**64.87**	**467.09**	**6,806.25**	**844.69**	**6,081.88**	**272.25**	**33.79**	**243.28**							**Dose:**	**0.19**	**0.07**	**0.14**	**2.46**	**0.89**	**1.76**	**0.10**	**0.04**	**0.07**						
Groundwater	Radium-226	0.21	1.35	0.00	---	---	---	---	---	---	10.70	67.50	0.00	5,168.10	32,602.50	0.00	224.70	1,417.50	0.00	1.321E-03	---	---	---	---	---	---	0.01	0.09	0.00	6.83	43.07	0.00	0.30	1.87	0.00
	Radium-228	0.28	2.20	0.00	---	---	---	---	---	---	13.85	110.00	0.00	6,689.55	53,130.00	0.00	290.85	2,310.00	0.00	1.442E-03	---	---	---	---	---	---	0.02	0.16	0.00	9.65	76.61	0.00	0.42	3.33	0.00
	Thorium-228	0.07	0.07	0.00	---	---	---	---	---	---	3.31	3.50	-0.19	1,598.73	1,690.50	-91.77	69.51	73.50	-3.99	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	1.29	1.37	-0.07	0.06	0.06	0.00
	Thorium-230	0.20	0.17	0.03	---	---	---	---	---	---	9.80	8.50	1.30	4,733.40	4,105.50	627.90	205.80	178.50	27.30	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	2.59	2.25	0.34	0.11	0.10	0.01
	Thorium-232	0.03	0.00	0.03	---	---	---	---	---	---	1.75	0.00	1.75	843	0	843	36.65	0.00	36.65	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	2.30	0.00	2.30	0.10	0.00	0.10
	Uranium-234	14.77	1.00	13.77	---	---	---	---	---	---	739	50	689	356,696	24,150	332,546	15,509	1,050	14,459	2.830E-04	---	---	---	---	---	---	0.21	0.01	0.19	100.94	6.83	94.11	4.39	0.30	4.09
	Uranium-235	0.73	0.09	0.65	---	---	---	---	---	---	36.50	4.25	32.25	17,630	2,053	15,577	767	89	677	2.673E-04	---	---	---	---	---	---	0.01	0.00	0.01	4.71	0.55	4.16	0.20	0.02	0.18
	Uranium-238	12.99	0.95	12.04	---	---	---	---	---	---	650	48	602	313,709	22,943	290,766	13,640	998	12,642	2.687E-04	---	---	---	---	---	---	0.17	0.01	0.16	84.29	6.16	78.13	3.66	0.27	3.40
	Total Intakes for EU13 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1,463.91**	**291.25**	**1,325.61**	**707,066**	**140,674**	**640,267**	**30,742**	**6,116**	**27,838**	**Dose:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.44**	**0.28**	**0.37**	**212.61**	**136.85**	**178.97**	**9.24**	**5.95**	**7.78**
EU14:																																			
Groundwater	Radium-226	0.24	1.35	0.00	---	---	---	---	---	---	11.90	67.50	0.00	5,747.70	32,602.50	0.00	249.90	1,417.50	0.00	1.321E-03	---	---	---	---	---	---	0.02	0.09	0.00	7.59	43.07	0.00	0.33	1.87	0.00
	Radium-228	0.35	2.20	0.00	---	---	---	---	---	---	17.45	110.00	0.00	8,428.35	53,130.00	0.00	366.45	2,310.00	0.00	1.442E-03	---	---	---	---	---	---	0.03	0.16	0.00	12.15	76.61	0.00	0.53	3.33	0.00
	Thorium-228	0.05	0.07	0.00	---	---	---	---	---	---	2.74	3.50	0.00	1,323.42	1,690.50	0.00	57.54	73.50	0.00	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	1.07	1.37	0.00	0.05	0.06	0.00
	Thorium-230	0.19	0.17	0.02	---	---	---	---	---	---	9.25	8.50	0.75	4,467.75	4,105.50	362.25	194.25	178.50	15.75	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	2.45	2.25	0.20	0.11	0.10	0.01
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.51	0.00	0.51	246	0	246	10.71	0.00	10.71	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	0.67	0.00	0.67	0.03	0.00	0.03
	Uranium-234	71.84	1.00	70.84	---	---	---	---	---	---	3,592	50	3,542	1,734,936	24,150	1,710,786	75,432	1,050	74,382	2.830E-04	---	---	---	---	---	---	1.02	0.01	1.00	490.99	6.83	484.15	21.35	0.30	21.05
	Uranium-235	3.45	0.09	3.37	---	---	---	---	---	---	172.70	4.25	168.45	83,414	2,053	81,361	3,627	89	3,537	2.673E-04	---	---	---	---	---	---	0.05	0.00	0.05	22.30	0.55	21.75	0.97	0.02	0.95
	Uranium-238	70.84	0.95	69.89	---	---	---	---	---	---	3,542	48	3,495	1,710,786	22,943	1,687,844	74,382	998	73,385	2.687E-04	---	---	---	---	---	---	0.95	0.01	0.94	459.69	6.16	453.52	19.99	0.27	19.72
	Total Intakes for EU14 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7,348.55**	**291.25**	**7,206.21**	**3,549,350**	**140,674**	**3,480,599**	**154,320**	**6,116**	**151,330**	**Dose:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.06**	**0.28**	**1.99**	**996.91**	**136.85**	**960.29**	**43.34**	**5.95**	**41.75**

TABLE 6-10
COPC SEDIMENT, SURFACE WATER, AND GROUNDWATER INTAKES, RISKS, AND DOSES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Ingestion Intakes (pCi)															Ingestion Dose Conversion Factor (mrem/pCi)	Dose (mrem)								
					Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child		Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU15:																																
Sediment	Radium-226	0.82	1.00	0.00	9.84	12.00	0.00	128.13	156.25	0.00	5.13	6.25	0.00	---	---	---	---	---	---	1.321E-03	0.01	0.02	0.00	0.17	0.21	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	0.99	0.60	0.39	11.88	7.20	4.68	154.69	93.75	60.94	6.19	3.75	2.44	---	---	---	---	---	---	1.442E-03	0.02	0.01	0.01	0.22	0.14	0.09	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	0.64	0.83	0.00	7.68	9.96	0.00	100.00	129.69	0.00	4.00	5.19	0.00	---	---	---	---	---	---	8.086E-04	0.01	0.01	0.00	0.08	0.10	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	0.87	0.80	0.07	10.44	9.60	0.84	135.94	125.00	10.94	5.44	5.00	0.44	---	---	---	---	---	---	5.480E-04	0.01	0.01	0.00	0.07	0.07	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	0.50	0.73	0.00	6.00	8.76	0.00	78.13	114.06	0.00	3.13	4.56	0.00	---	---	---	---	---	---	2.730E-03	0.02	0.02	0.00	0.21	0.31	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Uranium-234	10.30	0.77	9.53	123.60	9.19	114.41	1,609.38	119.69	1,489.69	64.38	4.79	59.59	---	---	---	---	---	---	2.830E-04	0.03	0.00	0.03	0.46	0.03	0.42	0.02	0.00	0.02	---	---	---	---	---	---
	Uranium-235	0.71	0.05	0.66	8.52	0.60	7.92	110.94	7.81	103.13	4.44	0.31	4.13	---	---	---	---	---	---	2.673E-04	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	10.70	0.63	10.07	128.40	7.56	120.84	1,671.88	98.44	1,573.44	66.88	3.94	62.94	---	---	---	---	---	---	2.687E-04	0.03	0.00	0.03	0.45	0.03	0.42	0.02	0.00	0.02	---	---	---	---	---	---
	Total Intakes for EU15 Sediment:				**306.36**	**64.87**	**248.69**	**3,989.06**	**844.69**	**3,238.13**	**159.56**	**33.79**	**129.53**							**Dose:**	**0.13**	**0.07**	**0.07**	**1.70**	**0.89**	**0.97**	**0.07**	**0.04**	**0.04**						
EU16:																																
Sediment	Radium-226	0.31	1.00	0.00	3.73	12.00	0.00	48.55	156.25	0.00	1.94	6.25	0.00	---	---	---	---	---	---	1.321E-03	0.00	0.02	0.00	0.06	0.21	0.00	0.00	0.01	0.00	---	---	---	---	---	---
	Radium-228	0.57	0.60	0.00	6.84	7.20	0.00	89.06	93.75	0.00	3.56	3.75	0.00	---	---	---	---	---	---	1.442E-03	0.01	0.01	0.00	0.13	0.14	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	0.35	0.83	0.00	4.20	9.96	0.00	54.69	129.69	0.00	2.19	5.19	0.00	---	---	---	---	---	---	8.086E-04	0.00	0.01	0.00	0.04	0.10	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	0.40	0.80	0.00	4.77	9.60	0.00	62.06	125.00	0.00	2.48	5.00	0.00	---	---	---	---	---	---	5.480E-04	0.00	0.01	0.00	0.03	0.07	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	0.26	0.73	0.00	3.12	8.76	0.00	40.63	114.06	0.00	1.63	4.56	0.00	---	---	---	---	---	---	2.730E-03	0.01	0.02	0.00	0.11	0.31	0.00	0.00	0.01	0.00	---	---	---	---	---	---
	Uranium-234	6.19	0.77	5.42	74.23	9.19	65.04	966.51	119.69	846.83	38.66	4.79	33.87	---	---	---	---	---	---	2.830E-04	0.02	0.00	0.02	0.27	0.03	0.24	0.01	0.00	0.01	---	---	---	---	---	---
	Uranium-235	0.31	0.05	0.26	3.66	0.60	3.06	47.72	7.81	39.91	1.91	0.31	1.60	---	---	---	---	---	---	2.673E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	6.71	0.63	6.08	80.56	7.56	73.00	1,048.90	98.44	950.46	41.96	3.94	38.02	---	---	---	---	---	---	2.687E-04	0.02	0.00	0.02	0.28	0.03	0.26	0.01	0.00	0.01	---	---	---	---	---	---
	Total Intakes for EU16 Sediment:				**181.10**	**64.87**	**141.10**	**2,358.12**	**844.69**	**1,837.20**	**94.32**	**33.79**	**73.49**							**Dose:**	**0.07**	**0.07**	**0.04**	**0.95**	**0.89**	**0.51**	**0.04**	**0.04**	**0.02**						
Groundwater	Radium-226	0.21	1.35	0.00	---	---	---	---	---	---	10.25	67.50	0.00	4,950.75	32,602.50	0.00	215.25	1,417.50	0.00	1.321E-03	---	---	---	---	---	---	0.01	0.09	0.00	6.54	43.07	0.00	0.28	1.87	0.00
	Radium-228	0.42	2.20	0.00	---	---	---	---	---	---	21.10	110.00	0.00	10,189.56	53,130.00	0.00	443.02	2,310.00	0.00	1.442E-03	---	---	---	---	---	---	0.03	0.16	0.00	14.69	76.61	0.00	0.64	3.33	0.00
	Thorium-228	0.09	0.07	0.02	---	---	---	---	---	---	4.31	3.50	0.81	2,081.68	1,690.50	391.18	90.51	73.50	17.01	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	1.68	1.37	0.32	0.07	0.06	0.01
	Thorium-230	0.20	0.17	0.03	---	---	---	---	---	---	9.83	8.50	1.33	4,746.34	4,105.50	640.84	206.36	178.50	27.86	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	2.60	2.25	0.35	0.11	0.10	0.02
	Thorium-232	0.06	0.00	0.06	---	---	---	---	---	---	2.90	0.00	2.90	1,401	0	1,401	60.90	0.00	60.90	2.730E-03	---	---	---	---	---	---	0.00	0.01	0.00	3.82	0.00	3.82	0.17	0.00	0.17
	Uranium-234	28.60	1.00	27.60	---	---	---	---	---	---	1,430	50	1,380	690,625	24,150	666,475	30,027	1,050	28,977	2.830E-04	---	---	---	---	---	---	0.40	0.01	0.39	195.45	6.83	188.61	8.50	0.30	8.20
	Uranium-235	1.70	0.09	1.62	---	---	---	---	---	---	85.07	4.25	80.82	41,087	2,053	39,034	1,786	89	1,697	2.673E-04	---	---	---	---	---	---	0.02	0.00	0.02	10.98	0.55	10.43	0.48	0.02	0.45
	Uranium-238	29.98	0.95	29.03	---	---	---	---	---	---	1,499	48	1,451	723,987	22,943	701,045	31,478	998	30,480	2.687E-04	---	---	---	---	---	---	0.40	0.01	0.39	194.54	6.16	188.37	8.46	0.27	8.19
	Total Intakes for EU16 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3,062.25**	**291.25**	**2,917.16**	**1,479,069**	**140,674**	**1,408,987**	**64,307**	**6,116**	**61,260**	**Dose:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.89**	**0.28**	**0.81**	**430.31**	**136.85**	**391.91**	**18.71**	**5.95**	**17.04**
EU18:																																
Groundwater	Radium-226	1.36	1.35	0.01	---	---	---	---	---	---	67.99	67.50	0.49	32,837.59	32,602.50	235.09	1,427.72	1,417.50	10.22	1.321E-03	---	---	---	---	---	---	0.09	0.09	0.00	43.38	43.07	0.31	1.89	1.87	0.01
	Radium-228	2.35	2.20	0.15	---	---	---	---	---	---	117.58	110.00	7.58	56,790.00	53,130.00	3,660.00	2,469.13	2,310.00	159.13	1.442E-03	---	---	---	---	---	---	0.17	0.16	0.01	81.89	76.61	5.28	3.56	3.33	0.23
	Thorium-228	0.12	0.07	0.05	---	---	---	---	---	---	6.24	3.50	2.74	3,014.45	1,690.50	1,323.95	131.06	73.50	57.56	8.086E-04	---	---	---	---	---	---	0.01	0.00	0.00	2.44	1.37	1.07	0.11	0.06	0.05
	Thorium-230	0.25	0.17	0.08	---	---	---	---	---	---	12.32	8.50	3.82	5,951.12	4,105.50	1,845.62	258.74	178.50	80.24	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	3.26	2.25	1.01	0.14	0.10	0.04
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.25	0.00	0.25	121	0	121	5.27	0.00	5.27	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	0.33	0.00	0.33	0.01	0.00	0.01
	Uranium-234	1.23	1.00	0.23	---	---	---	---	---	---	62	50	12	29,732	24,150	5,582	1,293	1,050	243	2.830E-04	---	---	---	---	---	---	0.02	0.01	0.00	8.41	6.83	1.58	0.37	0.30	0.07
	Uranium-235	0.08	0.09	0.00	---	---	---	---	---	---	4.00	4.25	0.00	1,932	2,053	0	84	89	0	2.673E-04	---	---	---	---	---	---	0.00	0.00	0.00	0.52	0.55	0.00	0.02	0.02	0.00
	Uranium-238	1.23	0.95	0.28	---	---	---	---	---	---	61	48	14	29,615	22,943	6,673	1,288	998	290	2.687E-04	---	---	---	---	---	---	0.02	0.01	0.00	7.96	6.16	1.79	0.35	0.27	0.08
	Total Intakes for EU18 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**331.25**	**291.25**	**40.25**	**159,993**	**140,674**	**19,440**	**6,956**	**6,116**	**845**	**Dose:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.31**	**0.28**	**0.02**	**148.19**	**136.85**	**11.37**	**6.44**	**5.95**	**0.49**
EU19:																																
Sediment	Radium-226	1.06	1.00	0.06	12.71	12.00	0.71	---	---	---	---	---	---	19.06	18.00	1.06	91.50	86.40	5.10	1.321E-03	0.02	0.02	0.00	---	---	---	---	---	---	0.03	0.02	0.00	0.12	0.11	0.01
	Radium-228	0.82	0.60	0.22	9.89	7.20	2.69	---	---	---	---	---	---	14.83	10.80	4.03	71.19	51.84	19.35	1.442E-03	0.01	0.01	0.00	---	---	---	---	---	---	0.02	0.02	0.01	0.10	0.07	0.03
	Thorium-228	0.85	0.83	0.02	10.18	9.96	0.22	---	---	---	---	---	---	15.26	14.94	0.32	73.27	71.71	1.56	8.086E-04	0.01	0.01	0.00	---	---	---	---	---	---	0.01	0.01	0.00	0.06	0.06	0.00
	Thorium-230	0.90	0.80	0.10	10.76	9.60	1.16	---	---	---	---	---	---	16.15	14.40	1.75	77.50	69.12	8.38	5.480E-04	0.01	0.01	0.00	---	---	---	---	---	---	0.01	0.01	0.00	0.04	0.04	0.00
	Thorium-232	0.78	0.73	0.05	9.40	8.76	0.64	---	---	---	---	---	---	14.09	13.14	0.95	67.65	63.07	4.58	2.730E-03	0.03	0.02	0.00	---	---	---	---	---	---	0.04	0.04	0.00	0.18	0.17	0.01
	Uranium-234	0.74	0.77	0.00	8.87	9.19	0.00	---	---	---	---	---	---	13.30	13.79	0.00	63.85	66.18	0.00	2.830E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.02	0.02	0.00
	Uranium-235	0.06	0.05	0.01	0.73	0.60	0.13	---	---	---	---	---	---	1.10	0.90	0.20	5.28	4.32	0.96	2.673E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Uranium-238	0.68	0.63	0.05	8.14	7.56	0.58	---	---	---	---	---	---	12.20	11.34	0.86	58.58	54.43	4.15	2.687E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.02	0.01	0.00
	Total Intakes for EU19 Sediment:				**70.67**	**64.87**	**6.12**							**106.00**	**97.31**	**9.18**	**508.82**	**467.08**	**44.07**	**Dose:**	**0.08**	**0.07**	**0.01**							**0.11**	**0.10**	**0.01**	**0.55**	**0.49**	**0.05**
Surface Water	Radium-226	0.14	0.13	0.01	1.66	1.56	0.10	---	---	---	---	---	---	2.48	2.34	0.14	11.92	11.23	0.69	1.321E-03	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.02	0.01	0.00
	Radium-228	0.61	0.33	0.28	7.34	3.96	3.38	---	---	---	---	---	---	11.02	5.94	5.08	52.88	28.51	24.36	1.442E-03	0.01	0.01	0.00	---	---	---	---	---	---	0.02	0.01	0.01	0.08	0.04	0.04
	Thorium-228	0.26	0.20	0.06	3.07	2.40	0.67	---	---	---	---	---	---	4.61	3.60	1.01	22.12	17.28	4.84	8.086E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.02	0.01	0.00
	Thorium-230	0.26	0.20	0.06	3.07	2.40	0.67	---	---	---	---	---	---	4.61	3.60	1.01	22.12	17.28	4.84	5.480E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.01	0.01	0.00
	Thorium-232	0.03	0.01	0.02	0.31	0.12	0.19	---	---	---	---	---	---	0.47	0.18	0.29	2.26	0.86	1.39	2.730E-03	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.01	0.00	0.00
	Uranium-234	0.20	0.17	0.04	2.42	1.99	0.43	---	---	---	---	---	---	3.64	2.99	0.65	17.45	14.34	3.11	2.830E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Uranium-235	0.05	0.04	0.01	0.57	0.48	0.09	---	---	---	---	---	---	0.85	0.72	0.13	4.09	3.46	0.63	2.673E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Uranium-238	0.17	0.10	0.07	2.04	1.15	0.89	---	---	---	---	---	---	3.06	1.73	1.33	14.69	8.29	6.39	2.687E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Total Intakes for EU19 Surface Water:				**20.49**	**14.06**	**6.42**							**30.73**	**21.10**	**9.64**	**147.52**	**101.26**	**46.26**	**Dose:**	**0.02**	**0.01**	**0.01**							**0.03**	**0.02**	**0.01**	**0.14**	**0.09**	**0.05**

Notes:
COPC = chemical of potential concern
EU = exposure unit
EPC = exposure point concentration
ILCR = incremental lifetime cancer risk
mrem = millirem
mrem/pCi = millirem per picocurie
1/pCi = quantity per picocurie
pCi/g = picocurie per gram
pCi/L = picocurie per liter
pCi = picocurie

TABLE 6-10
COPC SEDIMENT, SURFACE WATER, AND GROUNDWATER INTAKES, RISKS, AND DOSES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Ingestion Intakes (pCi)														
					Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU1:																			
Sediment	Radium-226	1.09	1.00	0.09	13.06	12.00	1.06	170.00	156.25	13.75	6.80	6.25	0.55	---	---	---	---	---	---
	Radium-228	0.91	0.60	0.31	10.87	7.20	3.67	141.56	93.75	47.81	5.66	3.75	1.91	---	---	---	---	---	---
	Thorium-228	1.03	0.83	0.20	12.35	9.96	2.39	160.78	129.69	31.09	6.43	5.19	1.24	---	---	---	---	---	---
	Thorium-230	0.56	0.80	0.00	6.76	9.60	0.00	87.97	125.00	0.00	3.52	5.00	0.00	---	---	---	---	---	---
	Thorium-232	0.51	0.73	0.00	6.11	8.76	0.00	79.53	114.06	0.00	3.18	4.56	0.00	---	---	---	---	---	---
	Uranium-234	42.19	0.77	41.42	506.28	9.19	497.09	6,592.19	119.69	6,472.50	263.69	4.79	258.90	---	---	---	---	---	---
	Uranium-235	2.17	0.05	2.12	26.09	0.60	25.49	339.69	7.81	331.88	13.59	0.31	13.28	---	---	---	---	---	---
	Uranium-238	47.00	0.63	46.37	564.00	7.56	556.44	7,343.75	98.44	7,245.31	293.75	3.94	289.81	---	---	---	---	---	---
	Total Intakes for EU1 Sediment:				**1,145.51**	**64.87**	**1,086.13**	**14,915.47**	**844.69**	**14,142.34**	**596.62**	**33.79**	**565.69**						
Surface Water	Radium-226	0.10	0.13	0.00	1.22	1.56	0.00	15.94	20.31	0.00	0.64	0.81	0.00	---	---	---	---	---	---
	Radium-228	0.44	0.33	0.11	5.27	3.96	1.31	68.59	51.56	17.03	2.74	2.06	0.68	---	---	---	---	---	---
	Thorium-228	0.33	0.20	0.13	3.96	2.40	1.56	51.56	31.25	20.31	2.06	1.25	0.81	---	---	---	---	---	---
	Thorium-230	0.47	0.20	0.27	5.59	2.40	3.19	72.81	31.25	41.56	2.91	1.25	1.66	---	---	---	---	---	---
	Thorium-232	0.04	0.01	0.03	0.48	0.12	0.36	6.27	1.56	4.70	0.25	0.06	0.19	---	---	---	---	---	---
	Uranium-234	25.92	0.17	25.75	311.04	1.99	309.05	4,050.00	25.94	4,024.06	162.00	1.04	160.96	---	---	---	---	---	---
	Uranium-235	1.11	0.04	1.07	13.28	0.48	12.80	172.97	6.25	166.72	6.92	0.25	6.67	---	---	---	---	---	---
	Uranium-238	26.01	0.10	25.91	312.12	1.15	310.97	4,064.06	15.00	4,049.06	162.56	0.60	161.96	---	---	---	---	---	---
	Total Intakes for EU1 Surface Water:				**652.97**	**14.06**	**639.24**	**8,502.20**	**183.13**	**8,323.45**	**340.09**	**7.33**	**332.94**						
EU2:																			
Sediment	Radium-226	1.02	1.00	0.02	12.24	12.00	0.24	159.38	156.25	3.13	6.38	6.25	0.13	---	---	---	---	---	---
	Radium-228	1.06	0.60	0.46	12.72	7.20	5.52	165.63	93.75	71.88	6.63	3.75	2.88	---	---	---	---	---	---
	Thorium-228	1.54	0.83	0.71	18.42	9.96	8.46	239.84	129.69	110.16	9.59	5.19	4.41	---	---	---	---	---	---
	Thorium-230	0.84	0.80	0.04	10.04	9.60	0.44	130.79	125.00	5.79	5.23	5.00	0.23	---	---	---	---	---	---
	Thorium-232	1.37	0.73	0.64	16.48	8.76	7.72	214.64	114.06	100.58	8.59	4.56	4.02	---	---	---	---	---	---
	Uranium-234	5.64	0.77	4.87	67.68	9.19	58.49	881.25	119.69	761.56	35.25	4.79	30.46	---	---	---	---	---	---
	Uranium-235	0.24	0.05	0.19	2.88	0.60	2.28	37.50	7.81	29.69	1.50	0.31	1.19	---	---	---	---	---	---
	Uranium-238	5.70	0.63	5.07	68.40	7.56	60.84	890.63	98.44	792.19	35.63	3.94	31.69	---	---	---	---	---	---
	Total Intakes for EU2 Sediment:				**208.87**	**64.87**	**144.00**	**2,719.64**	**844.69**	**1,874.96**	**108.79**	**33.79**	**75.00**						
Surface Water	Radium-226	0.44	0.13	0.31	5.28	1.56	3.72	68.75	20.31	48.44	2.75	0.81	1.94	---	---	---	---	---	---
	Radium-228	0.52	0.33	0.19	6.24	3.96	2.28	81.25	51.56	29.69	3.25	2.06	1.19	---	---	---	---	---	---
	Thorium-228	1.15	0.20	0.95	13.80	2.40	11.40	179.69	31.25	148.44	7.19	1.25	5.94	---	---	---	---	---	---
	Thorium-230	0.69	0.20	0.49	8.28	2.40	5.88	107.81	31.25	76.56	4.31	1.25	3.06	---	---	---	---	---	---
	Thorium-232	0.61	0.01	0.60	7.32	0.12	7.20	95.31	1.56	93.75	3.81	0.06	3.75	---	---	---	---	---	---
	Uranium-234	105.00	0.17	104.83	1,260.00	1.99	1,258.01	16,406.25	25.94	16,380.31	656.25	1.04	655.21	---	---	---	---	---	---
	Uranium-235	4.50	0.04	4.46	54.00	0.48	53.52	703.13	6.25	696.88	28.13	0.25	27.88	---	---	---	---	---	---
	Uranium-238	105.00	0.10	104.90	1,260.00	1.15	1,258.85	16,406.25	15.00	16,391.25	656.25	0.60	655.65	---	---	---	---	---	---
	Total Intakes for EU2 Surface Water:				**2,614.92**	**14.06**	**2,600.86**	**34,048.44**	**183.13**	**33,865.31**	**1,361.94**	**7.33**	**1,354.61**						
EU3:																			
Sediment	Radium-226	2.19	1.00	1.19	26.32	12.00	14.32	342.66	156.25	186.41	13.71	6.25	7.46	---	---	---	---	---	---
	Radium-228	1.31	0.60	0.71	15.74	7.20	8.54	205.00	93.75	111.25	8.20	3.75	4.45	---	---	---	---	---	---
	Thorium-228	1.16	0.83	0.33	13.97	9.96	4.01	181.88	129.69	52.19	7.28	5.19	2.09	---	---	---	---	---	---
	Thorium-230	1.26	0.80	0.46	15.10	9.60	5.50	196.56	125.00	71.56	7.86	5.00	2.86	---	---	---	---	---	---
	Thorium-232	1.16	0.73	0.43	13.88	8.76	5.12	180.78	114.06	66.72	7.23	4.56	2.67	---	---	---	---	---	---
	Uranium-234	52.97	0.77	52.20	635.64	9.19	626.45	8,276.56	119.69	8,156.88	331.06	4.79	326.28	---	---	---	---	---	---
	Uranium-235	2.84	0.05	2.79	34.12	0.60	33.52	444.22	7.81	436.41	17.77	0.31	17.46	---	---	---	---	---	---
	Uranium-238	57.67	0.63	57.04	692.04	7.56	684.48	9,010.94	98.44	8,912.50	360.44	3.94	356.50	---	---	---	---	---	---
	Total Intakes for EU3 Sediment:				**1,446.80**	**64.87**	**1,381.93**	**18,838.59**	**844.69**	**17,993.91**	**753.54**	**33.79**	**719.76**						
Surface Water	Radium-226	0.15	0.13	0.02	1.76	1.56	0.20	22.97	20.31	2.66	0.92	0.81	0.11	---	---	---	---	---	---
	Radium-228	0.39	0.33	0.06	4.62	3.96	0.66	60.16	51.56	8.59	2.41	2.06	0.34	---	---	---	---	---	---
	Thorium-228	0.10	0.20	0.00	1.18	2.40	0.00	15.42	31.25	0.00	0.62	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.24	0.20	0.04	2.90	2.40	0.50	37.81	31.25	6.56	1.51	1.25	0.26	---	---	---	---	---	---
	Thorium-232	0.06	0.01	0.05	0.67	0.12	0.55	8.72	1.56	7.16	0.35	0.06	0.29	---	---	---	---	---	---
	Uranium-234	16.16	0.17	15.99	193.92	1.99	191.93	2,525.00	25.94	2,499.06	101.00	1.04	99.96	---	---	---	---	---	---
	Uranium-235	1.05	0.04	1.01	12.65	0.48	12.17	164.69	6.25	158.44	6.59	0.25	6.34	---	---	---	---	---	---
	Uranium-238	16.79	0.10	16.69	201.48	1.15	200.33	2,623.44	15.00	2,608.44	104.94	0.60	104.34	---	---	---	---	---	---
	Total Intakes for EU3 Surface Water:				**419.19**	**14.06**	**406.34**	**5,458.20**	**183.13**	**5,290.91**	**218.33**	**7.33**	**211.64**						
EU4:																			
Sediment	Radium-226	0.54	1.00	0.00	6.49	12.00	0.00	84.53	156.25	0.00	3.38	6.25	0.00	---	---	---	---	---	---
	Radium-228	0.57	0.60	0.00	6.78	7.20	0.00	88.28	93.75	0.00	3.53	3.75	0.00	---	---	---	---	---	---
	Thorium-228	0.33	0.83	0.00	3.96	9.96	0.00	51.56	129.69	0.00	2.06	5.19	0.00	---	---	---	---	---	---
	Thorium-230	0.41	0.80	0.00	4.93	9.60	0.00	64.22	125.00	0.00	2.57	5.00	0.00	---	---	---	---	---	---
	Thorium-232	0.24	0.73	0.00	2.89	8.76	0.00	37.66	114.06	0.00	1.51	4.56	0.00	---	---	---	---	---	---
	Uranium-234	15.94	0.77	15.17	191.28	9.19	182.09	2,490.63	119.69	2,370.94	99.63	4.79	94.84	---	---	---	---	---	---
	Uranium-235	0.78	0.05	0.73	9.40	0.60	8.80	122.34	7.81	114.53	4.89	0.31	4.58	---	---	---	---	---	---
	Uranium-238	18.03	0.63	17.40	216.36	7.56	208.80	2,817.19	98.44	2,718.75	112.69	3.94	108.75	---	---	---	---	---	---
	Total Intakes for EU4 Sediment:				**442.09**	**64.87**	**399.68**	**5,756.41**	**844.69**	**5,204.22**	**230.26**	**33.79**	**208.17**						
Surface Water	Radium-226	0.15	0.13	0.02	1.82	1.56	0.26	23.75	20.31	3.44	0.95	0.81	0.14	---	---	---	---	---	---
	Radium-228	0.63	0.33	0.30	7.56	3.96	3.60	98.44	51.56	46.88	3.94	2.06	1.88	---	---	---	---	---	---
	Thorium-228	0.11	0.20	0.00	1.28	2.40	0.00	16.72	31.25	0.00	0.67	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.30	0.20	0.10	3.60	2.40	1.20	46.88	31.25	15.63	1.88	1.25	0.63	---	---	---	---	---	---
	Thorium-232	0.03	0.01	0.02	0.36	0.12	0.24	4.70	1.56	3.14	0.19	0.06	0.13	---	---	---	---	---	---
	Uranium-234	3.71	0.17	3.54	44.52	1.99	42.53	579.69	25.94	553.75	23.19	1.04	22.15	---	---	---	---	---	---
	Uranium-235	0.19	0.04	0.15	2.23	0.48	1.75	29.06	6.25	22.81	1.16	0.25	0.91	---	---	---	---	---	---
	Uranium-238	8.90	0.10	8.80	106.80	1.15	105.65	1,390.63	15.00	1,375.63	55.63	0.60	55.03	---	---	---	---	---	---
	Total Intakes for EU4 Surface Water:				**168.18**	**14.06**	**155.23**	**2,189.86**	**183.13**	**2,021.27**	**87.59**	**7.33**	**80.85**						
EU6:																			
Sediment	Radium-226	0.68	1.00	0.00	8.18	12.00	0.00	106.51	156.25	0.00	4.26	6.25	0.00	---	---	---	---	---	---
	Radium-228	1.26	0.60	0.66	15.15	7.20	7.95	197.24	93.75	103.49	7.89	3.75	4.14	---	---	---	---	---	---
	Thorium-228	2.06	0.83	1.23	24.76	9.96	14.80	322.37	129.69	192.69	12.89	5.19	7.71	---	---	---	---	---	---
	Thorium-230	0.72	0.80	0.00	8.64	9.60	0.00	112.50	125.00	0.00	4.50	5.00	0.00	---	---	---	---	---	---
	Thorium-232	2.00	0.73	1.27	23.98	8.76	15.22	312.30	114.06	198.24	12.49	4.56	7.93	---	---	---	---	---	---
	Uranium-234	48.84	0.77	48.07	586.06	9.19	576.87	7,630.96	119.69	7,511.27	305.24	4.79	300.45	---	---	---	---	---	---
	Uranium-235	2.63	0.05	2.58	31.56	0.60	30.96	410.94	7.81	403.13	16.44	0.31	16.13	---	---	---	---	---	---
	Uranium-238	50.81	0.63	50.18	609.74	7.56	602.18	7,939.37	98.44	7,840.93	317.57	3.94	313.64	---	---	---	---	---	---
	Total Intakes for EU6 Sediment:				**1,308.07**	**64.87**	**1,247.98**	**17,032.19**	**844.69**	**16,249.75**	**681.29**	**33.79**	**649.99**						
EU7:																			
Sediment	Radium-226	0.71	1.00	0.00	8.53	12.00	0.00	111.02	156.25	0.00	4.44	6.25	0.00	---	---	---	---	---	---
	Radium-228	1.08	0.60	0.48	12.96	7.20	5.76	168.75	93.75	75.00	6.75	3.75	3.00	---	---	---	---	---	---
	Thorium-228	2.56	0.83	1.73	30.72	9.96	20.76	400.00	129.69	270.31	16.00	5.19	10.81	---	---	---	---	---	---
	Thorium-230	1.06	0.80	0.26	12.72	9.60	3.12	165.63	125.00	40.63	6.63	5.00	1.63	---	---	---	---	---	---
	Thorium-232	2.58	0.73	1.85	30.96	8.76	22.20	403.13	114.06	289.06	16.13	4.56	11.56	---	---	---	---	---	---
	Uranium-234	199.00	0.77	198.23	2,388.00	9.19	2,378.81	31,093.75	119.69	30,974.06	1,243.75	4.79	1,238.96	---	---	---	---	---	---
	Uranium-235	11.40	0.05	11.35	136.80	0.60	136.20	1,781.25	7.81	1,773.44	71.25	0.31	70.94	---	---	---	---	---	---
	Uranium-238	224.00	0.63	223.37	2,688.00	7.56	2,680.44	35,000.00	98.44	34,901.56	1,400.00	3.94	1,396.06	---	---	---	---	---	---
	Total Intakes for EU7 Sediment:				**5,308.69**	**64.87**	**5,247.29**	**69,123.52**	**844.69**	**68,324.06**	**2,764.94**	**33.79**	**2,732.96**						
Surface Water	Radium-226	0.10	0.13	0.00	1.20	1.56	0.00	15.63	20.31	0.00	0.63	0.81	0.00	---	---	---	---	---	---
	Radium-228	0.69	0.33	0.36	8.28	3.96	4.32	107.81	51.56	56.25	4.31	2.06	2.25	---	---	---	---	---	---
	Thorium-228	0.10	0.20	0.00	1.20	2.40	0.00	15.63	31.25	0.00	0.63	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.17	0.20	0.00	2.04	2.40	0.00	26.56	31.25	0.00	1.06	1.25	0.00	---	---	---	---	---	---
	Thorium-232	-0.01	0.01	0.00	-0.07	0.12	0.00	-0.94	1.56	0.00	-0.04	0.06	0.00	---	---	---	---	---	---
	Uranium-234	12.90	0.17	12.73	154.80	1.99	152.81	2,015.63	25.94	1,989.69	80.63	1.04	79.59	---	---	---	---	---	---
	Uranium-235	0.60	0.04	0.56	7.20	0.48	6.72	93.75	6.25	87.50	3.75	0.25	3.50	---	---	---	---	---	---
	Uranium-238	13.20	0.10	13.10	158.40	1.15	157.25	2,062.50	15.00	2,047.50	82.50	0.60	81.90	---	---	---	---	---	---
	Total Intakes for EU7 Surface Water:				**333.05**	**14.06**	**321.10**	**4,336.56**	**183.13**	**4,180.94**	**173.46**	**7.33**	**167.24**						

Exposure Unit/ Sample Medium	COPC	Ingestion Dose Conversion Factor (mrem/pCi)	Annual Dose (mrem/year)														
			Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU1:																	
Sediment	Radium-226	1.321E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.01	0.00	0.01	0.07	0.00	0.07	0.07	0.00	0.07	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.02	0.00	0.01	0.08	0.00	0.08	0.08	0.00	0.08	---	---	---	---	---	---
		Dose:	**0.04**	**0.01**	**0.03**	**0.19**	**0.04**	**0.16**	**0.19**	**0.04**	**0.16**						
Surface Water	Radium-226	1.321E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.01	0.00	0.01	0.05	0.00	0.05	0.05	0.00	0.05	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.01	0.00	0.01	0.04	0.00	0.04	0.04	0.00	0.04	---	---	---	---	---	---
		Dose:	**0.02**	**0.00**	**0.02**	**0.10**	**0.01**	**0.09**	**0.10**	**0.01**	**0.09**						
EU2:																	
Sediment	Radium-226	1.321E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.02	0.01	0.01	0.02	0.01	0.01	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	---	---	---	---	---	---
		Dose:	**0.01**	**0.01**	**0.01**	**0.07**	**0.04**	**0.04**	**0.07**	**0.04**	**0.04**						
Surface Water	Radium-226	1.321E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.04	0.00	0.04	0.19	0.00	0.19	0.19	0.00	0.19	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.03	0.00	0.03	0.18	0.00	0.18	0.18	0.00	0.18	---	---	---	---	---	---
		Dose:	**0.08**	**0.00**	**0.07**	**0.40**	**0.01**	**0.39**	**0.40**	**0.01**	**0.39**						
EU3:																	
Sediment	Radium-226	1.321E-03	0.00	0.00	0.00	0.02	0.01	0.01	0.02	0.01	0.01	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.02	0.01	0.01	0.02	0.01	0.01	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.02	0.00	0.02	0.09	0.00	0.09	0.09	0.00	0.09	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.02	0.00	0.02	0.10	0.00	0.10	0.10	0.00	0.10	---	---	---	---	---	---
		Dose:	**0.05**	**0.01**	**0.04**	**0.26**	**0.04**	**0.22**	**0.26**	**0.04**	**0.22**						
Surface Water	Radium-226	1.321E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.01	0.00	0.01	0.03	0.00	0.03	0.03	0.00	0.03	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.01	0.00	0.01	0.03	0.00	0.03	0.03	0.00	0.03	---	---	---	---	---	---
		Dose:	**0.01**	**0.00**	**0.01**	**0.07**	**0.01**	**0.06**	**0.07**	**0.01**	**0.06**						
EU4:																	
Sediment	Radium-226	1.321E-03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.01	0.00	0.01	0.03	0.00	0.03	0.03	0.00	0.03	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.01	0.00	0.01	0.03	0.00	0.03	0.03	0.00	0.03	---	---	---	---	---	---
		Dose:	**0.01**	**0.01**	**0.01**	**0.08**	**0.04**	**0.06**	**0.08**	**0.04**	**0.06**						
Surface Water	Radium-226	1.321E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	---	---	---	---	---	---
		Dose:	**0.01**	**0.00**	**0.00**	**0.03**	**0.01**	**0.02**	**0.03**	**0.01**	**0.02**						
EU6:																	
Sediment	Radium-226	1.321E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.01	0.00	0.00	0.03	0.01	0.02	0.03	0.01	0.02	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.02	0.00	0.02	0.09	0.00	0.09	0.09	0.00	0.09	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.02	0.00	0.02	0.09	0.00	0.08	0.09	0.00	0.08	---	---	---	---	---	---
		Dose:	**0.05**	**0.01**	**0.04**	**0.24**	**0.04**	**0.21**	**0.24**	**0.04**	**0.21**						
EU7:																	
Sediment	Radium-226	1.321E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.01	0.00	0.01	0.04	0.01	0.03	0.04	0.01	0.03	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.07	0.00	0.07	0.35	0.00	0.35	0.35	0.00	0.35	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.02	0.00	0.02	0.02	0.00	0.02	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.07	0.00	0.07	0.38	0.00	0.38	0.38	0.00	0.38	---	---	---	---	---	---
		Dose:	**0.16**	**0.01**	**0.15**	**0.82**	**0.04**	**0.79**	**0.82**	**0.04**	**0.79**						
Surface Water	Radium-226	1.321E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.00	0.00	0.00	0.02	0.00	0.02	0.02	0.00	0.02	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.00	0.00	0.00	0.02	0.00	0.02	0.02	0.00	0.02	---	---	---	---	---	---
		Dose:	**0.01**	**0.00**	**0.01**	**0.05**	**0.01**	**0.05**	**0.05**	**0.01**	**0.05**						

TABLE 6-10
COPC SEDIMENT, SURFACE WATER, AND GROUNDWATER INTAKES, RISKS, AND DOSES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Ingestion Intakes (pCi)

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU8:																			
Sediment	Radium-226	1.28	1.00	0.28	15.30	12.00	3.30	199.22	156.25	42.97	7.97	6.25	1.72	---	---	---	---	---	---
	Radium-228	1.21	0.60	0.61	14.48	7.20	7.28	188.59	93.75	94.84	7.54	3.75	3.79	---	---	---	---	---	---
	Thorium-228	1.44	0.83	0.61	17.29	9.96	7.33	225.16	129.69	95.47	9.01	5.19	3.82	---	---	---	---	---	---
	Thorium-230	0.86	0.80	0.06	10.32	9.60	0.72	134.38	125.00	9.37	5.38	5.00	0.38	---	---	---	---	---	---
	Thorium-232	1.72	0.73	0.99	20.58	8.76	11.82	267.97	114.06	153.91	10.72	4.56	6.16	---	---	---	---	---	---
	Uranium-234	21.96	0.77	21.19	263.52	9.19	254.33	3,431.25	119.69	3,311.56	137.25	4.79	132.46	---	---	---	---	---	---
	Uranium-235	1.05	0.05	1.00	12.64	0.60	12.04	164.53	7.81	156.72	6.58	0.31	6.27	---	---	---	---	---	---
	Uranium-238	22.44	0.63	21.81	269.28	7.56	261.72	3,506.25	98.44	3,407.81	140.25	3.94	136.31	---	---	---	---	---	---
	Total Intakes for EU8 Sediment:				**623.41**	**64.87**	**558.54**	**8,117.34**	**844.69**	**7,272.66**	**324.69**	**33.79**	**290.91**						
EU10:																			
Groundwater	Radium-226	0.20	1.35	0.00	---	---	---	---	---	---	10.00	67.50	0.00	4,830.00	32,602.50	0.00	210.00	1,417.50	0.00
	Radium-228	0.43	2.20	0.00	---	---	---	---	---	---	21.65	110.00	0.00	10,456.95	53,130.00	0.00	454.65	2,310.00	0.00
	Thorium-228	0.02	0.07	0.00	---	---	---	---	---	---	1.09	3.50	0.00	526.47	1,690.50	0.00	22.89	73.50	0.00
	Thorium-230	0.25	0.17	0.08	---	---	---	---	---	---	12.50	8.50	4.00	6,037.50	4,105.50	1,932.00	262.50	178.50	84.00
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.71	0.00	0.71	341	0	341	14.81	0.00	14.81
	Uranium-234	4.05	1.00	3.05	---	---	---	---	---	---	202	50	152	97,735	24,150	73,585	4,249	1,050	3,199
	Uranium-235	0.21	0.09	0.12	---	---	---	---	---	---	10.45	4.25	6.20	5,047	2,053	2,995	219	89	130
	Uranium-238	4.43	0.95	3.48	---	---	---	---	---	---	222	48	174	106,985	22,943	84,042	4,652	998	3,654
	Total Intakes for EU10 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**480.25**	**291.25**	**337.26**	**231,958**	**140,674**	**162,894**	**10,085**	**6,116**	**7,082**
EU11:																			
Sediment	Radium-226	0.75	1.00	0.00	9.05	12.00	0.00	117.81	156.25	0.00	4.71	6.25	0.00	---	---	---	---	---	---
	Radium-228	0.66	0.60	0.06	7.96	7.20	0.76	103.59	93.75	9.84	4.14	3.75	0.39	---	---	---	---	---	---
	Thorium-228	0.76	0.83	0.00	9.07	9.96	0.00	118.13	129.69	0.00	4.73	5.19	0.00	---	---	---	---	---	---
	Thorium-230	0.83	0.80	0.03	9.94	9.60	0.34	129.38	125.00	4.37	5.18	5.00	0.17	---	---	---	---	---	---
	Thorium-232	0.70	0.73	0.00	8.39	8.76	0.00	109.22	114.06	0.00	4.37	4.56	0.00	---	---	---	---	---	---
	Uranium-234	36.30	0.77	35.53	435.60	9.19	426.41	5,671.88	119.69	5,552.19	226.88	4.79	222.09	---	---	---	---	---	---
	Uranium-235	2.17	0.05	2.12	26.04	0.60	25.44	339.06	7.81	331.25	13.56	0.31	13.25	---	---	---	---	---	---
	Uranium-238	41.00	0.63	40.37	492.00	7.56	484.44	6,406.25	98.44	6,307.81	256.25	3.94	252.31	---	---	---	---	---	---
	Total Intakes for EU11 Sediment:				**998.04**	**64.87**	**937.38**	**12,995.31**	**844.69**	**12,205.47**	**519.81**	**33.79**	**488.22**						
Surface Water	Radium-226	0.17	0.13	0.04	2.00	1.56	0.44	26.09	20.31	5.78	1.04	0.81	0.23	---	---	---	---	---	---
	Radium-228	0.48	0.33	0.15	5.76	3.96	1.80	75.00	51.56	23.44	3.00	2.06	0.94	---	---	---	---	---	---
	Thorium-228	0.17	0.20	0.00	2.05	2.40	0.00	26.72	31.25	0.00	1.07	1.25	0.00	---	---	---	---	---	---
	Thorium-230	0.15	0.20	0.00	1.82	2.40	0.00	23.75	31.25	0.00	0.95	1.25	0.00	---	---	---	---	---	---
	Thorium-232	0.03	0.01	0.02	0.39	0.12	0.27	5.06	1.56	3.50	0.20	0.06	0.14	---	---	---	---	---	---
	Uranium-234	33.30	0.17	33.13	399.60	1.99	397.61	5,203.13	25.94	5,177.19	208.13	1.04	207.09	---	---	---	---	---	---
	Uranium-235	1.54	0.04	1.50	18.47	0.48	17.99	240.47	6.25	234.22	9.62	0.25	9.37	---	---	---	---	---	---
	Uranium-238	32.80	0.10	32.70	393.60	1.15	392.45	5,125.00	15.00	5,110.00	205.00	0.60	204.40	---	---	---	---	---	---
	Total Intakes for EU11 Surface Water:				**823.70**	**14.06**	**810.56**	**10,725.22**	**183.13**	**10,554.13**	**429.01**	**7.33**	**422.17**						
Groundwater	Radium-226	0.29	1.35	0.00	---	---	---	---	---	---	14.60	67.50	0.00	7,051.80	32,602.50	0.00	306.60	1,417.50	0.00
	Radium-228	0.21	2.20	0.00	---	---	---	---	---	---	10.60	110.00	0.00	5,119.80	53,130.00	0.00	222.60	2,310.00	0.00
	Thorium-228	0.07	0.07	0.00	---	---	---	---	---	---	3.45	3.50	-0.05	1,666.35	1,690.50	-24.15	72.45	73.50	-1.05
	Thorium-230	0.25	0.17	0.08	---	---	---	---	---	---	12.50	8.50	4.00	6,037.50	4,105.50	1,932.00	262.50	178.50	84.00
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.38	0.00	0.38	183	0	183	7.94	0.00	7.94
	Uranium-234	17.33	1.00	16.33	---	---	---	---	---	---	867	50	817	418,520	24,150	394,370	18,197	1,050	17,147
	Uranium-235	0.66	0.09	0.57	---	---	---	---	---	---	32.90	4.25	28.65	15,891	2,053	13,838	691	89	602
	Uranium-238	15.64	0.95	14.69	---	---	---	---	---	---	782	48	735	377,706	22,943	354,764	16,422	998	15,425
	Total Intakes for EU11 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1,722.93**	**291.25**	**1,583.98**	**832,174**	**140,674**	**765,061**	**36,181**	**6,116**	**33,264**
EU12:																			
Sediment	Radium-226	1.18	1.00	0.18	14.16	12.00	2.16	184.38	156.25	28.13	7.38	6.25	1.13	---	---	---	---	---	---
	Radium-228	0.91	0.60	0.31	10.92	7.20	3.72	142.19	93.75	48.44	5.69	3.75	1.94	---	---	---	---	---	---
	Thorium-228	0.87	0.83	0.04	10.44	9.96	0.48	135.94	129.69	6.25	5.44	5.19	0.25	---	---	---	---	---	---
	Thorium-230	1.23	0.80	0.43	14.74	9.60	5.14	191.88	125.00	66.88	7.68	5.00	2.68	---	---	---	---	---	---
	Thorium-232	0.91	0.73	0.18	10.88	8.76	2.12	141.72	114.06	27.66	5.67	4.56	1.11	---	---	---	---	---	---
	Uranium-234	2.47	0.77	1.70	29.64	9.19	20.45	385.94	119.69	266.25	15.44	4.79	10.65	---	---	---	---	---	---
	Uranium-235	0.14	0.05	0.09	1.66	0.60	1.06	21.56	7.81	13.75	0.86	0.31	0.55	---	---	---	---	---	---
	Uranium-238	2.76	0.63	2.13	33.08	7.56	25.52	430.78	98.44	332.34	17.23	3.94	13.29	---	---	---	---	---	---
	Total Intakes for EU12 Sediment:				**125.52**	**64.87**	**60.65**	**1,634.38**	**844.69**	**789.69**	**65.38**	**33.79**	**31.59**						
Groundwater	Radium-226	0.26	1.35	0.00	---	---	---	---	---	---	13.05	67.50	0.00	6,303.15	32,602.50	0.00	274.05	1,417.50	0.00
	Radium-228	0.22	2.20	0.00	---	---	---	---	---	---	11.00	110.00	0.00	5,313.00	53,130.00	0.00	231.00	2,310.00	0.00
	Thorium-228	0.10	0.07	0.03	---	---	---	---	---	---	5.05	3.50	1.55	2,439.15	1,690.50	748.65	106.05	73.50	32.55
	Thorium-230	0.22	0.17	0.05	---	---	---	---	---	---	10.80	8.50	2.30	5,216.40	4,105.50	1,110.90	226.80	178.50	48.30
	Thorium-232	0.03	0.00	0.03	---	---	---	---	---	---	1.59	0.00	1.59	768	0	768	33.39	0.00	33.39
	Uranium-234	11.83	1.00	10.83	---	---	---	---	---	---	592	50	542	285,695	24,150	261,545	12,422	1,050	11,372
	Uranium-235	0.62	0.09	0.53	---	---	---	---	---	---	30.90	4.25	26.65	14,925	2,053	12,872	649	89	560
	Uranium-238	13.90	0.95	12.95	---	---	---	---	---	---	695	48	648	335,685	22,943	312,743	14,595	998	13,598
	Total Intakes for EU12 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1,358.89**	**291.25**	**1,221.09**	**656,344**	**140,674**	**589,786**	**28,537**	**6,116**	**25,643**
EU13:																			
Sediment	Radium-226	0.88	1.00	0.00	10.56	12.00	0.00	137.50	156.25	0.00	5.50	6.25	0.00	---	---	---	---	---	---
	Radium-228	1.05	0.60	0.45	12.60	7.20	5.40	164.06	93.75	70.31	6.56	3.75	2.81	---	---	---	---	---	---
	Thorium-228	0.57	0.83	0.00	6.84	9.96	0.00	89.06	129.69	0.00	3.56	5.19	0.00	---	---	---	---	---	---
	Thorium-230	0.68	0.80	0.00	8.16	9.60	0.00	106.25	125.00	0.00	4.25	5.00	0.00	---	---	---	---	---	---
	Thorium-232	0.46	0.73	0.00	5.52	8.76	0.00	71.88	114.06	0.00	2.88	4.56	0.00	---	---	---	---	---	---
	Uranium-234	19.70	0.77	18.93	236.40	9.19	227.21	3,078.13	119.69	2,958.44	123.13	4.79	118.34	---	---	---	---	---	---
	Uranium-235	1.02	0.05	0.97	12.24	0.60	11.64	159.38	7.81	151.56	6.38	0.31	6.06	---	---	---	---	---	---
	Uranium-238	19.20	0.63	18.57	230.40	7.56	222.84	3,000.00	98.44	2,901.56	120.00	3.94	116.06	---	---	---	---	---	---
	Total Intakes for EU13 Sediment:				**522.72**	**64.87**	**467.09**	**6,806.25**	**844.69**	**6,081.88**	**272.25**	**33.79**	**243.28**						
Groundwater	Radium-226	0.21	1.35	0.00	---	---	---	---	---	---	10.70	67.50	0.00	5,168.10	32,602.50	0.00	224.70	1,417.50	0.00
	Radium-228	0.28	2.20	0.00	---	---	---	---	---	---	13.85	110.00	0.00	6,689.55	53,130.00	0.00	290.85	2,310.00	0.00
	Thorium-228	0.07	0.07	0.00	---	---	---	---	---	---	3.31	3.50	-0.19	1,598.73	1,690.50	-91.77	69.51	73.50	-3.99
	Thorium-230	0.20	0.17	0.03	---	---	---	---	---	---	9.80	8.50	1.30	4,733.40	4,105.50	627.90	205.80	178.50	27.30
	Thorium-232	0.03	0.00	0.03	---	---	---	---	---	---	1.75	0.00	1.75	843	0	843	36.65	0.00	36.65
	Uranium-234	14.77	1.00	13.77	---	---	---	---	---	---	739	50	689	356,696	24,150	332,546	15,509	1,050	14,459
	Uranium-235	0.73	0.09	0.65	---	---	---	---	---	---	36.50	4.25	32.25	17,630	2,053	15,577	767	89	677
	Uranium-238	12.99	0.95	12.04	---	---	---	---	---	---	650	48	602	313,709	22,943	290,766	13,640	998	12,642
	Total Intakes for EU13 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1,463.91**	**291.25**	**1,325.61**	**707,066**	**140,674**	**640,267**	**30,742**	**6,116**	**27,838**
EU14:																			
Groundwater	Radium-226	0.24	1.35	0.00	---	---	---	---	---	---	11.90	67.50	0.00	5,747.70	32,602.50	0.00	249.90	1,417.50	0.00
	Radium-228	0.35	2.20	0.00	---	---	---	---	---	---	17.45	110.00	0.00	8,428.35	53,130.00	0.00	366.45	2,310.00	0.00
	Thorium-228	0.05	0.07	0.00	---	---	---	---	---	---	2.74	3.50	0.00	1,323.42	1,690.50	0.00	57.54	73.50	0.00
	Thorium-230	0.19	0.17	0.02	---	---	---	---	---	---	9.25	8.50	0.75	4,467.75	4,105.50	362.25	194.25	178.50	15.75
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.51	0.00	0.51	246	0	246	10.71	0.00	10.71
	Uranium-234	71.84	1.00	70.84	---	---	---	---	---	---	3,592	50	3,542	1,734,936	24,150	1,710,786	75,432	1,050	74,382
	Uranium-235	3.45	0.09	3.37	---	---	---	---	---	---	172.70	4.25	168.45	83,414	2,053	81,361	3,627	89	3,537
	Uranium-238	70.84	0.95	69.89	---	---	---	---	---	---	3,542	48	3,495	1,710,786	22,943	1,687,844	74,382	998	73,385
	Total Intakes for EU14 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7,348.55**	**291.25**	**7,206.21**	**3,549,350**	**140,674**	**3,480,599**	**154,320**	**6,116**	**151,330**

Annual Dose (mrem/year)

Exposure Unit/ Sample Medium	COPC	Ingestion Dose Conversion Factor (mrem/pCi)	Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU8:																	
Sediment	Radium-226	1.321E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.01	0.00	0.00	0.03	0.01	0.02	0.03	0.01	0.02	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.01	0.00	0.01	0.04	0.00	0.04	0.04	0.00	0.04	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.01	0.00	0.01	0.04	0.00	0.04	0.04	0.00	0.04	---	---	---	---	---	---
		Dose:	**0.03**	**0.01**	**0.02**	**0.14**	**0.04**	**0.10**	**0.14**	**0.04**	**0.10**						
EU10:																	
Groundwater	Radium-226	1.321E-03	---	---	---	---	---	---	0.01	0.09	0.00	0.21	1.44	0.00	0.05	0.31	0.00
	Radium-228	1.442E-03	---	---	---	---	---	---	0.03	0.16	0.00	0.50	2.55	0.00	0.11	0.56	0.00
	Thorium-228	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	0.01	0.05	0.00	0.00	0.01	0.00
	Thorium-230	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	0.11	0.07	0.04	0.02	0.02	0.01
	Thorium-232	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	0.03	0.00	0.03	0.01	0.00	0.01
	Uranium-234	2.830E-04	---	---	---	---	---	---	0.06	0.01	0.04	0.92	0.23	0.69	0.20	0.05	0.15
	Uranium-235	2.673E-04	---	---	---	---	---	---	0.00	0.00	0.00	0.04	0.02	0.03	0.01	0.00	0.01
	Uranium-238	2.687E-04	---	---	---	---	---	---	0.06	0.01	0.05	0.96	0.21	0.75	0.21	0.04	0.16
		Dose:	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.17**	**0.28**	**0.10**	**2.80**	**4.56**	**1.54**	**0.61**	**0.99**	**0.33**
EU11:																	
Sediment	Radium-226	1.321E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.01	0.00	0.01	0.06	0.00	0.06	0.06	0.00	0.06	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.01	0.00	0.01	0.07	0.00	0.07	0.07	0.00	0.07	---	---	---	---	---	---
		Dose:	**0.03**	**0.01**	**0.03**	**0.17**	**0.04**	**0.13**	**0.17**	**0.04**	**0.13**						
Surface Water	Radium-226	1.321E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.01	0.00	0.01	0.06	0.00	0.06	0.06	0.00	0.06	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.01	0.00	0.01	0.06	0.00	0.05	0.06	0.00	0.05	---	---	---	---	---	---
		Dose:	**0.02**	**0.00**	**0.02**	**0.12**	**0.01**	**0.12**	**0.12**	**0.01**	**0.12**						
Groundwater	Radium-226	1.321E-03	---	---	---	---	---	---	0.02	0.09	0.00	0.31	1.44	0.00	0.07	0.31	0.00
	Radium-228	1.442E-03	---	---	---	---	---	---	0.02	0.16	0.00	0.25	2.55	0.00	0.05	0.56	0.00
	Thorium-228	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	0.04	0.05	0.00	0.01	0.01	0.00
	Thorium-230	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	0.11	0.07	0.04	0.02	0.02	0.01
	Thorium-232	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00
	Uranium-234	2.830E-04	---	---	---	---	---	---	0.25	0.01	0.23	3.95	0.23	3.72	0.86	0.05	0.81
	Uranium-235	2.673E-04	---	---	---	---	---	---	0.01	0.00	0.01	0.14	0.02	0.12	0.03	0.00	0.03
	Uranium-238	2.687E-04	---	---	---	---	---	---	0.21	0.01	0.20	3.38	0.21	3.18	0.74	0.04	0.69
		Dose:	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.51**	**0.28**	**0.44**	**8.20**	**4.56**	**7.07**	**1.78**	**0.99**	**1.54**
EU12:																	
Sediment	Radium-226	1.321E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.02	0.01	0.00	0.02	0.01	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
		Dose:	**0.01**	**0.01**	**0.00**	**0.05**	**0.04**	**0.02**	**0.05**	**0.04**	**0.02**						
Groundwater	Radium-226	1.321E-03	---	---	---	---	---	---	0.02	0.09	0.00	0.28	1.44	0.00	0.06	0.31	0.00
	Radium-228	1.442E-03	---	---	---	---	---	---	0.02	0.16	0.00	0.26	2.55	0.00	0.06	0.56	0.00
	Thorium-228	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	0.07	0.05	0.02	0.01	0.01	0.00
	Thorium-230	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	0.10	0.07	0.02	0.02	0.02	0.00
	Thorium-232	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	0.07	0.00	0.07	0.02	0.00	0.02
	Uranium-234	2.830E-04	---	---	---	---	---	---	0.17	0.01	0.15	2.70	0.23	2.47	0.59	0.05	0.54
	Uranium-235	2.673E-04	---	---	---	---	---	---	0.01	0.00	0.01	0.13	0.02	0.11	0.03	0.00	0.02
	Uranium-238	2.687E-04	---	---	---	---	---	---	0.19	0.01	0.17	3.01	0.21	2.80	0.65	0.04	0.61
		Dose:	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.41**	**0.28**	**0.34**	**6.60**	**4.56**	**5.49**	**1.43**	**0.99**	**1.19**
EU13:																	
Sediment	Radium-226	1.321E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	2.730E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Uranium-234	2.830E-04	0.01	0.00	0.01	0.03	0.00	0.03	0.03	0.00	0.03	---	---	---	---	---	---
	Uranium-235	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	2.687E-04	0.01	0.00	0.01	0.03	0.00	0.03	0.03	0.00	0.03	---	---	---	---	---	---
		Dose:	**0.02**	**0.01**	**0.01**	**0.10**	**0.04**	**0.07**	**0.10**	**0.04**	**0.07**						
Groundwater	Radium-226	1.321E-03	---	---	---	---	---	---	0.01	0.09	0.00	0.23	1.44	0.00	0.05	0.31	0.00
	Radium-228	1.442E-03	---	---	---	---	---	---	0.02	0.16	0.00	0.32	2.55	0.00	0.07	0.56	0.00
	Thorium-228	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	0.04	0.05	0.00	0.01	0.01	0.00
	Thorium-230	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	0.09	0.07	0.01	0.02	0.02	0.00
	Thorium-232	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	0.08	0.00	0.08	0.02	0.00	0.02
	Uranium-234	2.830E-04	---	---	---	---	---	---	0.21	0.01	0.19	3.36	0.23	3.14	0.73	0.05	0.68
	Uranium-235	2.673E-04	---	---	---	---	---	---	0.01	0.00	0.01	0.16	0.02	0.14	0.03	0.00	0.03
	Uranium-238	2.687E-04	---	---	---	---	---	---	0.17	0.01	0.16	2.81	0.21	2.60	0.61	0.04	0.57
		Dose:	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.44**	**0.28**	**0.37**	**7.09**	**4.56**	**5.97**	**1.54**	**0.99**	**1.30**
EU14:																	
Groundwater	Radium-226	1.321E-03	---	---	---	---	---	---	0.02	0.09	0.00	0.25	1.44	0.00	0.06	0.31	0.00
	Radium-228	1.442E-03	---	---	---	---	---	---	0.03	0.16	0.00	0.41	2.55	0.00	0.09	0.56	0.00
	Thorium-228	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	0.04	0.05	0.00	0.01	0.01	0.00
	Thorium-230	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	0.08	0.07	0.01	0.02	0.02	0.00
	Thorium-232	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00
	Uranium-234	2.830E-04	---	---	---	---	---	---	1.02	0.01	1.00	16.37	0.23	16.14	3.56	0.05	3.51
	Uranium-235	2.673E-04	---	---	---	---	---	---	0.05	0.00	0.05	0.74	0.02	0.72	0.16	0.00	0.16
	Uranium-238	2.687E-04	---	---	---	---	---	---	0.95	0.01	0.94	15.32	0.21	15.12	3.33	0.04	3.29
		Dose:	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.06**	**0.28**	**1.99**	**33.23**	**4.56**	**32.01**	**7.22**	**0.99**	**6.96**

TABLE 6-10
COPC SEDIMENT, SURFACE WATER, AND GROUNDWATER INTAKES, RISKS, AND DOSES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

					Ingestion Intakes (pCi)																Annual Dose (mrem/year)											
Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child	Ingestion Dose Conversion Factor (mrem/pCi)	Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU15:																																		
Sediment	Radium-226	0.82	1.00	0.00	9.84	12.00	0.00	128.13	156.25	0.00	5.13	6.25	0.00	---	---	---	---	---	---	1.321E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Radium-228	0.99	0.60	0.39	11.88	7.20	4.68	154.69	93.75	60.94	6.19	3.75	2.44	---	---	---	---	---	---	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	0.64	0.83	0.00	7.68	9.96	0.00	100.00	129.69	0.00	4.00	5.19	0.00	---	---	---	---	---	---	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	0.87	0.80	0.07	10.44	9.60	0.84	135.94	125.00	10.94	5.44	5.00	0.44	---	---	---	---	---	---	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	0.50	0.73	0.00	6.00	8.76	0.00	78.13	114.06	0.00	3.13	4.56	0.00	---	---	---	---	---	---	2.730E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Uranium-234	10.30	0.77	9.53	123.60	9.19	114.41	1,609.38	119.69	1,489.69	64.38	4.79	59.59	---	---	---	---	---	---	2.830E-04	0.00	0.00	0.00	0.02	0.00	0.02	0.02	0.00	0.02	---	---	---	---	---	---
	Uranium-235	0.71	0.05	0.66	8.52	0.60	7.92	110.94	7.81	103.13	4.44	0.31	4.13	---	---	---	---	---	---	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	10.70	0.63	10.07	128.40	7.56	120.84	1,671.88	98.44	1,573.44	66.88	3.94	62.94	---	---	---	---	---	---	2.687E-04	0.00	0.00	0.00	0.02	0.00	0.02	0.02	0.00	0.02	---	---	---	---	---	---
	Total Intakes for EU15 Sediment:				**306.36**	**64.87**	**248.69**	**3,989.06**	**844.69**	**3,238.13**	**159.56**	**33.79**	**129.53**							**Dose:**	**0.01**	**0.01**	**0.01**	**0.07**	**0.04**	**0.04**	**0.07**	**0.04**	**0.04**							
EU16:																																		
Sediment	Radium-226	0.31	1.00	0.00	3.73	12.00	0.00	48.55	156.25	0.00	1.94	6.25	0.00	---	---	---	---	---	---	1.321E-03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	---	---	---	---	---	---
	Radium-228	0.57	0.60	0.00	6.84	7.20	0.00	89.06	93.75	0.00	3.56	3.75	0.00	---	---	---	---	---	---	1.442E-03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Thorium-228	0.35	0.83	0.00	4.20	9.96	0.00	54.69	129.69	0.00	2.19	5.19	0.00	---	---	---	---	---	---	8.086E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-230	0.40	0.80	0.00	4.77	9.60	0.00	62.06	125.00	0.00	2.48	5.00	0.00	---	---	---	---	---	---	5.480E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Thorium-232	0.26	0.73	0.00	3.12	8.76	0.00	40.63	114.06	0.00	1.63	4.56	0.00	---	---	---	---	---	---	2.730E-03	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	---	---	---	---	---	---
	Uranium-234	6.19	0.77	5.42	74.23	9.19	65.04	966.51	119.69	846.83	38.66	4.79	33.87	---	---	---	---	---	---	2.830E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	---	---	---	---	---	---
	Uranium-235	0.31	0.05	0.26	3.66	0.60	3.06	47.72	7.81	39.91	1.91	0.31	1.60	---	---	---	---	---	---	2.673E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
	Uranium-238	6.71	0.63	6.08	80.56	7.56	73.00	1,048.90	98.44	950.46	41.96	3.94	38.02	---	---	---	---	---	---	2.687E-04	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	---	---	---	---	---	---
	Total Intakes for EU16 Sediment:				**181.10**	**64.87**	**141.10**	**2,358.12**	**844.69**	**1,837.20**	**94.32**	**33.79**	**73.49**							**Dose:**	**0.01**	**0.01**	**0.00**	**0.04**	**0.04**	**0.02**	**0.04**	**0.04**	**0.02**							
Groundwater	Radium-226	0.21	1.35	0.00	---	---	---	---	---	---	10.25	67.50	0.00	4,950.75	32,602.50	0.00	215.25	1,417.50	0.00	1.321E-03	---	---	---	---	---	---	0.01	0.09	0.00	0.22	1.44	0.00	0.05	0.31	0.00
	Radium-228	0.42	2.20	0.00	---	---	---	---	---	---	21.10	110.00	0.00	10,189.56	53,130.00	0.00	443.02	2,310.00	0.00	1.442E-03	---	---	---	---	---	---	0.03	0.16	0.00	0.49	2.55	0.00	0.11	0.56	0.00
	Thorium-228	0.09	0.07	0.02	---	---	---	---	---	---	4.31	3.50	0.81	2,081.68	1,690.50	391.18	90.51	73.50	17.01	8.086E-04	---	---	---	---	---	---	0.00	0.00	0.00	0.06	0.05	0.01	0.01	0.01	0.00
	Thorium-230	0.20	0.17	0.03	---	---	---	---	---	---	9.83	8.50	1.33	4,746.34	4,105.50	640.84	206.36	178.50	27.86	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.00	0.09	0.07	0.01	0.02	0.02	0.00
	Thorium-232	0.06	0.00	0.06	---	---	---	---	---	---	2.90	0.00	2.90	1,401	0	1,401	60.90	0.00	60.90	2.730E-03	---	---	---	---	---	---	0.01	0.00	0.01	0.13	0.00	0.13	0.03	0.00	0.03
	Uranium-234	28.60	1.00	27.60	---	---	---	---	---	---	1,430	50	1,380	690,625	24,150	666,475	30,027	1,050	28,977	2.830E-04	---	---	---	---	---	---	0.40	0.01	0.39	6.51	0.23	6.29	1.42	0.05	1.37
	Uranium-235	1.70	0.09	1.62	---	---	---	---	---	---	85.07	4.25	80.82	41,087	2,053	39,034	1,786	89	1,697	2.673E-04	---	---	---	---	---	---	0.02	0.00	0.02	0.37	0.02	0.35	0.08	0.00	0.08
	Uranium-238	29.98	0.95	29.03	---	---	---	---	---	---	1,499	48	1,451	723,987	22,943	701,045	31,478	998	30,480	2.687E-04	---	---	---	---	---	---	0.40	0.01	0.39	6.48	0.21	6.28	1.41	0.04	1.37
	Total Intakes for EU16 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3,062.25**	**291.25**	**2,917.16**	**1,479,069**	**140,674**	**1,408,987**	**64,307**	**6,116**	**61,260**	**Dose:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.89**	**0.28**	**0.81**	**14.34**	**4.56**	**13.06**	**3.12**	**0.99**	**2.84**
EU18:																																		
Groundwater	Radium-226	1.36	1.35	0.01	---	---	---	---	---	---	67.99	67.50	0.49	32,837.59	32,602.50	235.09	1,427.72	1,417.50	10.22	1.321E-03	---	---	---	---	---	---	0.09	0.09	0.00	1.45	1.44	0.01	0.31	0.31	0.00
	Radium-228	2.35	2.20	0.15	---	---	---	---	---	---	117.58	110.00	7.58	56,790.00	53,130.00	3,660.00	2,469.13	2,310.00	159.13	1.442E-03	---	---	---	---	---	---	0.17	0.16	0.01	2.73	2.55	0.18	0.59	0.56	0.04
	Thorium-228	0.12	0.07	0.05	---	---	---	---	---	---	6.24	3.50	2.74	3,014.45	1,690.50	1,323.95	131.06	73.50	57.56	8.086E-04	---	---	---	---	---	---	0.01	0.00	0.00	0.08	0.05	0.04	0.02	0.01	0.01
	Thorium-230	0.25	0.17	0.08	---	---	---	---	---	---	12.32	8.50	3.82	5,951.12	4,105.50	1,845.62	258.74	178.50	80.24	5.480E-04	---	---	---	---	---	---	0.01	0.00	0.01	0.11	0.07	0.03	0.02	0.02	0.01
	Thorium-232	0.01	0.00	0.01	---	---	---	---	---	---	0.25	0.00	0.25	121	0	121	5.27	0.00	5.27	2.730E-03	---	---	---	---	---	---	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00
	Uranium-234	1.23	1.00	0.23	---	---	---	---	---	---	62	50	12	29,732	24,150	5,582	1,293	1,050	243	2.830E-04	---	---	---	---	---	---	0.02	0.01	0.00	0.28	0.23	0.05	0.06	0.05	0.01
	Uranium-235	0.08	0.09	0.00	---	---	---	---	---	---	4.00	4.25	0.00	1,932	2,053	0	84	89	0	2.673E-04	---	---	---	---	---	---	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00
	Uranium-238	1.23	0.95	0.28	---	---	---	---	---	---	61	48	14	29,615	22,943	6,673	1,288	998	290	2.687E-04	---	---	---	---	---	---	0.02	0.01	0.00	0.27	0.21	0.06	0.06	0.04	0.01
	Total Intakes for EU18 Groundwater:				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**331.25**	**291.25**	**40.25**	**159,993**	**140,674**	**19,440**	**6,956**	**6,116**	**845**	**Dose:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.31**	**0.28**	**0.02**	**4.94**	**4.56**	**0.38**	**1.07**	**0.99**	**0.08**
EU19:																																		
Sediment	Radium-226	1.06	1.00	0.06	12.71	12.00	0.71	---	---	---	---	---	---	19.06	18.00	1.06	91.50	86.40	5.10	1.321E-03	---	---	---	---	---	---	---	---	---	0.00	0.00	0.00	0.02	0.02	0.00
	Radium-228	0.82	0.60	0.22	9.89	7.20	2.69	---	---	---	---	---	---	14.83	10.80	4.03	71.19	51.84	19.35	1.442E-03	---	---	---	---	---	---	---	---	---	0.00	0.00	0.00	0.02	0.01	0.00
	Thorium-228	0.85	0.83	0.02	10.18	9.96	0.22	---	---	---	---	---	---	15.26	14.94	0.32	73.27	71.71	1.56	8.086E-04	---	---	---	---	---	---	---	---	---	0.00	0.00	0.00	0.01	0.01	0.00
	Thorium-230	0.90	0.80	0.10	10.76	9.60	1.16	---	---	---	---	---	---	16.15	14.40	1.75	77.50	69.12	8.38	5.480E-04	---	---	---	---	---	---	---	---	---	0.00	0.00	0.00	0.01	0.01	0.00
	Thorium-232	0.78	0.73	0.05	9.40	8.76	0.64	---	---	---	---	---	---	14.09	13.14	0.95	67.65	63.07	4.58	2.730E-03	---	---	---	---	---	---	---	---	---	0.00	0.00	0.00	0.03	0.03	0.00
	Uranium-234	0.74	0.77	0.00	8.87	9.19	0.00	---	---	---	---	---	---	13.30	13.79	0.00	63.85	66.18	0.00	2.830E-04	---	---	---	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Uranium-235	0.06	0.05	0.01	0.73	0.60	0.13	---	---	---	---	---	---	1.10	0.90	0.20	5.28	4.32	0.96	2.673E-04	---	---	---	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Uranium-238	0.68	0.63	0.05	8.14	7.56	0.58	---	---	---	---	---	---	12.20	11.34	0.86	58.58	54.43	4.15	2.687E-04	---	---	---	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Total Intakes for EU19 Sediment:				**70.67**	**64.87**	**6.12**							**106.00**	**97.31**	**9.18**	**508.82**	**467.08**	**44.07**	**Dose:**	**0.01**	**0.01**	**0.00**							**0.00**	**0.00**	**0.00**	**0.09**	**0.08**	**0.01**
Surface Water	Radium-226	0.14	0.13	0.01	1.66	1.56	0.10	---	---	---	---	---	---	2.48	2.34	0.14	11.92	11.23	0.69	1.321E-03	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Radium-228	0.61	0.33	0.28	7.34	3.96	3.38	---	---	---	---	---	---	11.02	5.94	5.08	52.88	28.51	24.36	1.442E-03	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.01	0.01	0.01
	Thorium-228	0.26	0.20	0.06	3.07	2.40	0.67	---	---	---	---	---	---	4.61	3.60	1.01	22.12	17.28	4.84	8.086E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Thorium-230	0.26	0.20	0.06	3.07	2.40	0.67	---	---	---	---	---	---	4.61	3.60	1.01	22.12	17.28	4.84	5.480E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Thorium-232	0.03	0.01	0.02	0.31	0.12	0.19	---	---	---	---	---	---	0.47	0.18	0.29	2.26	0.86	1.39	2.730E-03	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Uranium-234	0.20	0.17	0.04	2.42	1.99	0.43	---	---	---	---	---	---	3.64	2.99	0.65	17.45	14.34	3.11	2.830E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Uranium-235	0.05	0.04	0.01	0.57	0.48	0.09	---	---	---	---	---	---	0.85	0.72	0.13	4.09	3.46	0.63	2.673E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Uranium-238	0.17	0.10	0.07	2.04	1.15	0.89	---	---	---	---	---	---	3.06	1.73	1.33	14.69	8.29	6.39	2.687E-04	0.00	0.00	0.00	---	---	---	---	---	---	0.00	0.00	0.00	0.00	0.00	0.00
	Total Intakes for EU19 Surface Water:				**20.49**	**14.06**	**6.42**							**30.73**	**21.10**	**9.64**	**147.52**	**101.26**	**46.26**	**Dose:**	**0.00**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.02**	**0.01**	**0.01**

Notes:
COPC = chemical of potential concern
EU = exposure unit
EPC = exposure point concentration
ILCR = incremental lifetime cancer risk
mrem = millirem
mrem/pCi = millirem per picocurie
1/pCi = quantity per picocurie
pCi/g = picocurie per gram
pCi/L = picocurie per liter
pCi = picocurie

TABLE 6-11
URANIUM INGESTION INTAKES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Ingestion Intakes (pCi															Ingestion Intakes (mg														
					Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child	Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU1:																																		
Building Materials	Uranium-234	0.39	1.54	0.00	0.001	0.005	0.000	0.06	0.24	0.00	40.6	160.4	0.0	---	---	---	---	---	---	1.87E-10	7.40E-10	0.00E+00	9.79E-09	3.87E-08	0.00E+00	6.65E-06	2.63E-05	0.00E+00	---	---	---	---	---	---
	Uranium-235	0.03	0.08	0.00	0.0001	0.0002	0.0000	0.005	0.012	0.000	3.1	8.0	0.0	---	---	---	---	---	---	4.06E-08	1.05E-07	0.00E+00	2.12E-06	5.48E-06	0.00E+00	1.44E-03	3.72E-03	0.00E+00	---	---	---	---	---	---
	Uranium-238	0.32	1.74	0.00	0.001	0.005	0.000	0.05	0.27	0.00	33.3	181.4	0.0	---	---	---	---	---	---	2.79E-06	1.52E-05	0.00E+00	1.46E-04	7.96E-04	0.00E+00	9.92E-02	5.41E-01	0.00E+00	---	---	---	---	---	---
Sediment	Uranium-234	42.19	0.77	41.42	506	9	497	6592	120	6473	264	5	259	---	---	---	---	---	---	8.30E-05	1.51E-06	8.15E-05	1.08E-03	1.96E-05	1.06E-03	4.32E-05	7.85E-07	4.25E-05	---	---	---	---	---	---
	Uranium-235	2.17	0.05	2.12	26.1	0.6	25.5	340	8	332	13.6	0.3	13.3	---	---	---	---	---	---	1.21E-02	2.77E-04	1.18E-02	1.57E-01	3.61E-03	1.53E-01	6.28E-03	1.44E-04	6.13E-03	---	---	---	---	---	---
	Uranium-238	47.00	0.63	46.37	564	8	556	7344	98	7245	294	4	290	---	---	---	---	---	---	1.68E+00	2.25E-02	1.66E+00	2.19E+01	2.93E-01	2.16E+01	8.75E-01	1.17E-02	8.64E-01	---	---	---	---	---	---
Surface Water	Uranium-234	25.92	0.17	25.75	311	2	309	4050	26	4024	162	1	161	---	---	---	---	---	---	5.10E-05	3.27E-07	5.07E-05	6.64E-04	4.25E-06	6.60E-04	2.66E-05	1.70E-07	2.64E-05	---	---	---	---	---	---
	Uranium-235	1.11	0.04	1.07	13.3	0.5	12.8	173	6	167	6.92	0.25	6.67	---	---	---	---	---	---	6.14E-03	2.22E-04	5.92E-03	7.99E-02	2.89E-03	7.70E-02	3.20E-03	1.16E-04	3.08E-03	---	---	---	---	---	---
	Uranium-238	26.01	0.10	25.91	312	1	311	4064	15	4049	163	1	162	---	---	---	---	---	---	9.30E-01	3.43E-03	9.27E-01	1.21E+01	4.47E-02	1.21E+01	4.84E-01	1.79E-03	4.83E-01	---	---	---	---	---	---
																			Total Uranium Intakes for EU1	2.63E+00	2.65E-02	2.60E+00	3.42E+01	3.45E-01	3.39E+01	1.47E+00	5.58E-01	1.36E+00						
EU2:																																		
Building Materials	Uranium-234	1.75	1.54	0.21	0.005	0.005	0.001	0.27	0.24	0.03	182	160	22	---	---	---	---	---	---	8.42E-10	7.40E-10	1.01E-10	4.40E-08	3.87E-08	5.30E-09	2.99E-05	2.63E-05	3.60E-06	---	---	---	---	---	---
	Uranium-235	0.10	0.08	0.02	0.0003	0.0002	0.0001	0.015	0.012	0.003	10.17	8.05	2.12	---	---	---	---	---	---	1.32E-07	1.05E-07	2.76E-08	6.92E-06	5.48E-06	1.44E-06	4.70E-03	3.72E-03	9.80E-04	---	---	---	---	---	---
	Uranium-238	1.74	1.74	0.00	0.005	0.005	0.000	0.27	0.27	0.00	181	181	0	---	---	---	---	---	---	1.52E-05	1.52E-05	0.00E+00	7.93E-04	7.96E-04	0.00E+00	5.39E-01	5.41E-01	0.00E+00	---	---	---	---	---	---
Surface Soil	Uranium-234	15.14	0.78	14.36	545	28	517	4731	243	4489	1249	64	1185	---	---	---	---	---	---	8.94E-05	4.58E-06	8.48E-05	7.76E-04	3.98E-05	7.36E-04	2.05E-04	1.05E-05	1.94E-04	---	---	---	---	---	---
	Uranium-235	0.81	0.04	0.77	29.2	1.3	27.8	253	12	242	66.8	3.0	63.8	---	---	---	---	---	---	1.35E-02	6.14E-04	1.29E-02	1.17E-01	5.33E-03	1.12E-01	3.09E-02	1.41E-03	2.95E-02	---	---	---	---	---	---
	Uranium-238	15.37	0.82	14.55	553	29	524	4803	255	4548	1268	67	1201	---	---	---	---	---	---	1.65E+00	8.76E-02	1.56E+00	1.43E+01	7.61E-01	1.36E+01	3.78E+00	2.01E-01	3.58E+00	---	---	---	---	---	---
Total Soil	Uranium-234	12.74	0.71	12.03	---	---	---	---	---	---	1051	58	993	---	---	---	---	---	---	---	---	---	---	---	---	1.72E-04	9.57E-06	1.63E-04	---	---	---	---	---	---
	Uranium-235	0.68	0.03	0.65	---	---	---	---	---	---	56.0	2.7	53.3	---	---	---	---	---	---	---	---	---	---	---	---	2.59E-02	1.27E-03	2.46E-02	---	---	---	---	---	---
	Uranium-238	12.88	0.74	12.14	---	---	---	---	---	---	1063	61	1002	---	---	---	---	---	---	---	---	---	---	---	---	3.17E+00	1.81E-01	2.99E+00	---	---	---	---	---	---
Sediment	Uranium-234	5.64	0.77	4.87	68	9	58	881	120	762	35.3	4.8	30.5	---	---	---	---	---	---	1.11E-05	1.51E-06	9.59E-06	1.45E-04	1.96E-05	1.25E-04	5.78E-06	7.85E-07	5.00E-06	---	---	---	---	---	---
	Uranium-235	0.24	0.05	0.19	2.88	0.60	2.28	37.5	7.8	29.7	1.50	0.31	1.19	---	---	---	---	---	---	1.33E-03	2.77E-04	1.05E-03	1.73E-02	3.61E-03	1.37E-02	6.93E-04	1.44E-04	5.49E-04	---	---	---	---	---	---
	Uranium-238	5.70	0.63	5.07	68.4	7.6	60.8	891	98	792	35.6	3.9	31.7	---	---	---	---	---	---	2.04E-01	2.25E-02	1.81E-01	2.65E+00	2.93E-01	2.36E+00	1.06E-01	1.17E-02	9.44E-02	---	---	---	---	---	---
Surface Water	Uranium-234	105.00	0.17	104.83	1260	2	1258	16406	26	16380	656	1	655	---	---	---	---	---	---	2.07E-04	3.27E-07	2.06E-04	2.69E-03	4.25E-06	2.69E-03	1.08E-04	1.70E-07	1.07E-04	---	---	---	---	---	---
	Uranium-235	4.50	0.04	4.46	54.0	0.5	53.5	703	6	697	28.1	0.3	27.9	---	---	---	---	---	---	2.49E-02	2.22E-04	2.47E-02	3.25E-01	2.89E-03	3.22E-01	1.30E-02	1.16E-04	1.29E-02	---	---	---	---	---	---
	Uranium-238	105.00	0.10	104.90	1260	1	1259	16406	15	16391	656	1	656	---	---	---	---	---	---	3.75E+00	3.43E-03	3.75E+00	4.89E+01	4.47E-02	4.88E+01	1.96E+00	1.79E-03	1.95E+00	---	---	---	---	---	---
																			Total Uranium Intakes for EU2	5.65E+00	1.15E-01	5.53E+00	6.63E+01	1.11E+00	6.52E+01	5.81E+00	7.41E-01	5.07E+00						
EU3:																																		
Building Materials	Uranium-234	2.98	1.54	1.44	0.009	0.005	0.004	0.46	0.24	0.22	309.6	160.4	149.2	---	---	---	---	---	---	1.43E-09	7.40E-10	6.89E-10	7.48E-08	3.87E-08	3.60E-08	5.08E-05	2.63E-05	2.45E-05	---	---	---	---	---	---
	Uranium-235	0.16	0.08	0.08	0.0005	0.0002	0.0002	0.025	0.012	0.013	16.7	8.0	8.7	---	---	---	---	---	---	2.18E-07	1.05E-07	1.13E-07	1.14E-05	5.48E-06	5.91E-06	7.74E-03	3.72E-03	4.02E-03	---	---	---	---	---	---
	Uranium-238	3.14	1.74	1.39	0.009	0.005	0.004	0.48	0.27	0.21	326.2	181.4	144.9	---	---	---	---	---	---	2.74E-05	1.52E-05	1.22E-05	1.43E-03	7.96E-04	6.36E-04	9.72E-01	5.41E-01	4.32E-01	---	---	---	---	---	---
Surface Soil	Uranium-234	21.42	0.78	20.64	771	28	743	6694	243	6451	1767	64	1703	---	---	---	---	---	---	1.26E-04	4.58E-06	1.22E-04	1.10E-03	3.98E-05	1.06E-03	2.90E-04	1.05E-05	2.79E-04	---	---	---	---	---	---
	Uranium-235	1.11	0.04	1.08	40.0	1.3	38.7	348	12	336	91.7	3.0	88.7	---	---	---	---	---	---	1.85E-02	6.14E-04	1.79E-02	1.61E-01	5.33E-03	1.55E-01	4.24E-02	1.41E-03	4.10E-02	---	---	---	---	---	---
	Uranium-238	23.04	0.82	22.22	829	29	800	7200	255	6945	1901	67	1833	---	---	---	---	---	---	2.47E+00	8.76E-02	2.38E+00	2.15E+01	7.61E-01	2.07E+01	5.66E+00	2.01E-01	5.46E+00	---	---	---	---	---	---
Total Soil	Uranium-234	94.80	0.71	94.09	---	---	---	---	---	---	7821	58	7763	---	---	---	---	---	---	---	---	---	---	---	---	1.28E-03	9.57E-06	1.27E-03	---	---	---	---	---	---
	Uranium-235	4.54	0.03	4.51	---	---	---	---	---	---	374.8	2.7	372.1	---	---	---	---	---	---	---	---	---	---	---	---	1.73E-01	1.27E-03	1.72E-01	---	---	---	---	---	---
	Uranium-238	95.50	0.74	94.76	---	---	---	---	---	---	7879	61	7818	---	---	---	---	---	---	---	---	---	---	---	---	2.35E+01	1.81E-01	2.33E+01	---	---	---	---	---	---
Sediment	Uranium-234	52.97	0.77	52.20	636	9	626	8277	120	8157	331	5	326	---	---	---	---	---	---	1.04E-04	1.51E-06	1.03E-04	1.36E-03	1.96E-05	1.34E-03	5.43E-05	7.85E-07	5.35E-05	---	---	---	---	---	---
	Uranium-235	2.84	0.05	2.79	34.1	0.6	33.5	444	8	436	17.8	0.3	17.5	---	---	---	---	---	---	1.58E-02	2.77E-04	1.55E-02	2.05E-01	3.61E-03	2.02E-01	8.21E-03	1.44E-04	8.06E-03	---	---	---	---	---	---
	Uranium-238	57.67	0.63	57.04	692	8	684	9011	98	8913	360	4	357	---	---	---	---	---	---	2.06E+00	2.25E-02	2.04E+00	2.69E+01	2.93E-01	2.66E+01	1.07E+00	1.17E-02	1.06E+00	---	---	---	---	---	---
Surface Water	Uranium-234	16.16	0.17	15.99	0.000	0.000	0.000	2525	26	2499	101	1	100	---	---	---	---	---	---	0.00E+00	0.00E+00	0.00E+00	4.14E-04	4.25E-06	4.10E-04	1.66E-05	1.70E-07	1.64E-05	---	---	---	---	---	---
	Uranium-235	1.05	0.04	1.01	12.6	0.5	12.2	165	6	158	6.59	0.25	6.34	---	---	---	---	---	---	5.84E-03	2.22E-04	5.62E-03	7.61E-02	2.89E-03	7.32E-02	3.04E-03	1.16E-04	2.93E-03	---	---	---	---	---	---
	Uranium-238	16.79	0.10	16.69	201	1	200	2623	15	2608	0.1049375	0.0006	0.1043375	---	---	---	---	---	---	6.00E-01	3.43E-03	5.97E-01	7.82E+00	4.47E-02	7.77E+00	3.13E-04	1.79E-06	3.11E-04	---	---	---	---	---	---
																			Total Uranium Intakes for EU3	5.17E+00	1.15E-01	5.06E+00	5.66E+01	1.11E+00	5.55E+01	2.57E+01	7.39E-01	2.50E+01						
EU4:																																		
Building Materials	Uranium-234	1.90	1.54	0.36	0.006	0.005	0.001	0.29	0.24	0.05	197.7	160.4	37.3	---	---	---	---	---	---	9.13E-10	7.40E-10	1.72E-10	4.77E-08	3.87E-08	9.01E-09	3.24E-05	2.63E-05	6.12E-06	---	---	---	---	---	---
	Uranium-235	0.07	0.08	0.00	0.0002	0.0002	0.0000	0.011	0.012	0.000	7.3	8.0	0.0	---	---	---	---	---	---	9.55E-08	1.05E-07	0.00E+00	5.00E-06	5.48E-06	0.00E+00	3.39E-03	3.72E-03	0.00E+00	---	---	---	---	---	---
	Uranium-238	1.79	1.74	0.05	0.005	0.005	0.000	0.27	0.27	0.01	186.4	181.4	5.1	---	---	---	---	---	---	1.56E-05	1.52E-05	4.24E-07	8.18E-04	7.96E-04	2.22E-05	5.56E-01	5.41E-01	1.51E-02	---	---	---	---	---	---
Surface Soil	Uranium-234	9.84	0.78	9.06	354	28	326	3074	243	2831	811	64	747	---	---	---	---	---	---	5.81E-05	4.58E-06	5.35E-05	5.04E-04	3.98E-05	4.64E-04	1.33E-04	1.05E-05	1.23E-04	---	---	---	---	---	---
	Uranium-235	0.41	0.04	0.37	14.6	1.3	13.3	127	12	115	33.4	3.0	30.4	---	---	---	---	---	---	6.74E-03	6.14E-04	6.12E-03	5.85E-02	5.33E-03	5.31E-02	1.54E-02	1.41E-03	1.40E-02	---	---	---	---	---	---
	Uranium-238	12.69	0.82	11.87	457	29	427	3966	255	3710	1047	67	980	---	---	---	---	---	---	1.36E+00	8.76E-02	1.27E+00	1.18E+01	7.61E-01	1.11E+01	3.12E+00	2.01E-01	2.92E+00	---	---	---	---	---	---
Total Soil	Uranium-234	8.65	0.71	7.94	---	---	---	---	---	---	714	58	655	---	---	---	---	---	---	---	---	---	---	---	---	1.17E-04	9.57E-06	1.07E-04	---	---	---	---	---	---
	Uranium-235	0.34	0.03	0.31	---	---	---	---	---	---	28.1	2.7	25.4	---	---	---	---	---	---	---	---	---	---	---	---	1.30E-02	1.27E-03	1.17E-02	---	---	---	---	---	---
	Uranium-238	8.67	0.74	7.93	---	---	---	---	---	---	715	61	654	---	---	---	---	---	---	---	---	---	---	---	---	2.13E+00	1.81E-01	1.95E+00	---	---	---	---	---	---
Sediment	Uranium-234	15.94	0.77	15.17	191	9	182	2491	120	2371	100	5	95	---	---	---	---	---	---	3.14E-05	1.51E-06	2.99E-05	4.08E-04	1.96E-05	3.89E-04	1.63E-05	7.85E-07	1.56E-05	---	---	---	---	---	---
	Uranium-235	0.78	0.05	0.73	9.4	0.6	8.8	122	8	115	4.89	0.31	4.58	---	---	---	---	---	---	4.34E-03	2.77E-04	4.06E-03	5.65E-02	3.61E-03	5.29E-02	2.26E-03	1.44E-04	2.12E-03	---	---	---	---	---	---
	Uranium-238	18.03	0.63	17.40	216	8	209	2817	98	2719	113	4	109	---	---	---	---	---	---	6.45E-01	2.25E-02	6.22E-01	8.40E+00	2.93E-01	8.10E+00	3.36E-01	1.17E-02	3.24E-01	---	---	---	---	---	---
Surface Water	Uranium-234	3.71	0.17	3.54	44.5	2.0	42.5	580	26	554	23.2	1.0	22.2	---	---	---	---	---	---	7.30E-06	3.27E-07	6.97E-06	9.51E-05	4.25E-06	9.08E-05	3.80E-06	1.70E-07	3.63E-06	---	---	---	---	---	---
	Uranium-235	0.19	0.04	0.15	2.23	0.48	1.75	29.1	6.3	22.8	1.1625	0.25	0.9125	---	---	---	---	---	---	1.03E-03	2.22E-04	8.09E-04	1.34E-02	2.89E-03	1.05E-02	5.37E-04	1.16E-04	4.22E-04	---	---	---	---	---	---
	Uranium-238	8.90	0.10	8.80	107	1	106	1391	15	1376	55.6	0.6	55.0	---	---	---	---	---	---	3.18E-01	3.43E-03	3.15E-01	4.14E+00	4.47E-02	4.10E+00	1.66E-01	1.79E-03	1.64E-01	---	---	---	---	---	---
																			Total Uranium Intakes for EU4	2.34E+00	1.15E-01	2.22E+00	2.45E+01	1.11E+00	2.34E+01	3.21E+00	7.41E-01	2.47E+00						
EU5:																																		
Building Materials	Uranium-234	0.47	1.54	0.00	0.001	0.005	0.000	0.07	0.24	0.00	48.9	160.4	0.0	---	---	---	---	---	---	2.26E-10	7.40E-10	0.00E+00	1.18E-08	3.87E-08	0.00E+00	8.02E-06	2.63E-05	0.00E+00	---	---	---	---	---	---
	Uranium-235	0.04	0.08	0.00	0.0001	0.0002	0.0000	0.006	0.012	0.000	3.8	8.0	0.0	---	---	---	---	---	---	5.01E-08	1.05E-07	0.00E+00	2.62E-06	5.48E-06	0.00E+00	1.78E-03	3.72E-03	0.00E+00	---	---	---	---	---	---
	Uranium-238	0.40	1.74	0.00	0.001	0.005	0.000	0.06	0.27	0.00	41.6	181.4	0.0	---	---	---	---	---	---	3.49E-06	1.52E-05	0.00E+00	1.83E-04	7.96E-04	0.00E+00	1.24E-01	5.41E-01	0.00E+00	---	---	---	---	---	---
																			Total Uranium Intakes for EU5	3.54E-06	1.53E-05	0.00E+00	1.85E-04	8.01E-04	0.00E+00	1.26E-01	5.44E-01	0.00E+00						
EU6:																																		
Building Materials	Uranium-234	4.19	1.54	2.65	0.012	0.005	0.008	0.64	0.24	0.41	436.0	160.4	275.6	---	---	---	---	---	---	2.01E-09	7.40E-10	1.27E-09	1.05E-07	3.87E-08	6.65E-08	7.15E-05	2.63E-05	4.52E-05	---	---	---	---	---	---
	Uranium-235	0.19	0.08	0.11	0.0005	0.0002	0.0003	0.028	0.012	0.017	19.3	8.0	11.3	---	---	---	---	---	---	2.52E-07	1.05E-07	1.47E-07	1.32E-05	5.48E-06	7.68E-06	8.94E-03	3.72E-03	5.22E-03	---	---	---	---	---	---
	Uranium-238	4.24	1.74	2.50	0.012	0.005	0.007	0.65	0.27	0.38	441.4	181.4	260.0	---	---	---	---	---	---	3.70E-05	1.52E-05	2.18E-05	1.94E-03	7.96E-04	1.14E-03	1.32E+00	5.41E-01	7.75E-01	---	---	---	---	---	---
Surface Soil	Uranium-234	66.00	0.78	65.07	2376	28	2343	20625	243	20334	5445	64	5368	---	---	---	---	---	---	3.90E-04	4.58E-06	3.84E-04	3.38E-03	3.98E-05	3.33E-03	8.93E-04	1.05E-05	8.80E-04	---	---	---	---	---	---
	Uranium-235	3.07	0.04	3.00	111	1	108	959	12	938	253	3	248	---	---	---	---	---	---	5.11E-02	6.14E-04	4.99E-02	4.43E-01	5.33E-03	4.33E-01	1.17E-01	1.41E-03	1.14E-01	---	---	---	---	---	---
	Uranium-238	67.60	0.82	66.54	2434	29	2395	21125	255	20794	5577	67	5490	---	---	---	---	---	---	7.25E+00	8.76E-02	7.14E+00	6.30E+01	7.61E-01	6.20E+01	1.66E+01	2.01E-01	1.64E+01	---	---	---	---	---	---
Total Soil	Uranium-234	57.22	0.71	56.51	---	---	---	---	---	---	4721	58	4662	---	---	---	---	---	---	---	---	---	---	---	---	7.74E-04	9.57E-06	7.65E-04	---	---	---	---	---	---
	Uranium-235	3.02	0.03	2.99	---	---	---	---	---	---	249	3	247	---	---	---	---	---	---	---	---	---	---	---	---	1.15E-01	1.27E-03	1.14E-01	---	---	---	---	---	---
	Uranium-238	59.78	0.74	59.04	---	---	---	---	---	---	4932	61	4871	---	---	---	---	---	---	---	---	---	---	---	---	1.47E+01	1.81E-01	1.45E+01	---	---	---	---	---	---
Sediment	Uranium-234	48.84	0.77	48.07	586	9	577	7631	120	7511	305	5	300	---	---	---	---	---	---	9.61E-05	1.51E-06	9.46E-05	1.25E-03	1.96E-05	1.23E-03	5.01E-05	7.85E-07	4.93E-05	---	---	---	---	---	---
	Uranium-235	2.63	0.05	2.58	31.6	0.6	31.0	411	8	403	16.4	0.3	16.1	---	---	---	---	---	---	1.46E-02	2.77E-04	1.43E-02	1.90E-01	3.61E-03	1.86E-01	7.59E-03	1.44E-04	7.45E-03	---	---	---	---	---	---
	Uranium-238	50.81	0.63	50.18	610	8	602	7939	98	7841	317.6	3.9	313.6	---	---	---	---	---	---	1.82E+00	2.25E-02	1.79E+00	2.37E+01	2.93E-01	2.34E+01	9.46E-01	1.17E-02	9.35E-01	---	---	---	---	---	---
																			Total Uranium Intakes for EU6	9.14E+00	1.11E-01	9.00E+00	8.73E+01	1.06E+00	8.60E+01	1.71E+01	7.39E-01	1.64E+01						
EU7:																																		
Building Materials	Uranium-234	5.94	1.54	4.40	0.017	0.005	0.013	0.91	0.24	0.67	617.8	160.4	457.4	---	---	---	---	---	---	2.85E-09	7.40E-10	2.11E-09	1.49E-07	3.87E-08	1.10E-07	1.01E-04	2.63E-05	7.50E-05	---	---	---	---	---	---
	Uranium-235	0.31	0.08	0.23	0.0009	0.0002	0.0007	0.047	0.012	0.036	32.2	8.0	24.2	---	---	---	---	---	---	4.19E-07	1.05E-07	3.15E-07	2.19E-05	5.48E-06	1.65E-05	1.49E-02	3.72E-03	1.12E-02	---	---	---	---	---	---
	Uranium-238	6.44	1.74	4.70	0.019	0.005	0.014	0.99	0.27	0.72	669.8	181.4	488.4	---	---	---	---	---	---	5.62E-05	1.52E-05	4.10E-05	2.94E-03	7.96E-04	2.14E-03	2.00E+00	5.41E-01	1.46E+00	---	---	---	---	---	---
Surface Soil	Uranium-234	18514.00	0.78	18513.22	666504	28	666476	5785625	243	5785383	1527405	64	1527341	---	---	---	---	---	---	1.09E-01	4.58E-06	1.09E-01	9.49E-01	3.98E-05	9.49E-01	2.50E-01	1.05E-05	2.50E-01	---	---	---	---	---	---
	Uranium-235	1022.00	0.04	1021.96	36792.0	1.3	36790.7	319375	12	319363	84315.0	3.0	84312.0	---	---	---	---	---	---	1.70E+01	6.14E-04	1.70E+01	1.48E+02	5.33E-03	1.48E+02	3.90E+01	1.41E-03	3.90E+01	---	---	---	---	---	---
	Uranium-238	17919.00	0.82	17918.18	645084	29	645055	5599688	255	5599432	1478318	67	1478250	---	---	---	---	---	---	1.92E+03	8.76E-02	1.92E+03	1.67E+04	7.61E-01	1.67E+04	4.41E+03	2.01E-01	4.41E+03	---	---	---	---	---	---
Total Soil	Uranium-234	6035.00	0.71	6034.29	---	---	---	---	---	---	497888	58	497829	---	---	---	---	---	---	---	---	---	---	---	---	8.17E-02	9.57E-06	8.16E-02	---	---	---	---	---	---
	Uranium-235	329.40	0.03	329.37	---	---	---	---	---	---	27175.5	2.7	27172.8	---	---	---	---	---	---	---	---	---	---	---	---	1.26E+01	1.27E-03	1.26E+01	---	---	---	---	---	---
	Uranium-238	5722.00	0.74	5721.26	---	---	---	---	---	---	472065	61	472004	---	---	---	---	---	---	---	---	---	---	---	---	1.41E+03	1.81E-01	1.41E+03	---	---	---	---	---	---
Sediment	Uranium-234	199.00	0.77	198.23	2388	9	2379	31094	120	30974	1244	5	1239	---	---	---	---	---	---	3.92E-04	1.51E-06	3.90E-04	5.10E-03	1.96E-05	5.08E-03	2.04E-04	7.85E-07	2.03E-04	---	---	---	---	---	---
	Uranium-235	11.40	0.05	11.35	136.8	0.6	136.2	1781	8	1773	71.3	0.3	70.9	---	---	---	---	---	---	6.32E-02	2.77E-04	6.29E-02	8.23E-01	3.61E-03	8.19E-01	3.29E-02	1.44E-04	3.28E-02	---	---	---	---	---	---
	Uranium-238	224.00	0.63	223.37	2688	8	2680	35000	98	34902	1400.0	3.9	1396.1	---	---	---	---	---	---	8.01E+00	2.25E-02	7.99E+00	1.04E+02	2.93E-01	1.04E+02	4.17E+00	1.17E-02	4.16E+00	---	---	---	---	---	---
Surface Water	Uranium-234	12.90	0.17	12.73	155	2	153	2016	26	1990	80.6	1.0	79.6	---	---	---	---	---	---	2.54E-05	3.27E-07	2.51E-05	3.31E-04	4.25E-06	3.26E-04	1.32E-05	1.70E-07	1.31E-05	---	---	---	---	---	---
	Uranium-235	0.60	0.04	0.56	7.20	0.48	6.72	93.8	6.3	87.5	3.75	0.25	3.50	---	---	---	---	---	---	3.33E-03	2.22E-04	3.10E-03	4.33E-02	2.89E-03	4.04E-02	1.73E-03	1.16E-04	1.62E-03	---	---	---	---	---	---
	Uranium-238	13.20	0.10	13.10	158	1	157	2063	15	2048	82.5	0.6	81.9	---	---	---	---	---	---	4.72E-01	3.43E-03	4.69E-01	6.15E+00	4.47E-02	6.10E+00	2.46E-01	1.79E-03	2.44E-01	---	---	---	---	---	---
																			Total Uranium Intakes for EU7	1.95E+03	1.15E-01	1.95E+03	1.69E+04	1.11E+00	1.69E+04	1.43E+03	7.41E-01	1.43E+03						

TABLE 6-11
URANIUM INGESTION INTAKES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Ingestion Intakes (pCi															Ingestion Intakes (mg														
					Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child	Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU8:																																		
Building Materials	Uranium-234	2110.00	1.54	2108.46	6.178	0.005	6.174	323.09	0.24	322.86	219440.0	160.4	219279.6	---	---	---	---	---	---	1.01E-06	7.40E-10	1.01E-06	5.30E-05	3.87E-08	5.29E-05	3.60E-02	2.63E-05	3.60E-02	---	---	---	---	---	---
	Uranium-235	83.94	0.08	83.86	0.2458	0.0002	0.2455	12.853	0.012	12.841	8729.8	8.0	8721.7	---	---	---	---	---	---	1.14E-04	1.05E-07	1.13E-04	5.94E-03	5.48E-06	5.93E-03	4.03E+00	3.72E-03	4.03E+00	---	---	---	---	---	---
	Uranium-238	2169.00	1.74	2167.26	6.351	0.005	6.346	332.13	0.27	331.86	225576.0	181.4	225394.6	---	---	---	---	---	---	1.89E-02	1.52E-05	1.89E-02	9.90E-01	7.96E-04	9.89E-01	6.72E+02	5.41E-01	6.72E+02	---	---	---	---	---	---
Surface Soil	Uranium-234	12.17	0.78	11.39	438	28	410	3803	243	3561	1004	64	940	---	---	---	---	---	---	7.19E-05	4.58E-06	6.73E-05	6.24E-04	3.98E-05	5.84E-04	1.65E-04	1.05E-05	1.54E-04	---	---	---	---	---	---
	Uranium-235	0.51	0.04	0.47	18.4	1.3	17.0	159	12	148	42.1	3.0	39.0	---	---	---	---	---	---	8.48E-03	6.14E-04	7.87E-03	7.36E-02	5.33E-03	6.83E-02	1.94E-02	1.41E-03	1.80E-02	---	---	---	---	---	---
	Uranium-238	11.95	0.82	11.13	430	29	401	3734	255	3479	986	67	918	---	---	---	---	---	---	1.28E+00	8.76E-02	1.19E+00	1.11E+01	7.61E-01	1.04E+01	2.94E+00	2.01E-01	2.74E+00	---	---	---	---	---	---
Total Soil	Uranium-234	8.03	0.71	7.32	---	---	---	---	---	---	662	58	604	---	---	---	---	---	---	---	---	---	---	---	---	1.09E-04	9.57E-06	9.90E-05	---	---	---	---	---	---
	Uranium-235	0.35	0.03	0.32	---	---	---	---	---	---	28.8	2.7	26.0	---	---	---	---	---	---	---	---	---	---	---	---	1.33E-02	1.27E-03	1.20E-02	---	---	---	---	---	---
	Uranium-238	7.82	0.74	7.08	---	---	---	---	---	---	645	61	584	---	---	---	---	---	---	---	---	---	---	---	---	1.92E+00	1.81E-01	1.74E+00	---	---	---	---	---	---
Sediment	Uranium-234	21.96	0.77	21.19	264	9	254	3431	120	3312	137	5	132	---	---	---	---	---	---	4.32E-05	1.51E-06	4.17E-05	5.63E-04	1.96E-05	5.43E-04	2.25E-05	7.85E-07	2.17E-05	---	---	---	---	---	---
	Uranium-235	1.05	0.05	1.00	12.6	0.6	12.0	165	8	157	6.58	0.31	6.27	---	---	---	---	---	---	5.84E-03	2.77E-04	5.56E-03	7.60E-02	3.61E-03	7.24E-02	3.04E-03	1.44E-04	2.90E-03	---	---	---	---	---	---
	Uranium-238	22.44	0.63	21.81	269	8	262	3506	98	3408	140.3	3.9	136.3	---	---	---	---	---	---	8.02E-01	2.25E-02	7.80E-01	1.04E+01	2.93E-01	1.02E+01	4.18E-01	1.17E-02	4.06E-01	---	---	---	---	---	---
																			Total Uranium Intakes for EU8	2.12E+00	1.11E-01	2.01E+00	2.27E+01	1.06E+00	2.17E+01	6.79E+02	7.39E-01	6.78E+02						
EU9:																																		
Building Materials	Uranium-234	0.09	1.54	0.00	0.000	0.005	0.000	0.01	0.24	0.00	9.7	160.4	0.0	---	---	---	---	---	---	4.47E-11	7.40E-10	0.00E+00	2.34E-09	3.87E-08	0.00E+00	1.59E-06	2.63E-05	0.00E+00	---	---	---	---	---	---
	Uranium-235	0.03	0.08	0.00	0.0001	0.0002	0.0000	0.005	0.012	0.000	3.54	8.05	0.00	---	---	---	---	---	---	4.60E-08	1.05E-07	0.00E+00	2.41E-06	5.48E-06	0.00E+00	1.63E-03	3.72E-03	0.00E+00	---	---	---	---	---	---
	Uranium-238	0.12	1.74	0.00	0.000	0.005	0.000	0.02	0.27	0.00	12.3	181.4	0.0	---	---	---	---	---	---	1.03E-06	1.52E-05	0.00E+00	5.38E-05	7.96E-04	0.00E+00	3.66E-02	5.41E-01	0.00E+00	---	---	---	---	---	---
Surface Soil	Uranium-234	6.72	0.78	5.94	242	28	214	2100	243	1858	554	64	490	---	---	---	---	---	---	3.97E-05	4.58E-06	3.51E-05	3.44E-04	3.98E-05	3.05E-04	9.09E-05	1.05E-05	8.04E-05	---	---	---	---	---	---
	Uranium-235	0.30	0.04	0.26	10.8	1.3	9.5	94	12	82	24.8	3.0	21.7	---	---	---	---	---	---	4.99E-03	6.14E-04	4.38E-03	4.33E-02	5.33E-03	3.80E-02	1.14E-02	1.41E-03	1.00E-02	---	---	---	---	---	---
	Uranium-238	6.58	0.82	5.76	237	29	207	2056	255	1801	543	67	475	---	---	---	---	---	---	7.06E-01	8.76E-02	6.18E-01	6.13E+00	7.61E-01	5.37E+00	1.62E+00	2.01E-01	1.42E+00	---	---	---	---	---	---
Total Soil	Uranium-234	6.72	0.71	6.01	---	---	---	---	---	---	554	58	496	---	---	---	---	---	---	---	---	---	---	---	---	9.09E-05	9.57E-06	8.14E-05	---	---	---	---	---	---
	Uranium-235	0.30	0.03	0.27	---	---	---	---	---	---	24.8	2.7	22.0	---	---	---	---	---	---	---	---	---	---	---	---	1.14E-02	1.27E-03	1.02E-02	---	---	---	---	---	---
	Uranium-238	6.58	0.74	5.84	---	---	---	---	---	---	543	61	482	---	---	---	---	---	---	---	---	---	---	---	---	1.62E+00	1.81E-01	1.44E+00	---	---	---	---	---	---
																			Total Uranium Intakes for EU9	7.11E-01	8.83E-02	6.23E-01	6.17E+00	7.67E-01	5.41E+00	1.67E+00	7.27E-01	1.45E+00						
EU10:																																		
Surface Soil	Uranium-234	13.86	0.78	13.08	499	28	471	4331	243	4089	1143	64	1079	14553	814.8	13738.2	5821	326	5495	8.18E-05	4.58E-06	7.72E-05	7.10E-04	3.98E-05	6.71E-04	1.88E-04	1.05E-05	1.77E-04	2.39E-03	1.34E-04	2.25E-03	9.55E-04	5.35E-05	9.01E-04
	Uranium-235	0.48	0.04	0.44	17.2	1.3	15.9	149	12	138	39.4	3.0	36.4	502	39	463	201	15	185	7.95E-03	6.14E-04	7.34E-03	6.90E-02	5.33E-03	6.37E-02	1.82E-02	1.41E-03	1.68E-02	2.32E-01	1.79E-02	2.14E-01	9.28E-02	7.16E-03	8.56E-02
	Uranium-238	15.27	0.82	14.45	550	29	520	4772	255	4517	1260	67	1192	16034	858	15176	6413	343	6070	1.64E+00	8.76E-02	1.55E+00	1.42E+01	7.61E-01	1.35E+01	3.75E+00	2.01E-01	3.55E+00	4.78E+01	2.56E+00	4.52E+01	1.91E+01	1.02E+00	1.81E+01
Total Soil	Uranium-234	11.14	0.71	10.43	---	---	---	---	---	---	919	58	861	11697	742	10955	4679	297	4382	---	---	---	---	---	---	1.51E-04	9.57E-06	1.41E-04	1.92E-03	1.22E-04	1.80E-03	7.67E-04	4.87E-05	7.19E-04
	Uranium-235	0.32	0.03	0.29	---	---	---	---	---	---	26.3	2.7	23.6	335	35	300	134	14	120	---	---	---	---	---	---	1.22E-02	1.27E-03	1.09E-02	1.55E-01	1.62E-02	1.39E-01	6.19E-02	6.46E-03	5.54E-02
	Uranium-238	11.85	0.74	11.11	---	---	---	---	---	---	978	61	917	12442.5	774.9	11667.6	4977	310	4667	---	---	---	---	---	---	2.91E+00	1.81E-01	2.73E+00	3.71E+01	2.31E+00	3.48E+01	1.48E+01	9.24E-01	1.39E+01
Groundwater	Uranium-234	4.05	1.00	3.05	---	---	---	---	---	---	202	50	152	97735	24150	73585	4249	1050	3199	---	---	---	---	---	---	3.32E-05	8.20E-06	2.50E-05	1.60E-02	3.96E-03	1.21E-02	6.97E-04	1.72E-04	5.25E-04
	Uranium-235	0.21	0.09	0.12	---	---	---	---	---	---	10.45	4.25	6.20	5047	2053	2995	219	89	130	---	---	---	---	---	---	4.83E-03	1.96E-03	2.86E-03	2.33E+00	9.48E-01	1.38E+00	1.01E-01	4.12E-02	6.02E-02
	Uranium-238	4.43	0.95	3.48	---	---	---	---	---	---	222	48	174	106985	22943	84042	4652	998	3654	---	---	---	---	---	---	6.60E-01	1.42E-01	5.19E-01	3.19E+02	6.84E+01	2.50E+02	1.39E+01	2.97E+00	1.09E+01
Produce**	Uranium-234	13.86	0.78	13.08	---	---	---	---	---	---	---	---	---	1.31	0.07	1.24	0.058	0.003	0.055	---	---	---	---	---	---	---	---	---	2.15E-07	1.20E-08	2.03E-07	9.55E-09	5.35E-10	9.01E-09
	Uranium-235	0.48	0.04	0.44	---	---	---	---	---	---	---	---	---	0.05	0.00	0.04	0.002	0.000	0.002	---	---	---	---	---	---	---	---	---	2.09E-05	1.61E-06	1.93E-05	9.28E-07	7.16E-08	8.56E-07
	Uranium-238	15.27	0.82	14.45	---	---	---	---	---	---	---	---	---	1.44	0.08	1.37	0.064	0.003	0.061	---	---	---	---	---	---	---	---	---	4.30E-03	2.30E-04	4.07E-03	1.91E-04	1.02E-05	1.81E-04
																			Total Uranium Intakes for EU10	1.65E+00	8.83E-02	1.56E+00	1.43E+01	7.66E-01	1.35E+01	3.59E+00	3.26E-01	3.26E+00	3.58E+02	7.16E+01	2.87E+02	2.89E+01	3.94E+00	2.49E+01
EU11:																																		
Surface Soil	Uranium-234	49.14	0.78	48.36	1769	28	1741	15356	243	15114	4054	64	3990	51597	814.8	50782.2	20639	326	20313	2.90E-04	4.58E-06	2.86E-04	2.52E-03	3.98E-05	2.48E-03	6.65E-04	1.05E-05	6.54E-04	8.46E-03	1.34E-04	8.33E-03	3.38E-03	5.35E-05	3.33E-03
	Uranium-235	2.33	0.04	2.29	83.8	1.3	82.4	727	12	716	192.0	3.0	188.9	2443	39	2405	977	15	962	3.87E-02	6.14E-04	3.81E-02	3.36E-01	5.33E-03	3.31E-01	8.87E-02	1.41E-03	8.73E-02	1.13E+00	1.79E-02	1.11E+00	4.52E-01	7.16E-03	4.44E-01
	Uranium-238	49.45	0.82	48.63	1780	29	1751	15453	255	15198	4080	67	4012	51923	858	51065	20769	343	20426	5.30E+00	8.76E-02	5.22E+00	4.61E+01	7.61E-01	4.53E+01	1.22E+01	2.01E-01	1.20E+01	1.55E+02	2.56E+00	1.52E+02	6.19E+01	1.02E+00	6.09E+01
Total Soil	Uranium-234	32.31	0.71	31.60	---	---	---	---	---	---	2666	58	2607	33926	742	33183	13570	297	13273	---	---	---	---	---	---	4.37E-04	9.57E-06	4.28E-04	5.56E-03	1.22E-04	5.44E-03	2.23E-03	4.87E-05	2.18E-03
	Uranium-235	1.00	0.03	0.97	---	---	---	---	---	---	82.6	2.7	79.8	1051	35	1016	420	14	406	---	---	---	---	---	---	3.82E-02	1.27E-03	3.69E-02	4.86E-01	1.62E-02	4.69E-01	1.94E-01	6.46E-03	1.88E-01
	Uranium-238	35.58	0.74	34.84	---	---	---	---	---	---	2935	61	2874	37359	774.9	36584.1	14944	310	14634	---	---	---	---	---	---	8.75E+00	1.81E-01	8.57E+00	1.11E+02	2.31E+00	1.09E+02	4.45E+01	9.24E-01	4.36E+01
Groundwater	Uranium-234	17.33	1.00	16.33	---	---	---	---	---	---	867	50	817	418520	24150	394370	18197	1050	17147	---	---	---	---	---	---	1.42E-04	8.20E-06	1.34E-04	6.86E-02	3.96E-03	6.47E-02	2.98E-03	1.72E-04	2.81E-03
	Uranium-235	0.66	0.09	0.57	---	---	---	---	---	---	32.9	4.3	28.7	15891	2053	13838	691	89	602	---	---	---	---	---	---	1.52E-02	1.96E-03	1.32E-02	7.34E+00	9.48E-01	6.39E+00	3.19E-01	4.12E-02	2.78E-01
	Uranium-238	15.64	0.95	14.69	---	---	---	---	---	---	782	48	735	377706	22943	354764	16422	998	15425	---	---	---	---	---	---	2.33E+00	1.42E-01	2.19E+00	1.13E+03	6.84E+01	1.06E+03	4.89E+01	2.97E+00	4.60E+01
Sediment	Uranium-234	36.30	0.77	35.53	436	9	426	5672	120	5552	227	5	222	---	---	---	---	---	---	7.14E-05	1.51E-06	6.99E-05	9.30E-04	1.96E-05	9.11E-04	3.72E-05	7.85E-07	3.64E-05	---	---	---	---	---	---
	Uranium-235	2.17	0.05	2.12	26.0	0.6	25.4	339	8	331	13.6	0.3	13.3	---	---	---	---	---	---	1.20E-02	2.77E-04	1.18E-02	1.57E-01	3.61E-03	1.53E-01	6.27E-03	1.44E-04	6.12E-03	---	---	---	---	---	---
	Uranium-238	41.00	0.63	40.37	492	8	484	6406	98	6308	256	4	252	---	---	---	---	---	---	1.47E+00	2.25E-02	1.44E+00	1.91E+01	2.93E-01	1.88E+01	7.64E-01	1.17E-02	7.52E-01	---	---	---	---	---	---
Surface Water	Uranium-234	33.30	0.17	33.13	400	2	398	5203	26	5177	208	1	207	---	---	---	---	---	---	6.55E-05	3.27E-07	6.52E-05	8.53E-04	4.25E-06	8.49E-04	3.41E-05	1.70E-07	3.40E-05	---	---	---	---	---	---
	Uranium-235	1.54	0.04	1.50	18.5	0.5	18.0	240	6	234	9.62	0.25	9.37	---	---	---	---	---	---	8.53E-03	2.22E-04	8.31E-03	1.11E-01	2.89E-03	1.08E-01	4.44E-03	1.16E-04	4.33E-03	---	---	---	---	---	---
	Uranium-238	32.80	0.10	32.70	394	1	392	5125	15	5110	205	1	204	---	---	---	---	---	---	1.17E+00	3.43E-03	1.17E+00	1.53E+01	4.47E-02	1.52E+01	6.11E-01	1.79E-03	6.09E-01	---	---	---	---	---	---
Produce	Uranium-234	49.14	0.78	48.36	---	---	---	---	---	---	---	---	---	4.64	0.07	4.57	0.206	0.003	0.203	---	---	---	---	---	---	---	---	---	7.62E-07	1.20E-08	7.50E-07	3.38E-08	5.35E-10	3.33E-08
	Uranium-235	2.33	0.04	2.29	---	---	---	---	---	---	---	---	---	0.22	0.00	0.22	0.010	0.000	0.010	---	---	---	---	---	---	---	---	---	1.02E-04	1.61E-06	1.00E-04	4.52E-06	7.16E-08	4.44E-06
	Uranium-238	49.45	0.82	48.63	---	---	---	---	---	---	---	---	---	4.67	0.08	4.60	0.208	0.003	0.204	---	---	---	---	---	---	---	---	---	1.39E-02	2.30E-04	1.37E-02	6.19E-04	1.02E-05	6.09E-04
																			Total Uranium Intakes for EU11	8.00E+00	1.15E-01	7.89E+00	8.10E+01	1.11E+00	7.99E+01	1.25E+01	3.40E-01	1.22E+01	1.24E+03	7.16E+01	1.17E+03	9.40E+01	3.94E+00	9.00E+01
EU12:																																		
Surface Soil	Uranium-234	10.73	0.78	9.95	386	28	358	3353	243	3111	885	64	821	11266.5	814.8	10451.7	4507	326	4181	6.33E-05	4.58E-06	5.88E-05	5.50E-04	3.98E-05	5.10E-04	1.45E-04	1.05E-05	1.35E-04	1.85E-03	1.34E-04	1.71E-03	7.39E-04	5.35E-05	6.86E-04
	Uranium-235	0.58	0.04	0.55	21.0	1.3	19.6	182	12	170	48.0	3.0	45.0	611	39	572	244	15	229	9.68E-03	6.14E-04	9.07E-03	8.40E-02	5.33E-03	7.87E-02	2.22E-02	1.41E-03	2.08E-02	2.82E-01	1.79E-02	2.64E-01	1.13E-01	7.16E-03	1.06E-01
	Uranium-238	11.28	0.82	10.46	406	29	377	3525	255	3270	931	67	863	11844	858	10986	4738	343	4394	1.21E+00	8.76E-02	1.12E+00	1.05E+01	7.61E-01	9.74E+00	2.77E+00	2.01E-01	2.57E+00	3.53E+01	2.56E+00	3.27E+01	1.41E+01	1.02E+00	1.31E+01
Total Soil	Uranium-234	21.94	0.71	21.23	---	---	---	---	---	---	1810	58	1752	23037	742	22295	9215	297	8918	---	---	---	---	---	---	2.97E-04	9.57E-06	2.87E-04	3.78E-03	1.22E-04	3.66E-03	1.51E-03	4.87E-05	1.46E-03
	Uranium-235	0.97	0.03	0.94	---	---	---	---	---	---	80.4	2.7	77.6	1023	35	988	409	14	395	---	---	---	---	---	---	3.71E-02	1.27E-03	3.59E-02	4.72E-01	1.62E-02	4.56E-01	1.89E-01	6.46E-03	1.83E-01
	Uranium-238	22.75	0.74	22.01	---	---	---	---	---	---	1877	61	1816	23887.5	774.9	23112.6	9555	310	9245	---	---	---	---	---	---	5.59E+00	1.81E-01	5.41E+00	7.12E+01	2.31E+00	6.89E+01	2.85E+01	9.24E-01	2.76E+01
Groundwater	Uranium-234	11.83	1.00	10.83	---	---	---	---	---	---	592	50	542	285695	24150	261545	12422	1050	11372	---	---	---	---	---	---	9.70E-05	8.20E-06	8.88E-05	4.69E-02	3.96E-03	4.29E-02	2.04E-03	1.72E-04	1.86E-03
	Uranium-235	0.62	0.09	0.53	---	---	---	---	---	---	30.9	4.3	26.7	14925	2053	12872	649	89	560	---	---	---	---	---	---	1.43E-02	1.96E-03	1.23E-02	6.90E+00	9.48E-01	5.95E+00	3.00E-01	4.12E-02	2.59E-01
	Uranium-238	13.90	0.95	12.95	---	---	---	---	---	---	695	48	648	335685	22943	312743	14595	998	13598	---	---	---	---	---	---	2.07E+00	1.42E-01	1.93E+00	1.00E+03	6.84E+01	9.32E+02	4.35E+01	2.97E+00	4.05E+01
Sediment	Uranium-234	2.47	0.77	1.70	30	9	20	386	120	266	15	5	11	---	---	---	---	---	---	4.86E-06	1.51E-06	3.35E-06	6.33E-05	1.96E-05	4.37E-05	2.53E-06	7.85E-07	1.75E-06	---	---	---	---	---	---
	Uranium-235	0.14	0.05	0.09	1.7	0.6	1.1	22	8	14	0.9	0.3	0.6	---	---	---	---	---	---	7.65E-04	2.77E-04	4.88E-04	9.96E-03	3.61E-03	6.35E-03	3.98E-04	1.44E-04	2.54E-04	---	---	---	---	---	---
	Uranium-238	2.76	0.63	2.13	33	8	26	431	98	332	17.2	3.9	13.3	---	---	---	---	---	---	9.86E-02	2.25E-02	7.61E-02	1.28E+00	2.93E-01	9.90E-01	5.13E-02	1.17E-02	3.96E-02	---	---	---	---	---	---
Produce	Uranium-234	10.73	0.78	9.95	---	---	---	---	---	---	---	---	---	1.01	0.07	0.94	0.045	0.003	0.042	---	---	---	---	---	---	---	---	---	1.66E-07	1.20E-08	1.54E-07	7.39E-09	5.35E-10	6.86E-09
	Uranium-235	0.58	0.04	0.55	---	---	---	---	---	---	---	---	---	0.05	0.00	0.05	0.002	0.000	0.002	---	---	---	---	---	---	---	---	---	2.54E-05	1.61E-06	2.38E-05	1.13E-06	7.16E-08	1.06E-06
	Uranium-238	11.28	0.82	10.46	---	---	---	---	---	---	---	---	---	1.07	0.08	0.99	0.047	0.003	0.044	---	---	---	---	---	---	---	---	---	3.18E-03	2.30E-04	2.95E-03	1.41E-04	1.02E-05	1.31E-04
																			Total Uranium Intakes for EU12	1.32E+00	1.11E-01	1.21E+00	1.19E+01	1.06E+00	1.08E+01	7.77E+00	3.38E-01	7.43E+00	1.08E+03	7.16E+01	1.01E+03	7.25E+01	3.94E+00	6.85E+01
EU13:																																		
Surface Soil	Uranium-234	31.44	0.78	30.66	1132	28	1104	9825	243	9583	2594	64	2530	33012	814.8	32197.2	13205	326	12879	1.86E-04	4.58E-06	1.81E-04	1.61E-03	3.98E-05	1.57E-03	4.25E-04	1.05E-05	4.15E-04	5.41E-03	1.34E-04	5.28E-03	2.17E-03	5.35E-05	2.11E-03
	Uranium-235	1.57	0.04	1.53	56.3	1.3	55.0	489	12	478	129.1	3.0	126.1	1643	39	1605	657	15	642	2.60E-02	6.14E-04	2.54E-02	2.26E-01	5.33E-03	2.21E-01	5.96E-02	1.41E-03	5.82E-02	7.59E-01	1.79E-02	7.41E-01	3.04E-01	7.16E-03	2.97E-01
	Uranium-238	32.22	0.82	31.40	1160	29	1131	10069	255	9813	2658	67	2591	33831	858	32973	13532	343	13189	3.46E+00	8.76E-02	3.37E+00	3.00E+01	7.61E-01	2.92E+01	7.92E+00	2.01E-01	7.72E+00	1.01E+02	2.56E+00	9.83E+01	4.03E+01	1.02E+00	3.93E+01
Total Soil	Uranium-234	63.98	0.71	63.27	---	---	---	---	---	---	5278	58	5220	67179	742	66437	26872	297	26575	---	---	---	---	---	---	8.66E-04	9.57E-06	8.56E-04	1.10E-02	1.22E-04	1.09E-02	4.41E-03	4.87E-05	4.36E-03
	Uranium-235	2.67	0.03	2.63	---	---	---	---	---	---	219.9	2.7	217.1	2798	35	2763	1119	14	1105	---	---	---	---	---	---	1.02E-01	1.27E-03	1.00E-01	1.29E+00	1.62E-02	1.28E+00	5.17E-01	6.46E-03	5.11E-01
	Uranium-238	58.99	0.74	58.25	---	---	---	---	---	---	4867	61	4806	61939.5	774.9	61164.6	24776	310	24466	---	---	---	---	---	---	1.45E+01	1.81E-01	1.43E+01	1.85E+02	2.31E+00	1.82E+02	7.38E+01	9.24E-01	7.29E+01
Groundwater	Uranium-234	14.77	1.00	13.77	---	---	---	---	---	---	739	50	689	356696	24150	332546	15509	1050	14459	---	---	---	---	---	---	1.21E-04	8.20E-06	1.13E-04	5.85E-02	3.96E-03	5.45E-02	2.54E-03	1.72E-04	2.37E-03
	Uranium-235	0.73	0.09	0.65	---	---	---	---	---	---	36.5	4.3	32.3	17630	2053	15577	767	89	677	---	---	---	---	---	---	1.69E-02	1.96E-03	1.49E-02	8.14E+00	9.48E-01	7.20E+00	3.54E-01	4.12E-02	3.13E-01
	Uranium-238	12.99	0.95	12.04	---	---	---	---	---	---	650	48	602	313709	22943	290766	13640	998	12642	---	---	---	---	---	---	1.94E+00	1.42E-01	1.79E+00	9.35E+02	6.84E+01	8.66E+02	4.06E+01	2.97E+00	3.77E+01
Sediment	Uranium-234	19.70	0.77	18.93	236	9	227	3078	120	2958	123	5	118	---	---	---	---	---	---	3.88E-05	1.51E-06	3.73E-05	5.05E-04	1.96E-05	4.85E-04	2.02E-05	7.85E-07	1.94E-05	---	---	---	---	---	---
	Uranium-235	1.02	0.05	0.97	12.2	0.6	11.6	159	8	152	6.4	0.3	6.1	---	---	---	---	---	---	5.65E-03	2.77E-04	5.38E-03	7.36E-02	3.61E-03	7.00E-02	2.95E-03	1.44E-04	2.80E-03	---	---	---	---	---	---
	Uranium-238	19.20	0.63	18.57	230	8	223	3000	98	2902	120.0	3.9	116.1	---	---	---	---	---	---	6.87E-01	2.25E-02	6.64E-01	8.94E+00	2.93E-01	8.65E+00	3.58E-01	1.17E-02	3.46E-01	---	---	---	---	---	---
Produce	Uranium-234	31.44	0.78	30.66	---	---	---	---	---	---	---	---	---	2.97	0.07	2.90	0.132	0.003	0.129	---	---	---	---	---	---	---	---	---	4.87E-07	1.20E-08	4.75E-07	2.17E-08	5.35E-10	2.11E-08
	Uranium-235	1.57	0.04	1.53	---	---	---	---	---	---	---	---	---	0.15	0.00	0.14	0.007	0.000	0.006	---	---	---	---	---	---	---	---	---	6.83E-05	1.61E-06	6.67E-05	3.04E-06	7.16E-08	2.97E-06
	Uranium-238	32.22	0.82	31.40	---	---	---	---	---	---	---	---	---	3.04	0.08	2.97	0.135	0.003	0.132	---	---	---	---	---	---	---	---	---	9.07E-03	2.30E-04	8.84E-03	4.03E-04	1.02E-05	3.93E-04
																			Total Uranium Intakes for EU13	4.18E+00	1.11E-01	4.06E+00	3.92E+01	1.06E+00	3.82E+01	1.69E+01	3.38E-01	1.66E+01	1.13E+03	7.16E+01	1.06E+03	1.15E+02	3.94E+00	1.11E+02

TABLE 6-11
URANIUM INGESTION INTAKES FOR RECEPTORS IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPC	Gross EPC (pCi/g) or (pCi/L)	Background (pCi/g) or (pCi/L)	Net EPC (pCi/g) or (pCi/L)	Ingestion Intakes (pCi															Ingestion Intakes (mg														
					Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child	Gross Juvenile Trespasser	Background Juvenile Trespasser	Net Juvenile Trespasser	Gross Onsite Worker	Background Onsite Worker	Net Onsite Worker	Gross Construction Worker	Background Construction Worker	Net Construction Worker	Gross Resident - Adult	Background Resident - Adult	Net Resident - Adult	Gross Resident - Child	Background Resident - Child	Net Resident - Child
EU14:																																		
Surface Soil	Uranium-234	1.44	0.78	0.66	52	28	24	450	243	208	119	64	55	1512	814.8	697.2	605	326	279	8.50E-06	4.58E-06	3.92E-06	7.38E-05	3.98E-05	3.40E-05	1.95E-05	1.05E-05	8.98E-06	2.48E-04	1.34E-04	1.14E-04	9.92E-05	5.35E-05	4.57E-05
	Uranium-235	0.11	0.04	0.08	4.1	1.3	2.8	36	12	24	9.4	3.0	6.4	120	39	81	48	15	32	1.90E-03	6.14E-04	1.28E-03	1.65E-02	5.33E-03	1.11E-02	4.35E-03	1.41E-03	2.94E-03	5.53E-02	1.79E-02	3.74E-02	2.21E-02	7.16E-03	1.50E-02
	Uranium-238	1.70	0.82	0.88	61	29	32	532	255	276	140	67	73	1786	858	928	714	343	371	1.82E-01	8.76E-02	9.48E-02	1.58E+00	7.61E-01	8.23E-01	4.18E-01	2.01E-01	2.17E-01	5.32E+00	2.56E+00	2.77E+00	2.13E+00	1.02E+00	1.11E+00
Total Soil	Uranium-234	3.03	0.71	2.33	---	---	---	---	---	---	250	58	192	3184	742	2441	1273	297	977	---	---	---	---	---	---	4.10E-05	9.57E-06	3.15E-05	5.22E-04	1.22E-04	4.00E-04	2.09E-04	4.87E-05	1.60E-04
	Uranium-235	0.17	0.03	0.14	---	---	---	---	---	---	13.9	2.7	11.2	177	35	142	71	14	57	---	---	---	---	---	---	6.44E-03	1.27E-03	5.17E-03	8.20E-02	1.62E-02	6.58E-02	3.28E-02	6.46E-03	2.63E-02
	Uranium-238	3.22	0.74	2.48	---	---	---	---	---	---	265	61	205	3378.9	774.9	2604	1352	310	1042	---	---	---	---	---	---	7.91E-01	1.81E-01	6.10E-01	1.01E+01	2.31E+00	7.76E+00	4.03E+00	9.24E-01	3.10E+00
Groundwater	Uranium-234	71.84	1.00	70.84	---	---	---	---	---	---	3592	50	3542	1734936	24150	1710786	75432	1050	74382	---	---	---	---	---	---	5.89E-04	8.20E-06	5.81E-04	2.85E-01	3.96E-03	2.81E-01	1.24E-02	1.72E-04	1.22E-02
	Uranium-235	3.45	0.09	3.37	---	---	---	---	---	---	173	4	168	83414	2053	81361	3627	89	3537	---	---	---	---	---	---	7.98E-02	1.96E-03	7.78E-02	3.85E+01	9.48E-01	3.76E+01	1.68E+00	4.12E-02	1.63E+00
	Uranium-238	70.84	0.95	69.89	---	---	---	---	---	---	3542	48	3495	1710786	22943	1687844	74382	998	73385	---	---	---	---	---	---	1.06E+01	1.42E-01	1.04E+01	5.10E+03	6.84E+01	5.03E+03	2.22E+02	2.97E+00	2.19E+02
Produce	Uranium-234	1.44	0.78	0.66	---	---	---	---	---	---	---	---	---	0.14	0.07	0.06	0.006	0.003	0.003	---	---	---	---	---	---	---	---	---	2.23E-08	1.20E-08	1.03E-08	9.92E-10	5.35E-10	4.57E-10
	Uranium-235	0.11	0.04	0.08	---	---	---	---	---	---	---	---	---	0.01	0.00	0.01	0.0005	0.0002	0.0003	---	---	---	---	---	---	---	---	---	4.98E-06	1.61E-06	3.37E-06	2.21E-07	7.16E-08	1.50E-07
	Uranium-238	1.70	0.82	0.88	---	---	---	---	---	---	---	---	---	0.16	0.08	0.08	0.007	0.003	0.004	---	---	---	---	---	---	---	---	---	4.79E-04	2.30E-04	2.49E-04	2.13E-05	1.02E-05	1.11E-05
																			Total Uranium Intakes for EU14	1.84E-01	8.83E-02	9.61E-02	1.60E+00	7.66E-01	8.34E-01	1.14E+01	3.26E-01	1.11E+01	5.15E+03	7.16E+01	5.08E+03	2.27E+02	3.94E+00	2.23E+02
EU15:																																		
Surface Soil	Uranium-234	1.86	0.78	1.08	67	28	39	580	243	337	153	64	89	1947.75	814.8	1132.95	779	326	453	1.10E-05	4.58E-06	6.37E-06	9.51E-05	3.98E-05	5.53E-05	2.51E-05	1.05E-05	1.46E-05	3.19E-04	1.34E-04	1.86E-04	1.28E-04	5.35E-05	7.43E-05
	Uranium-235	0.15	0.04	0.11	5.4	1.3	4.1	47	12	36	12.5	3.0	9.4	159	39	120	63	15	48	2.51E-03	6.14E-04	1.90E-03	2.18E-02	5.33E-03	1.65E-02	5.76E-03	1.41E-03	4.35E-03	7.33E-02	1.79E-02	5.53E-02	2.93E-02	7.16E-03	2.21E-02
	Uranium-238	1.84	0.82	1.02	66	29	37	574	255	318	151	67	84	1928	858	1070	771	343	428	1.97E-01	8.76E-02	1.09E-01	1.71E+00	7.61E-01	9.49E-01	4.51E-01	2.01E-01	2.51E-01	5.74E+00	2.56E+00	3.19E+00	2.30E+00	1.02E+00	1.28E+00
Total Soil	Uranium-234	1.78	0.71	1.08	---	---	---	---	---	---	147	58	89	1873	742	1131	749	297	452	---	---	---	---	---	---	2.41E-05	9.57E-06	1.46E-05	3.07E-04	1.22E-04	1.85E-04	1.23E-04	4.87E-05	7.42E-05
	Uranium-235	0.13	0.03	0.09	---	---	---	---	---	---	10.6	2.7	7.8	134	35	99	54	14	40	---	---	---	---	---	---	4.88E-03	1.27E-03	3.61E-03	6.21E-02	1.62E-02	4.59E-02	2.48E-02	6.46E-03	1.84E-02
	Uranium-238	1.77	0.74	1.03	---	---	---	---	---	---	146	61	85	1855.35	774.9	1080.45	742	310	432	---	---	---	---	---	---	4.34E-01	1.81E-01	2.53E-01	5.53E+00	2.31E+00	3.22E+00	2.21E+00	9.24E-01	1.29E+00
Sediment	Uranium-234	10.30	0.77	9.53	124	9	114	1609	120	1490	64	5	60	---	---	---	---	---	---	2.03E-05	1.51E-06	1.88E-05	2.64E-04	1.96E-05	2.44E-04	1.06E-05	7.85E-07	9.77E-06	---	---	---	---	---	---
	Uranium-235	0.71	0.05	0.66	8.5	0.6	7.9	111	8	103	4.4	0.3	4.1	---	---	---	---	---	---	3.94E-03	2.77E-04	3.66E-03	5.13E-02	3.61E-03	4.76E-02	2.05E-03	1.44E-04	1.91E-03	---	---	---	---	---	---
	Uranium-238	10.70	0.63	10.07	128	8	121	1672	98	1573	66.9	3.9	62.9	---	---	---	---	---	---	3.83E-01	2.25E-02	3.60E-01	4.98E+00	2.93E-01	4.69E+00	1.99E-01	1.17E-02	1.88E-01	---	---	---	---	---	---
Produce	Uranium-234	1.86	0.78	1.08	---	---	---	---	---	---	---	---	---	0.18	0.07	0.10	0.008	0.003	0.005	---	---	---	---	---	---	---	---	---	2.87E-08	1.20E-08	1.67E-08	1.28E-09	5.35E-10	7.43E-10
	Uranium-235	0.15	0.04	0.11	---	---	---	---	---	---	---	---	---	0.01	0.00	0.01	0.001	0.000	0.000	---	---	---	---	---	---	---	---	---	6.59E-06	1.61E-06	4.98E-06	2.93E-07	7.16E-08	2.21E-07
	Uranium-238	1.84	0.82	1.02	---	---	---	---	---	---	---	---	---	0.17	0.08	0.10	0.008	0.003	0.004	---	---	---	---	---	---	---	---	---	5.17E-04	2.30E-04	2.87E-04	2.30E-05	1.02E-05	1.28E-05
																			Total Uranium Intakes for EU15	5.86E-01	1.11E-01	4.75E-01	6.77E+00	1.06E+00	5.70E+00	6.41E-01	1.95E-01	4.46E-01	5.59E+00	2.33E+00	3.27E+00	2.24E+00	9.30E-01	1.31E+00
EU16:																																		
Surface Soil	Uranium-234	5.83	0.78	5.05	210	28	182	1822	243	1579	481	64	417	6120.45	814.8	5305.65	2448	326	2122	3.44E-05	4.58E-06	2.98E-05	2.99E-04	3.98E-05	2.59E-04	7.89E-05	1.05E-05	6.84E-05	1.00E-03	1.34E-04	8.70E-04	4.02E-04	5.35E-05	3.48E-04
	Uranium-235	0.32	0.04	0.28	11.6	1.3	10.2	100	12	89	26.5	3.0	23.4	337	39	298	135	15	119	5.34E-03	6.14E-04	4.73E-03	4.63E-02	5.33E-03	4.10E-02	1.22E-02	1.41E-03	1.08E-02	1.56E-01	1.79E-02	1.38E-01	6.23E-02	7.16E-03	5.51E-02
	Uranium-238	7.28	0.82	6.46	262	29	233	2274	255	2018	600	67	533	7640	858	6782	3056	343	2713	7.81E-01	8.76E-02	6.93E-01	6.78E+00	7.61E-01	6.01E+00	1.79E+00	2.01E-01	1.59E+00	2.28E+01	2.56E+00	2.02E+01	9.11E+00	1.02E+00	8.08E+00
Total Soil	Uranium-234	5.22	0.71	4.51	---	---	---	---	---	---	431	58	372	5482	742	4740	2193	297	1896	---	---	---	---	---	---	7.06E-05	9.57E-06	6.11E-05	8.99E-04	1.22E-04	7.77E-04	3.60E-04	4.87E-05	3.11E-04
	Uranium-235	0.18	0.03	0.14	---	---	---	---	---	---	14.7	2.7	11.9	187	35	152	75	14	61	---	---	---	---	---	---	6.78E-03	1.27E-03	5.52E-03	8.63E-02	1.62E-02	7.02E-02	3.45E-02	6.46E-03	2.81E-02
	Uranium-238	6.04	0.74	5.30	---	---	---	---	---	---	498	61	438	6344	775	5569	2538	310	2228	---	---	---	---	---	---	1.49E+00	1.81E-01	1.30E+00	1.89E+01	2.31E+00	1.66E+01	7.56E+00	9.24E-01	6.64E+00
Groundwater	Uranium-234	28.60	1.00	27.60	---	---	---	---	---	---	1430	50	1380	690625	24150	666475	30027	1050	28977	---	---	---	---	---	---	2.34E-04	8.20E-06	2.26E-04	1.13E-01	3.96E-03	1.09E-01	4.92E-03	1.72E-04	4.75E-03
	Uranium-235	1.70	0.09	1.62	---	---	---	---	---	---	85.1	4.3	80.8	41087	2053	39034	1786	89	1697	---	---	---	---	---	---	3.93E-02	1.96E-03	3.73E-02	1.90E+01	9.48E-01	1.80E+01	8.25E-01	4.12E-02	7.84E-01
	Uranium-238	29.98	0.95	29.03	---	---	---	---	---	---	1499	48	1451	723987	22943	701045	31478	998	30480	---	---	---	---	---	---	4.47E+00	1.42E-01	4.33E+00	2.16E+03	6.84E+01	2.09E+03	9.38E+01	2.97E+00	9.08E+01
Sediment	Uranium-234	6.19	0.77	5.42	74	9	65	967	120	847	39	5	34	---	---	---	---	---	---	1.22E-05	1.51E-06	1.07E-05	1.59E-04	1.96E-05	1.39E-04	6.34E-06	7.85E-07	5.56E-06	---	---	---	---	---	---
	Uranium-235	0.31	0.05	0.26	3.7	0.6	3.1	48	8	40	1.9	0.3	1.6	---	---	---	---	---	---	1.69E-03	2.77E-04	1.42E-03	2.20E-02	3.61E-03	1.84E-02	8.82E-04	1.44E-04	7.38E-04	---	---	---	---	---	---
	Uranium-238	6.71	0.63	6.08	81	8	73	1049	98	950	42.0	3.9	38.0	---	---	---	---	---	---	2.40E-01	2.25E-02	2.18E-01	3.13E+00	2.93E-01	2.83E+00	1.25E-01	1.17E-02	1.13E-01	---	---	---	---	---	---
Produce	Uranium-234	5.83	0.78	5.05	---	---	---	---	---	---	---	---	---	0.55	0.07	0.48	0.024	0.003	0.021	---	---	---	---	---	---	---	---	---	9.03E-08	1.20E-08	7.83E-08	4.02E-09	5.35E-10	3.48E-09
	Uranium-235	0.32	0.04	0.28	---	---	---	---	---	---	---	---	---	0.03	0.00	0.03	0.001	0.000	0.001	---	---	---	---	---	---	---	---	---	1.40E-05	1.61E-06	1.24E-05	6.23E-07	7.16E-08	5.51E-07
	Uranium-238	7.28	0.82	6.46	---	---	---	---	---	---	---	---	---	0.69	0.08	0.61	0.031	0.003	0.027	---	---	---	---	---	---	---	---	---	2.05E-03	2.30E-04	1.82E-03	9.11E-05	1.02E-05	8.08E-05
																			Total Uranium Intakes for EU16	1.03E+00	1.11E-01	9.17E-01	9.97E+00	1.06E+00	8.91E+00	6.12E+00	3.38E-01	5.79E+00	2.20E+03	7.16E+01	2.12E+03	1.02E+02	3.94E+00	9.83E+01
EU17:																																		
Surface Soil	Uranium-234	1492	1	1491	53712	28	53684	466250	243	466008	123090	64	123026	1566600	814.8	1565785.2	626640	326	626314	8.81E-03	4.58E-06	8.80E-03	7.65E-02	3.98E-05	7.64E-02	2.02E-02	1.05E-05	2.02E-02	2.57E-01	1.34E-04	2.57E-01	1.03E-01	5.35E-05	1.03E-01
	Uranium-235	39	0	39	1390.7	1.3	1389.4	12072	12	12060	3187.0	3.0	3183.9	40562	39	40523	16225	15	16209	6.42E-01	6.14E-04	6.42E-01	5.58E+00	5.33E-03	5.57E+00	1.47E+00	1.41E-03	1.47E+00	1.87E+01	1.79E-02	1.87E+01	7.50E+00	7.16E-03	7.49E+00
	Uranium-238	1592	1	1591	57312	29	57283	497500	255	497245	131340	67	131273	1671600	858	1670742	668640	343	668297	1.71E+02	8.76E-02	1.71E+02	1.48E+03	7.61E-01	1.48E+03	3.91E+02	2.01E-01	3.91E+02	4.98E+03	2.56E+00	4.98E+03	1.99E+03	1.02E+00	1.99E+03
Total Soil	Uranium-234	561.60	0.71	560.89	---	---	---	---	---	---	46332	58	46274	589680	742	588938	235872	297	235575	---	---	---	---	---	---	7.60E-03	9.57E-06	7.59E-03	9.67E-02	1.22E-04	9.66E-02	3.87E-02	4.87E-05	3.86E-02
	Uranium-235	22.62	0.03	22.59	---	---	---	---	---	---	1866	3	1863	23751	35	23716	9500	14	9486	---	---	---	---	---	---	8.62E-01	1.27E-03	8.61E-01	1.10E+01	1.62E-02	1.10E+01	4.39E+00	6.46E-03	4.38E+00
	Uranium-238	599.80	0.74	599.06	---	---	---	---	---	---	49484	61	49423	629790	775	629015	251916	310	251606	---	---	---	---	---	---	1.47E+02	1.81E-01	1.47E+02	1.88E+03	2.31E+00	1.87E+03	7.51E+02	9.24E-01	7.50E+02
Produce	Uranium-234	1492	1	1491	---	---	---	---	---	---	---	---	---	141	0	141	6.27	0.00	6.26	---	---	---	---	---	---	---	---	---	2.31E-05	1.20E-08	2.31E-05	1.03E-06	5.35E-10	1.03E-06
	Uranium-235	39	0	39	---	---	---	---	---	---	---	---	---	3.65	0.00	3.65	0.162	0.000	0.162	---	---	---	---	---	---	---	---	---	1.69E-03	1.61E-06	1.68E-03	7.50E-05	7.16E-08	7.49E-05
	Uranium-238	1592	1	1591	---	---	---	---	---	---	---	---	---	150.44	0.08	150.37	6.686	0.003	6.683	---	---	---	---	---	---	---	---	---	4.48E-01	2.30E-04	4.48E-01	1.99E-02	1.02E-05	1.99E-02
																			Total Uranium Intakes for EU17	1.71E+02	8.83E-02	1.71E+02	1.49E+03	7.66E-01	1.49E+03	1.48E+02	1.83E-01	1.48E+02	1.89E+03	2.33E+00	1.89E+03	7.55E+02	9.30E-01	7.54E+02
EU18:																																		
Surface Soil	Uranium-234	0.82	0.78	0.05	30	28	2	258	243	15	68	64	4	865.2	814.8	50.4	346	326	20	4.86E-06	4.58E-06	2.83E-07	4.22E-05	3.98E-05	2.46E-06	1.11E-05	1.05E-05	6.49E-07	1.42E-04	1.34E-04	8.27E-06	5.68E-05	5.35E-05	3.31E-06
	Uranium-235	0.07	0.04	0.03	2.4	1.3	1.1	21	12	9	5.5	3.0	2.5	70	39	31	28	15	13	1.11E-03	6.14E-04	4.96E-04	9.63E-03	5.33E-03	4.30E-03	2.54E-03	1.41E-03	1.14E-03	3.24E-02	1.79E-02	1.45E-02	1.29E-02	7.16E-03	5.78E-03
	Uranium-238	0.73	0.82	0.00	26	29	0	229	255	0	60	67	0	770	858	0	308	343	0	7.86E-02	8.76E-02	0.00E+00	6.83E-01	7.61E-01	0.00E+00	1.80E-01	2.01E-01	0.00E+00	2.29E+00	2.56E+00	0.00E+00	9.17E-01	1.02E+00	0.00E+00
Total Soil	Uranium-234	0.77	0.71	0.06	---	---	---	---	---	---	64	58	5	810	742	67	324	297	27	---	---	---	---	---	---	1.04E-05	9.57E-06	8.66E-07	1.33E-04	1.22E-04	1.10E-05	5.31E-05	4.87E-05	4.41E-06
	Uranium-235	0.05	0.03	0.02	---	---	---	---	---	---	4.4	2.7	1.6	56	35	21	22	14	8	---	---	---	---	---	---	2.02E-03	1.27E-03	7.47E-04	2.57E-02	1.62E-02	9.51E-03	1.03E-02	6.46E-03	3.80E-03
	Uranium-238	0.73	0.74	0.00	---	---	---	---	---	---	60	61	0	761.25	774.9	0	305	310	0	---	---	---	---	---	---	1.78E-01	1.81E-01	0.00E+00	2.27E+00	2.31E+00	0.00E+00	9.07E-01	9.24E-01	0.00E+00
Groundwater	Uranium-234	1.23	1.00	0.23	---	---	---	---	---	---	61.6	50.0	11.6	29732	24150	5582	1293	1050	243	---	---	---	---	---	---	1.01E-05	8.20E-06	1.90E-06	4.88E-03	3.96E-03	9.15E-04	2.12E-04	1.72E-04	3.98E-05
	Uranium-235	0.08	0.09	0.00	---	---	---	---	---	---	4.000	4.250	0.000	1932	2053	0	84.0	89.3	0.0	---	---	---	---	---	---	1.85E-03	1.96E-03	0.00E+00	8.93E-01	9.48E-01	0.00E+00	3.88E-02	4.12E-02	0.00E+00
	Uranium-238	1.23	0.95	0.28	---	---	---	---	---	---	61.3	47.5	13.8	29615	22943	6673	1288	998	290	---	---	---	---	---	---	1.83E-01	1.42E-01	4.12E-02	8.83E+01	6.84E+01	1.99E+01	3.84E+00	2.97E+00	8.65E-01
Produce	Uranium-234	0.82	0.78	0.05	---	---	---	---	---	---	---	---	---	0.08	0.07	0.00	0.003	0.003	0.000	---	---	---	---	---	---	---	---	---	1.28E-08	1.20E-08	7.44E-10	5.68E-10	5.35E-10	3.31E-11
	Uranium-235	0.07	0.04	0.03	---	---	---	---	---	---	---	---	---	0.01	0.00	0.00	0.000	0.000	0.000	---	---	---	---	---	---	---	---	---	2.91E-06	1.61E-06	1.30E-06	1.29E-07	7.16E-08	5.78E-08
	Uranium-238	0.73	0.82	0.00	---	---	---	---	---	---	---	---	---	0.07	0.08	0.00	0.003	0.003	0.000	---	---	---	---	---	---	---	---	---	2.06E-04	2.30E-04	0.00E+00	9.17E-06	1.02E-05	0.00E+00
																			Total Uranium Intakes for EU18	7.98E-02	8.83E-02	4.96E-04	6.92E-01	7.66E-01	4.30E-03	3.65E-01	3.26E-01	4.19E-02	9.14E+01	7.16E+01	1.99E+01	4.79E+00	3.94E+00	8.68E-01
EU19:																																		
Sediment*	Uranium-234	0.74	0.77	0.00	8.868	9.192	0.000	---	---	---	---	---	---	13.3	13.8	0.0	5.32	5.52	0.00	1.45E-06	1.51E-06	0.00E+00	---	---	---	---	---	---	2.18E-06	2.26E-06	0.00E+00	8.73E-07	9.04E-07	0.00E+00
	Uranium-235	0.06	0.05	0.01	0.733	0.600	0.133	---	---	---	---	---	---	1.1	0.9	0.2	0.44	0.36	0.08	3.39E-04	2.77E-04	6.15E-05	---	---	---	---	---	---	5.08E-04	4.16E-04	9.23E-05	2.03E-04	1.66E-04	3.69E-05
	Uranium-238	0.68	0.63	0.05	8.136	7.560	0.576	---	---	---	---	---	---	12.2	11.3	0.9	4.88	4.54	0.35	2.42E-02	2.25E-02	1.72E-03	---	---	---	---	---	---	3.64E-02	3.38E-02	2.57E-03	1.45E-02	1.35E-02	1.03E-03
Surface Water*	Uranium-234	0.20	0.17	0.04	2.4240	1.9920	0.4320	---	---	---	---	---	---	3.636	2.988	0.648	1.454	1.195	0.259	3.98E-07	3.27E-07	7.08E-08	---	---	---	---	---	---	5.96E-07	4.90E-07	1.06E-07	2.39E-07	1.96E-07	4.25E-08
	Uranium-235	0.05	0.04	0.01	0.5676	0.4800	0.0876	---	---	---	---	---	---	0.851	0.720	0.131	0.341	0.288	0.053	2.62E-04	2.22E-04	4.05E-05	---	---	---	---	---	---	3.93E-04	3.33E-04	6.07E-05	1.57E-04	1.33E-04	2.43E-05
	Uranium-238	0.17	0.10	0.07	2.0400	1.1520	0.8880	---	---	---	---	---	---	3.060	1.728	1.332	1.224	0.691	0.533	6.08E-03	3.43E-03	2.65E-03	---	---	---	---	---	---	9.12E-03	5.15E-03	3.97E-03	3.65E-03	2.06E-03	1.59E-03
																			Total Uranium Intakes for EU19	3.09E-02	2.65E-02	4.46E-03							4.64E-02	3.97E-02	6.70E-03	1.86E-02	1.59E-02	2.68E-03
EU20:																																		
Surface Soil	Uranium-234	1.70	0.78	0.93	61	28	33	532	243	289	140	64	76	1786.05	814.8	971.25	714	326	389	1.00E-05	4.58E-06	5.46E-06	8.72E-05	3.98E-05	4.74E-05	2.30E-05	1.05E-05	1.25E-05	2.93E-04	1.34E-04	1.59E-04	1.17E-04	5.35E-05	6.37E-05
	Uranium-235	0.09	0.04	0.05	3.2	1.3	1.9	28	12	16	7.4	3.0	4.3	94	39	55	38	15	22	1.49E-03	6.14E-04	8.77E-04	1.29E-02	5.33E-03	7.61E-03	3.42E-03	1.41E-03	2.01E-03	4.35E-02	1.79E-02	2.56E-02	1.74E-02	7.16E-03	1.02E-02
	Uranium-238	1.85	0.82	1.04	67	29	37	579	255	324	153	67	85	1946	858	1088	778	343	435	1.99E-01	8.76E-02	1.11E-01	1.73E+00	7.61E-01	9.65E-01	4.56E-01	2.01E-01	2.55E-01	5.80E+00	2.56E+00	3.24E+00	2.32E+00	1.02E+00	1.30E+00
Total Soil	Uranium-234	2.24	0.71	1.53	---	---	---	---	---	---	185	58	126	2350	742	1608	940	297	643	---	---	---	---	---	---	3.03E-05	9.57E-06	2.07E-05	3.85E-04	1.22E-04	2.64E-04	1.54E-04	4.87E-05	1.05E-04
	Uranium-235	0.08	0.03	0.05	---	---	---	---	---	---	6.8	2.7	4.0	86	35	51	35	14	21	---	---	---	---	---	---	3.13E-03	1.27E-03	1.86E-03	3.99E-02	1.62E-02	2.37E-02	1.60E-02	6.46E-03	9.49E-03
	Uranium-238	2.28	0.74	1.54	---	---	---	---	---	---	188	61	127	2395.05	774.9	1620.15	958	310	648	---	---	---	---	---	---	5.61E-01	1.81E-01	3.79E-01	7.14E+00	2.31E+00	4.83E+00	2.85E+00	9.24E-01	1.93E+00
Produce	Uranium-234	1.70	0.78	0.93	---	---	---	---	---	---	---	---	---	0.16	0.07	0.09	0.007	0.003	0.004	---	---	---	---	---	---	---	---	---	2.64E-08	1.20E-08	1.43E-08	1.17E-09	5.35E-10	6.37E-10
	Uranium-235	0.09	0.04	0.05	---	---	---	---	---	---	---	---	---	0.01	0.00	0.00	0.000	0.000	0.000	---	---	---	---	---	---	---	---	---	3.91E-06	1.61E-06	2.30E-06	1.74E-07	7.16E-08	1.02E-07
	Uranium-238	1.85	0.82	1.04	---	---	---	---	---	---	---	---	---	0.18	0.08	0.10	0.008	0.003	0.004	---	---	---	---	---	---	---	---	---	5.22E-04	2.30E-04	2.92E-04	2.32E-05	1.02E-05	1.30E-05
																			Total Uranium Intakes for EU20	2.00E-01	8.83E-02	1.12E-01	1.74E+00	7.66E-01	9.72E-01	5.64E-01	1.83E-01	3.81E-01	7.18E+00	2.33E+00	4.85E+00	2.87E+00	9.30E-01	1.94E+00

Notes:

* It is assumed that the exposure frequency for the adult and child resident to surface water and sediments in the Erie Canal would be the same as for a juvenile trespasser because of the weather and working factors.

** The ingestion intakes for produce is estimated using the soil concentration balanced by a fraction ingested factor of 0.05, in lieu of using a soil-to-plant conversion factor. The types of produce a hypothetical future resident would plant and consume is an unknown.

TABLE 6-12
RADIOLOGICAL RISK COEFFICIENTS AND DOSE CONVERSION FACTORS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Radiological Risk Coefficients and Dose Conversion Factors									
	Coefficient for Lifetime Cancer Risk Morbidity			Dose Conversion Factor			Decay Factor		
Radionuclide	Inhalation Slope Factor (1/pCi)	Ingestion Slope Factor (1/pCi)	External Gamma (1/yr per pCi/g)	Inhalation (mrem/pCi)	Ingestion (mrem/pCi)	External (mrem per pCi/g per yr)	Half-life $T_{1/2}$ yr	Near Term (yr) 1	Near Term (yr) 100
COPCs									
Radium-226	2.6E-08	4.0E-09	8.5E-06	3.2E-02	8.6E-03	1.1E+01	1.6E+03	1	9.6E-01
Radium-228	9.7E-08	1.9E-09	1.2E-05	3.5E-01	2.3E-03	1.6E+01	5.8E+00	1	6.5E-06
Thorium-228	1.3E-07	2.9E-10	5.6E-09	3.5E-01	8.1E-04	7.9E-03	1.9E+01	1	1.0E+00
Thorium-230	2.4E-08	1.2E-10	8.2E-10	3.3E-01	5.5E-04	1.2E-03	7.7E+04	1	1.0E+00
Thorium-232	4.3E-08	2.3E-10	3.4E-10	1.6E+00	2.7E-03	5.2E-04	1.4E+10	1	1.0E+00
Uranium-234	2.8E-08	9.6E-11	2.5E-10	1.3E-01	2.8E-04	4.0E-04	2.4E+05	1	1.0E+00
Uranium-235	2.5E-08	9.8E-11	5.4E-07	1.2E-01	2.7E-04	7.6E-01	7.0E+08	1	1.0E+00
Uranium-238	2.4E-08	1.2E-10	8.5E-08	1.2E-01	2.7E-04	1.4E-01	4.5E+09	1	1.0E+00

Chemical Toxicity for Noncarcinogenic Effects Oral Exposure					
Radionuclide	RfD, Chronic (mg/kg-d)[a]	Confidence Level	Uncertainty Factor	Modifying Factor	Critical Effect
Metals					
Uranium, sol.salt	3.00E-03	Medium	1000	1	kidney damage

Note:

This table provides cancer risk coefficients and dose conversion factors (DCFs) for inhalation, ingestion, and external gamma irradiation for the COPCs at Guterl Steel. For ingestion and inhalation, units are risk of cancer induction or dose (in mrem) per picocurie (pCi) taken into the body. Units for external gamma exposure are risk or dose (in mrem) per pCi/g soil for one year of continuous exposure. Values presented here include the contributions from short-lived decay products. All values are given to two significant figures.

The DCFs for inhalation and ingestion represent the 50-year CEDE using the methodology developed by the ICRP. The DCFs for external gamma irradiation represent the EDE for that exposure. These internal and external DCFs are based on a metabolic and anatomical model for an adult male. The internal (inhalation and ingestion) factors were obtained from Figure 11 (EPA 1998), and the factors for external gamma irradiation were obtained from Figure 12 (EPA 1993). A number of radionuclides contain multiple (up to three) inhalation DCFs based on the rate of clearance from the lung. The three lung clearance classes are D, W, and Y corresponding to retention half-times of less than 10 days, 10 to 100 days, and greater than 100 days, respectively. Where multiple values are given for inhalation DCFs, the most conservative (highest) values have been tabulated here for use in this assessment. In addition, multiple ingestion DCFs corresponding to various fractional uptakes from the intestines (f_1) are provided for some radionuclides. Where multiple values are given for ingestion, the most conservative (highest) values are tabulated and used in this assessment.

The cancer risk coefficients given in this table represent the lifetime risk of incurring all cancers (including those that are cured) and were obtained from Figure 13 (EPA 1999). These coefficients represent values that are averaged over all ages and both genders. For inhalation of radionuclides, risk coefficients are provided for three types of particulates corresponding to fast (F), medium (M), and slow (S) absorption to blood. The risk coefficients corresponding closest to the DCF were used (For example, if the most conservative DCF corresponded to an inhalation class of W, the risk coefficient for M would be used.) Two sets of ingestion risk coefficients are given in Figure 13, i.e., corresponding to "dietary" and "tap water" intakes. The dietary values are given here, as these are the highest for ingestion exposures; values for tap water ingestion are typically 70 to 80% of those for diet. The fractional uptake from the intestines (f_1) varies from the 0.0001 to 1.0 for the various radionuclides; only one ingestion risk value (corresponding to a specific value of f_1) is given for each radionuclide.

Additional cancer risk coefficients and DCFs ere calculated for three of the COPCs for future use scenarios to account for the effect of radionuclide ingrowth. The future-use scenarios were evaluated in a manner consistent with the approach used to develop the PRGs for the hypothetical resident scenario. The PRGs were developed from the mean dose-to-source ratios of the peak doses over 1000-year time period using the probabilistic version of RESRAD. The peak doses for these three COPCs occur many years in the future, and at different times.

[a] Source for Uranium RfD is EPA's Integated Risk Information System.

CEDE = committed effective dose equivalent
COPC = chemical of potential concern
DCF = dose conversion factor
EDE = effective dose equivalent
EPA = Environmental Protection Agency
ICRP = International Council on Radiation Protection
mg/kg-d = milligrams per kilogram per day
mrem = millirem
mrem/pCi = millirem per picocurie
1/pCi = quantity per picocurie
pCi/g = picocurie per gram
PRG = preliminary remediation goal
RESRAD = residual radioactivity; RESRAD refers to the RESRAD software program
RfD = reference dose
sol. = soluble
yr = year

TABLE 6-13
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Scenario	Time (years)	Gross EPC Total Dose (mrem/yr)	Background Total Dose (mrem/yr)	Net EPC Total Dose (mrem/yr)	Gross Groundwater Dose	Background Groundwater Dose	Net Groundwater Dose	Gross Surface Water Dose	Background Surface Water Dose	Net Surface Water Dose	Gross Building Surface Dose	Background Building Surface Dose	Net Building Surface Dose	Gross Sediment Dose	Background Sediment Dose	Net Sediment Dose	Gross Soil Dose	Background Soil Dose	Net Soil Dose	Gross EPC Total Risk	Background Total Risk	Net EPC Total Risk	Gross Groundwater Risk	Background Groundwater Risk	Net Groundwater Risk	Gross Surface Water Risk	Background Surface Water Risk	Net Surface Water Risk	Gross Building Surface Risk	Background Building Surface Risk	Net Building Surface Risk	Gross Sediment Risk	Background Sediment Risk	Net Sediment Risk	Gross Soil Risk	Background Soil Risk	Net Soil Risk	Gross EPC Hazard Index	Background Hazard Index	Net EPC Hazard Index
Exposure Unit 1																																								
Juvenile Trespasser	0	0.10	0.008	0.10	--	--	--	1.92E-02	1.24E-03	1.80E-02	4.85E-02	0.00E+00	4.85E-02	3.65E-02	6.83E-03	3.06E-02	--	--	--	3E-07	5E-08	3E-07	--	--	--	5.78E-08	5.95E-09	5.20E-08	1.32E-08	0.00E+00	1.32E-08	2.50E-07	4.04E-08	2.11E-07	--	--	--	**4E-03**	4E-05	4E-03
On-site Worker	0	12	0.042	12	--	--	--	1.00E-01	6.44E-03	9.39E-02	1.16E+01	0.00E+00	1.16E+01	1.90E-01	3.56E-02	1.59E-01	--	--	--	7E-06	6E-07	7E-06	--	--	--	7.53E-07	7.74E-08	6.77E-07	3.14E-06	0.00E+00	3.14E-06	3.25E-06	5.26E-07	2.74E-06	--	--	--	**2E-02**	**2E-04**	2E-02
Construction Worker	0	**591**	0.042	**591**	--	--	--	1.00E-01	6.44E-03	9.39E-02	**5.91E+02**	0.00E+00	**5.91E+02**	1.90E-01	3.56E-02	1.59E-01	--	--	--	5E-05	2E-08	5E-05	--	--	--	3.01E-08	3.10E-09	2.71E-08	5.37E-05	0.00E+00	5.37E-05	1.30E-07	2.10E-08	1.10E-07	--	--	--	**2E-02**	**7E-03**	2E-02
Exposure Unit 1																																								
Juvenile Trespasser	1	0.048	0	0.048	--	--	--	NC	NC	NC	4.79E-02	0.00E+00	4.79E-02	NC	NC	NC	--	--	--	1E-08	0E+00	1E-08	--	--	--	NC	NC	NC	1.26E-08	0.00E+00	1.26E-08	NC	NC	NC	--	--	--	NC	NC	NC
On-site Worker	1	12	0	12	--	--	--	NC	NC	NC	1.15E+01	0.00E+00	1.15E+01	NC	NC	NC	--	--	--	3E-06	0E+00	3E-06	--	--	--	NC	NC	NC	3.01E-06	0.00E+00	3.01E-06	NC	NC	NC	--	--	--	NC	NC	NC
Construction Worker	1	**591**	0	**591**	--	--	--	NC	NC	NC	**5.91E+02**	0.00E+00	**5.91E+02**	NC	NC	NC	--	--	--	5E-05	0E+00	5E-05	--	--	--	NC	NC	NC	5.32E-05	0.00E+00	5.32E-05	NC	NC	NC	--	--	--	NC	NC	NC
Exposure Unit 1																																								
Juvenile Trespasser	10	0.042	0.000	0.042	--	--	--	NC	NC	NC	4.21E-02	0.00E+00	4.21E-02	NC	NC	NC	--	--	--	9E-09	0E+00	9E-09	--	--	--	NC	NC	NC	9.09E-09	0.00E+00	9.09E-09	NC	NC	NC	--	--	--	NC	NC	NC
On-site Worker	10	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC
Construction Worker	10	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC
Exposure Unit 1																																								
Juvenile Trespasser	25	0.032	0.000	0.032	--	--	--	NC	NC	NC	3.25E-02	0.00E+00	3.25E-02	NC	NC	NC	--	--	--	3E-09	0E+00	3E-09	--	--	--	NC	NC	NC	3.42E-09	0.00E+00	3.42E-09	NC	NC	NC	--	--	--	NC	NC	NC
On-site Worker	25	8.6	0.0	8.6	--	--	--	NC	NC	NC	8.60E+00	0.00E+00	8.60E+00	NC	NC	NC	--	--	--	1E-06	0E+00	1E-06	--	--	--	NC	NC	NC	1.02E-06	0.00E+00	1.02E-06	NC	NC	NC	--	--	--	NC	NC	NC
Construction Worker	25	0.00	0.00	0.00	--	--	--	NC	NC	NC	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	--	--	--	0E+00	0E+00	0E+00	--	--	--	NC	NC	NC	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	--	--	--	NC	NC	NC
Exposure Unit 2																																								
Juvenile Trespasser	0	0.77	0.29	0.48	--	--	--	7.61E-02	1.24E-03	7.49E-02	2.94E-02	0.00E+00	2.94E-02	1.38E-02	6.83E-03	7.00E-03	6.53E-01	2.80E-01	3.72E-01	5E-06	2E-06	3E-06	--	--	--	2.17E-07	5.95E-09	2.11E-07	6.99E-09	0.00E+00	6.99E-09	8.43E-08	4.04E-08	4.39E-08	4.81E-06	2.06E-06	2.75E-06	**8E-03**	**2E-04**	8E-03
On-site Worker	0	18	4	14	--	--	--	3.96E-01	6.44E-03	3.90E-01	7.62E+00	0.00E+00	7.62E+00	7.20E-02	3.56E-02	3.64E-02	9.88E+00	4.26E+00	5.62E+00	**2E-04**	8E-05	**1E-04**	--	--	--	2.82E-06	7.74E-08	2.75E-06	1.50E-06	0.00E+00	1.50E-06	1.10E-06	5.26E-07	5.72E-07	**1.75E-04**	7.71E-05	9.78E-05	**3E-02**	**6E-04**	3E-02
Construction Worker	0	**476**	6	**470**	--	--	--	3.96E-01	6.44E-03	3.90E-01	**4.62E+02**	0.00E+00	**4.62E+02**	7.20E-02	3.56E-02	3.64E-02	1.35E+01	5.98E+00	7.47E+00	5E-05	4E-06	5E-05	--	--	--	1.13E-07	3.10E-09	1.10E-07	4.18E-05	0.00E+00	4.18E-05	4.39E-08	2.10E-08	2.29E-08	9.74E-06	4.39E-06	5.35E-06	**8E-02**	**1E-02**	7E-02
Exposure Unit 2																																								
Juvenile Trespasser	1	0.029	0.000	0.029	--	--	--	NC	NC	NC	2.92E-02	0.00E+00	2.92E-02	NC	NC	NC	NC	NC	NC	7E-09	0E+00	7E-09	--	--	--	NC	NC	NC	6.75E-09	0.00E+00	6.75E-09	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	1	7.6	0.0	7.6	--	--	--	NC	NC	NC	7.60E+00	0.00E+00	7.60E+00	NC	NC	NC	NC	NC	NC	1E-06	0E+00	1E-06	--	--	--	NC	NC	NC	1.45E-06	0.00E+00	1.45E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	1	**462**	0	**462**	--	--	--	NC	NC	NC	**4.62E+02**	0.00E+00	**4.62E+02**	NC	NC	NC	NC	NC	NC	4E-05	0E+00	4E-05	--	--	--	NC	NC	NC	4.17E-05	0.00E+00	4.17E-05	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 2																																								
Juvenile Trespasser	10	0.028	0.000	0.028	--	--	--	NC	NC	NC	2.80E-02	0.00E+00	2.80E-02	NC	NC	NC	NC	NC	NC	5E-09	0E+00	5E-09	--	--	--	NC	NC	NC	5.25E-09	0.00E+00	5.25E-09	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	10	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	10	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 2																																								
Juvenile Trespasser	25	0.026	0.000	0.026	--	--	--	NC	NC	NC	2.60E-02	0.00E+00	2.60E-02	NC	NC	NC	NC	NC	NC	3E-09	0E+00	3E-09	--	--	--	NC	NC	NC	2.85E-09	0.00E+00	2.85E-09	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	25	7.0	0.0	7.0	--	--	--	NC	NC	NC	6.98E+00	0.00E+00	6.98E+00	NC	NC	NC	NC	NC	NC	7E-07	0E+00	7E-07	--	--	--	NC	NC	NC	7.16E-07	0.00E+00	7.16E-07	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	25	0.00	0.00	0.00	--	--	--	NC	NC	NC	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	NC	NC	NC	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 2																																								
Juvenile Trespasser	58	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	25	6	19	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	2.47E+01	6.14E+00	1.85E+01	1E-05	4E-06	8E-06	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	1.19E-05	4.11E-06	7.77E-06	NC	NC	NC
Exposure Unit 2																																								
Juvenile Trespasser	1000	0.30	0.15	0.15	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	3.03E-01	1.51E-01	1.51E-01	2E-06	1E-06	1E-06	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	2.28E-06	1.14E-06	1.14E-06	NC	NC	NC
On-site Worker	1000	4.6	2.3	2.3	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	4.58E+00	2.29E+00	2.29E+00	9E-05	4E-05	4E-05	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	8.64E-05	4.31E-05	4.32E-05	NC	NC	NC
Construction Worker	1000	6.3	3.4	2.9	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	6.31E+00	3.41E+00	2.89E+00	4E-06	2E-06	2E-06	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	4.50E-06	2.45E-06	2.04E-06	NC	NC	NC
Exposure Unit 3																																								
Juvenile Trespasser	0	1.11	0.29	0.82	--	--	--	1.26E-02	1.24E-03	1.14E-02	6.28E-01	0.00E+00	6.28E-01	4.90E-02	6.83E-03	4.22E-02	4.24E-01	2.80E-01	1.43E-01	4E-06	2E-06	2E-06	--	--	--	3.83E-08	5.95E-09	3.28E-08	3.81E-07	0.00E+00	3.81E-07	3.24E-07	4.04E-08	2.84E-07	3.02E-06	2.06E-06	9.58E-07	**8E-03**	**2E-04**	7E-03
On-site Worker	0	**124**	4	**120**	--	--	--	6.55E-02	6.44E-03	5.96E-02	**1.18E+02**	0.00E+00	**1.18E+02**	2.55E-01	3.56E-02	2.20E-01	6.38E+00	4.26E+00	2.12E+00	**2E-04**	8E-05	**1E-04**	--	--	--	4.99E-07	7.74E-08	4.27E-07	7.09E-05	0.00E+00	7.09E-05	4.22E-06	5.26E-07	3.69E-06	**1.12E-04**	7.71E-05	3.48E-05	**3E-02**	**6E-04**	3E-02
Construction Worker	0	**62**	6	**55**	--	--	--	6.55E-02	6.44E-03	5.96E-02	**4.54E+01**	0.00E+00	**4.54E+01**	2.55E-01	3.56E-02	2.20E-01	1.58E+01	5.98E+00	9.78E+00	2E-05	4E-06	1E-05	--	--	--	2.00E-08	3.10E-09	1.71E-08	5.10E-06	0.00E+00	5.10E-06	1.69E-07	2.10E-08	1.48E-07	1.01E-05	4.39E-06	5.71E-06	**3E-01**	**1E-02**	3E-01
Exposure Unit 3																																								
Juvenile Trespasser	1	0.61	0.00	0.61	--	--	--	NC	NC	NC	6.05E-01	0.00E+00	6.05E-01	NC	NC	NC	NC	NC	NC	4E-07	0E+00	4E-07	--	--	--	NC	NC	NC	3.60E-07	0.00E+00	3.60E-07	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	1	**113**	0	**113**	--	--	--	NC	NC	NC	**1.13E+02**	0.00E+00	**1.13E+02**	NC	NC	NC	NC	NC	NC	7E-05	0E+00	7E-05	--	--	--	NC	NC	NC	6.73E-05	0.00E+00	6.73E-05	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	1	**45**	0	**45**	--	--	--	NC	NC	NC	**4.54E+01**	0.00E+00	**4.54E+01**	NC	NC	NC	NC	NC	NC	5E-06	0E+00	5E-06	--	--	--	NC	NC	NC	4.75E-06	0.00E+00	4.75E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 3																																								
Juvenile Trespasser	10	0.40	0.00	0.40	--	--	--	NC	NC	NC	3.99E-01	0.00E+00	3.99E-01	NC	NC	NC	NC	NC	NC	2E-07	0E+00	2E-07	--	--	--	NC	NC	NC	2.36E-07	0.00E+00	2.36E-07	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	10	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	10	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 3																																								
Juvenile Trespasser	25	0.056	0.000	0.056	--	--	--	NC	NC	NC	5.64E-02	0.00E+00	5.64E-02	NC	NC	NC	NC	NC	NC	3E-08	0E+00	3E-08	--	--	--	NC	NC	NC	3.29E-08	0.00E+00	3.29E-08	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	25	9.5	0.0	9.5	--	--	--	NC	NC	NC	9.53E+00	0.00E+00	9.53E+00	NC	NC	NC	NC	NC	NC	5E-06	0E+00	5E-06	--	--	--	NC	NC	NC	5.45E-06	0.00E+00	5.45E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	25	0.00	0.00	0.00	--	--	--	NC	NC	NC	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	NC	NC	NC	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 3																																								
Juvenile Trespasser	58	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	**111**	6	**105**	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	**1.11E+02**	6.14E+00	**1.05E+02**	4E-05	4E-06	3E-05	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	3.62E-05	4.11E-06	3.21E-05	NC	NC	NC
Exposure Unit 3																																								
Juvenile Trespasser	1000	0.190	0.151	0.039	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	1.90E-01	1.51E-01	3.92E-02	1E-06	1E-06	3E-07	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	1.43E-06	1.14E-06	2.94E-07	NC	NC	NC
On-site Worker	1000	2.88	2.29	0.59	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	2.88E+00	2.29E+00	5.92E-01	5E-05	4E-05	1E-05	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	5.43E-05	4.31E-05	1.12E-05	NC	NC	NC
Construction Worker	1000	5.2	3.4	1.7	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	5.16E+00	3.41E+00	1.75E+00	3E-06	2E-06	9E-07	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	3.40E-06	2.45E-06	9.49E-07	NC	NC	NC
Exposure Unit 4																																								
Juvenile Trespasser	0	0.60	0.29	0.31	--	--	--	5.92E-03	1.24E-03	4.77E-03	1.45E-01	0.00E+00	1.45E-01	1.47E-02	6.83E-03	1.10E-02	4.30E-01	2.80E-01	1.50E-01	3E-06	2E-06	1E-06	--	--	--	2.19E-08	5.95E-09	1.63E-08	8.82E-08	0.00E+00	8.82E-08	1.02E-07	4.04E-08	7.41E-08	3.14E-06	2.06E-06	1.08E-06	**3E-03**	**2E-04**	3E-03
On-site Worker	0	**34**	4	**30**	--	--	--	3.08E-02	6.44E-03	2.49E-02	**2.73E+01**	0.00E+00	**2.73E+01**	7.65E-02	3.56E-02	5.73E-02	6.51E+00	4.26E+00	2.26E+00	**1E-04**	8E-05	6E-05	--	--	--	2.85E-07	7.74E-08	2.12E-07	1.64E-05	0.00E+00	1.64E-05	1.33E-06	5.26E-07	9.64E-07	**1.18E-04**	7.71E-05	4.13E-05	**1E-02**	**6E-04**	1E-02
Construction Worker	0	20	6	14	--	--	--	3.08E-02	6.44E-03	2.49E-02	1.04E+01	0.00E+00	1.04E+01	7.65E-02	3.56E-02	5.73E-02	9.14E+00	5.98E+00	3.15E+00	8E-06	4E-06	3E-06	--	--	--	1.14E-08	3.10E-09	8.50E-09	1.20E-06	0.00E+00	1.20E-06	5.33E-08	2.10E-08	3.86E-08	6.59E-06	4.39E-06	2.20E-06	**4E-02**	**1E-02**	3E-02
Exposure Unit 4																																								
Juvenile Trespasser	1	0.14	0.00	0.14	--	--	--	NC	NC	NC	1.40E-01	0.00E+00	1.40E-01	NC	NC	NC	NC	NC	NC	8E-08	0E+00	8E-08	--	--	--	NC	NC	NC	8.36E-08	0.00E+00	8.36E-08	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	1	**26**	0	**26**	--	--	--	NC	NC	NC	**2.62E+01**	0.00E+00	**2.62E+01**	NC	NC	NC	NC	NC	NC	2E-05	0E+00	2E-05	--	--	--	NC	NC	NC	1.56E-05	0.00E+00	1.56E-05	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	1	10	0	10	--	--	--	NC	NC	NC	1.04E+01	0.00E+00	1.04E+01	NC	NC	NC	NC	NC	NC	1E-06	0E+00	1E-06	--	--	--	NC	NC	NC	1.13E-06	0.00E+00	1.13E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 4																																								
Juvenile Trespasser	10	0.092	0.000	0.092	--	--	--	NC	NC	NC	9.23E-02	0.00E+00	9.23E-02	NC	NC	NC	NC	NC	NC	5E-08	0E+00	5E-08	--	--	--	NC	NC	NC	5.47E-08	0.00E+00	5.47E-08	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	10	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	10	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 4																																								
Juvenile Trespasser	25	0.013	0.000	0.013	--	--	--	NC	NC	NC	1.31E-02	0.00E+00	1.31E-02	NC	NC	NC	NC	NC	NC	8E-09	0E+00	8E-09	--	--	--	NC	NC	NC	7.62E-09	0.00E+00	7.62E-09	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	25	2.2	0.0	2.2	--	--	--	NC	NC	NC	2.21E+00	0.00E+00	2.21E+00	NC	NC	NC	NC	NC	NC	1E-06	0E+00	1E-06	--	--	--	NC	NC	NC	1.26E-06	0.00E+00	1.26E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	25	0.00	0.00	0.00	--	--	--	NC	NC	NC	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	NC	NC	NC	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 4																																								
Juvenile Trespasser	58	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	17	6	11	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	1.72E+01	6.14E+00	1.11E+01	8E-06	4E-06	4E-06	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	8.42E-06	4.11E-06	4.31E-06	NC	NC	NC
Exposure Unit 4																																								
Juvenile Trespasser	1000	0.212	0.151	0.061	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	2.12E-01	1.51E-01	6.12E-02	2E-06	1E-06	5E-07	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	1.60E-06	1.14E-06	4.60E-07	NC	NC	NC
On-site Worker	1000	3.21	2.29	0.93	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	3.21E+00	2.29E+00	9.26E-01	6E-05	4E-05	2E-05	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	6.06E-05	4.31E-05	1.75E-05	NC	NC	NC
Construction Worker	1000	4.7	3.4	1.3	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	4.75E+00	3.41E+00	1.34E+00	3E-06	2E-06	9E-07	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	3.38E-06	2.45E-06	9.34E-07	NC	NC	NC
Exposure Unit 5																																								
Juvenile Trespasser	0	0.015	0.000	0.015	--	--	--	--	--	--	1.52E-02	0.00E+00	1.52E-02	--	--	--	--	--	--	9E-09	0E+00	9E-09	--	--	--	--	--	--	8.58E-09	0.00E+00	8.58E-09	--	--	--	--	--	--	5E-09	2E-08	0E+00
On-site Worker	0	3.0	0.0	3.0	--	--	--	--	--	--	2.96E+00	0.00E+00	2.96E+00	--	--	--	--	--	--	2E-06	0E+00	2E-06	--	--	--	--	--	--	1.61E-06	0.00E+00	1.61E-06	--	--	--	--	--	--	1E-07	4E-07	0E+00
Construction Worker	0	25	0	25	--	--	--	--	--	--	2.45E+01	0.00E+00	2.45E+01	--	--	--	--	--	--	3E-06	0E+00	3E-06	--	--	--	--	--	--	2.71E-06	0.00E+00	2.71E-06	--	--	--	--	--	--	**2E-03**	**7E-03**	0E+00
Exposure Unit 5																																								
Juvenile Trespasser	1	0.015	0.000	0.015	--	--	--	--	--	--	1.47E-02	0.00E+00	1.47E-02	--	--	--	--	--	--	8E-09	0E+00	8E-09	--	--	--	--	--	--	8.11E-09	0.00E+00	8.11E-09	--	--	--	--	--	--	NC	NC	NC
On-site Worker	1	2.9	0.0	2.9	--	--	--	--	--	--	2.87E+00	0.00E+00	2.87E+00	--	--	--	--	--	--	2E-06	0E+00	2E-06	--	--	--	--	--	--	1.52E-06	0.00E+00	1.52E-06	--	--	--	--	--	--	NC	NC	NC
Construction Worker	1	25	0	25	--	--	--	--	--	--	2.45E+01	0.00E+00	2.45E+01	--	--	--	--	--	--	2E-06	0E+00	2E-06	--	--	--	--	--	--	2.47E-06	0.00E+00	2.47E-06	--	--	--	--	--	--	NC	NC	NC
Exposure Unit 5																																								
Juvenile Trespasser	10	0.010	0.000	0.010	--	--	--	--	--	--	1.02E-02	0.00E+00	1.02E-02	--	--	--	--	--	--	5E-09	0E+00	5E-09	--	--	--	--	--	--	5.35E-09	0.00E+00	5.35E-09	--	--	--	--	--	--	NC	NC	NC
On-site Worker	10	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC
Construction Worker	10	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC
Exposure Unit 5																																								
Juvenile Trespasser	25	0.0026	0.0000	0.0026	--	--	--	--	--	--	2.57E-03	0.00E+00	2.57E-03	--	--	--	--	--	--	9E-10	0E+00	9E-10	--	--	--	--	--	--	8.68E-10	0.00E+00	8.68E-10	--	--	--	--	--	--	NC	NC	NC
On-site Worker	25	0.57	0.00	0.57	--	--	--	--	--	--	5.66E-01	0.00E+00	5.66E-01	--	--	--	--	--	--	2E-07	0E+00	2E-07	--	--	--	--	--	--	1.57E-07	0.00E+00	1.57E-07	--	--	--	--	--	--	NC	NC	NC
Construction Worker	25	24	0	24	--	--	--	--	--	--	2.45E+01	0.00E+00	2.45E+01	--	--	--	--	--	--	3E-06	0E+00	3E-06	--	--	--	--	--	--	2.68E-06	0.00E+00	2.68E-06	--	--	--	--	--	--	NC	NC	NC

TABLE 6-13
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Scenario	Time (years)	Gross EPC Total Dose (mrem/yr)	Background Total Dose (mrem/yr)	Net EPC Total Dose (mrem/yr)	Gross Groundwater Dose	Background Groundwater Dose	Net Groundwater Dose	Gross Surface Water Dose	Background Surface Water Dose	Net Surface Water Dose	Gross Building Surface Dose	Background Building Surface Dose	Net Building Surface Dose	Gross Sediment Dose	Background Sediment Dose	Net Sediment Dose	Gross Soil Dose	Background Soil Dose	Net Soil Dose	Gross EPC Total Risk	Background Total Risk	Net EPC Total Risk	Gross Groundwater Risk	Background Groundwater Risk	Net Groundwater Risk	Gross Surface Water Risk	Background Surface Water Risk	Net Surface Water Risk	Gross Building Surface Risk	Background Building Surface Risk	Net Building Surface Risk	Gross Sediment Risk	Background Sediment Risk	Net Sediment Risk	Gross Soil Risk	Background Soil Risk	Net Soil Risk	Gross EPC Hazard Index	Background Hazard Index	Net EPC Hazard Index
Exposure Unit 6																																								
Juvenile Trespasser	0	4.2	0.3	3.8	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	4.61E-02	6.83E-03	3.98E-02	4.16E+00	2.80E-01	3.79E+00	3E-05	2E-06	3E-05	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	2.94E-07	4.04E-08	2.56E-07	2.98E-05	2.06E-06	2.70E-05	**1E-02**	**2E-04**	1E-02
On-site Worker	0	**63**	4	**58**	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	2.40E-01	3.56E-02	2.07E-01	**6.30E+01**	4.26E+00	**5.73E+01**	**1E-03**	8E-05	**1E-03**	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	3.83E-06	5.26E-07	3.34E-06	**1.16E-03**	7.71E-05	**1.06E-03**	**5E-02**	**6E-04**	4E-02
Construction Worker	0	**90**	6	**84**	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	2.40E-01	3.56E-02	2.07E-01	**9.02E+01**	5.98E+00	**8.42E+01**	7E-05	4E-06	6E-05	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	1.53E-07	2.10E-08	1.34E-07	6.57E-05	4.39E-06	6.13E-05	**2E-01**	**1E-02**	2E-01
Exposure Unit 6																																							
Juvenile Trespasser	1	0.00	0.00	0.00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	1	0.00	0.00	0.00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	1	0.00	0.00	0.00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 6																																							
Juvenile Trespasser	10	0.00	0.00	0.00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	10	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	10	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 6																																							
Juvenile Trespasser	25	0.00	0.00	0.00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	25	0.00	0.00	0.00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	25	0.00	0.00	0.00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	--	--	--	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 6																																							
Juvenile Trespasser	58	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	**124**	6	**117**	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	**1.24E+02**	6.14E+00	**1.17E+02**	6E-05	4E-06	6E-05	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	6.22E-05	4.11E-06	5.81E-05	NC	NC	NC
Exposure Unit 6																																							
Juvenile Trespasser	1000	3.7	0.2	3.6	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	3.75E+00	1.51E-01	3.56E+00	3E-05	1E-06	3E-05	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	2.82E-05	1.14E-06	2.68E-05	NC	NC	NC
On-site Worker	1000	**57**	2	**54**	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	**5.68E+01**	2.29E+00	**5.39E+01**	**1E-03**	4E-05	**1E-03**	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	**1.07E-03**	4.31E-05	**1.02E-03**	NC	NC	NC
Construction Worker	1000	**53**	3	**49**	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	**5.25E+01**	3.41E+00	**4.91E+01**	4E-05	2E-06	4E-05	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	3.79E-05	2.45E-06	3.54E-05	NC	NC	NC
Exposure Unit 7																																							
Juvenile Trespasser	0	**48**	0.3	**48**	--	--	--	1.04E-02	1.24E-03	9.35E-03	5.22E-01	0.00E+00	5.22E-01	1.58E-01	6.83E-03	1.52E-01	**4.74E+01**	2.80E-01	**4.71E+01**	**3E-04**	2E-06	**3E-04**	--	--	--	3.49E-08	5.95E-09	2.95E-08	3.16E-07	0.00E+00	3.16E-07	1.03E-06	4.04E-08	9.97E-07	**3.21E-04**	2.06E-06	**3.19E-04**	**3E+00**	**2E-04**	**3E+00**
On-site Worker	0	**769**	4	**765**	--	--	--	5.40E-02	6.44E-03	4.87E-02	**9.79E+01**	0.00E+00	**9.79E+01**	8.23E-01	3.56E-02	7.90E-01	**6.71E+02**	4.26E+00	**6.66E+02**	**1E-02**	8E-05	**1E-02**	--	--	--	4.54E-07	7.74E-08	3.84E-07	5.87E-05	0.00E+00	5.87E-05	1.35E-05	5.26E-07	1.30E-05	**1.07E-02**	7.71E-05	**1.07E-02**	**9E+00**	**6E-04**	**9E+00**
Construction Worker	0	**562**	6	**556**	--	--	--	5.40E-02	6.44E-03	4.87E-02	**6.05E+01**	0.00E+00	**6.05E+01**	8.23E-01	3.56E-02	7.90E-01	**5.01E+02**	5.98E+00	**4.95E+02**	**3E-04**	4E-06	**3E-04**	--	--	--	1.82E-08	3.10E-09	1.54E-08	6.90E-06	0.00E+00	6.90E-06	5.39E-07	2.10E-08	5.19E-07	**2.75E-04**	4.39E-06	**2.70E-04**	**2E+01**	**1E-02**	**2E+01**
Exposure Unit 7																																							
Juvenile Trespasser	1	0.50	0.00	0.50	--	--	--	NC	NC	NC	5.02E-01	0.00E+00	5.02E-01	NC	NC	NC	NC	NC	NC	3E-07	0E+00	3E-07	--	--	--	NC	NC	NC	3.00E-07	0.00E+00	3.00E-07	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	1	**94**	0	**94**	--	--	--	NC	NC	NC	**9.44E+01**	0.00E+00	**9.44E+01**	NC	NC	NC	NC	NC	NC	6E-05	0E+00	6E-05	--	--	--	NC	NC	NC	5.58E-05	0.00E+00	5.58E-05	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	1	**60**	0	**60**	--	--	--	NC	NC	NC	**6.05E+01**	0.00E+00	**6.05E+01**	NC	NC	NC	NC	NC	NC	6E-06	0E+00	6E-06	--	--	--	NC	NC	NC	6.45E-06	0.00E+00	6.45E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 7																																							
Juvenile Trespasser	10	0.33	0.00	0.33	--	--	--	NC	NC	NC	3.32E-01	0.00E+00	3.32E-01	NC	NC	NC	NC	NC	NC	2E-07	0E+00	2E-07	--	--	--	NC	NC	NC	1.96E-07	0.00E+00	1.96E-07	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	10	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	10	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 7																																							
Juvenile Trespasser	25	0.048	0.000	0.048	--	--	--	NC	NC	NC	4.82E-02	0.00E+00	4.82E-02	NC	NC	NC	NC	NC	NC	3E-08	0E+00	3E-08	--	--	--	NC	NC	NC	2.75E-08	0.00E+00	2.75E-08	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	25	8.3	0.0	8.3	--	--	--	NC	NC	NC	8.27E+00	0.00E+00	8.27E+00	NC	NC	NC	NC	NC	NC	5E-06	0E+00	5E-06	--	--	--	NC	NC	NC	4.57E-06	0.00E+00	4.57E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	25	0.00	0.00	0.00	--	--	--	NC	NC	NC	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	0E+00	0E+00	0E+00	--	--	--	NC	NC	NC	0.00E+00	0.00E+00	0.00E+00	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 7																																							
Juvenile Trespasser	58	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	**6481**	**6481**	**6481**	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	**6.49E+03**	6.14E+00	**6.48E+03**	**2E-03**	4E-06	**2E-03**	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	**1.93E-03**	4.11E-06	**1.93E-03**	NC	NC	NC
Exposure Unit 7																																							
Juvenile Trespasser	1000	0.72	0.72	0.72	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	8.72E-01	1.51E-01	7.21E-01	6E-06	1E-06	5E-06	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	6.46E-06	1.14E-06	5.32E-06	NC	NC	NC
On-site Worker	1000	11	11	11	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	1.31E+01	2.29E+00	1.08E+01	**2E-04**	4E-05	**2E-04**	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	**2.44E-04**	4.31E-05	**2.01E-04**	NC	NC	NC
Construction Worker	1000	**55**	**55**	**55**	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	**5.87E+01**	3.41E+00	**5.53E+01**	2E-05	2E-06	2E-05	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	2.32E-05	2.45E-06	2.08E-05	NC	NC	NC
Exposure Unit 8																																							
Juvenile Trespasser	0	0.43	0.43	0.43	--	--	--	--	--	--	3.40E-01	0.00E+00	3.40E-01	2.67E-02	6.83E-03	1.99E-02	3.53E-01	2.80E-01	7.28E-02	3E-06	2E-06	8E-07	--	--	--	--	--	--	2.06E-07	0.00E+00	2.06E-07	1.65E-07	4.04E-08	1.25E-07	2.56E-06	2.06E-06	4.99E-07	**3E-03**	**2E-04**	3E-03
On-site Worker	0	**65**	**65**	**65**	--	--	--	--	--	--	**6.36E+01**	0.00E+00	**6.36E+01**	1.39E-01	3.56E-02	1.04E-01	5.33E+00	4.26E+00	1.07E+00	**1E-04**	8E-05	6E-05	--	--	--	--	--	--	3.84E-05	0.00E+00	3.84E-05	2.15E-06	5.26E-07	1.63E-06	9.53E-05	7.71E-05	1.82E-05	**1E-02**	**6E-04**	1E-02
Construction Worker	0	19	19	19	--	--	--	--	--	--	1.65E+01	0.00E+00	1.65E+01	1.39E-01	3.56E-02	1.04E-01	8.91E+00	5.98E+00	2.92E+00	1E-05	4E-06	5E-06	--	--	--	--	--	--	3.07E-06	0.00E+00	3.07E-06	8.62E-08	2.10E-08	6.51E-08	6.42E-06	4.39E-06	2.03E-06	**9E+00**	**1E-02**	**9E+00**
Exposure Unit 8																																							
Juvenile Trespasser	1	0.33	0.33	0.33	--	--	--	--	--	--	3.27E-01	0.00E+00	3.27E-01	NC	NC	NC	NC	NC	NC	2E-07	0E+00	2E-07	--	--	--	--	--	--	1.95E-07	0.00E+00	1.95E-07	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	1	**61**	**61**	**61**	--	--	--	--	--	--	**6.13E+01**	0.00E+00	**6.13E+01**	NC	NC	NC	NC	NC	NC	4E-05	0E+00	4E-05	--	--	--	--	--	--	3.64E-05	0.00E+00	3.64E-05	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	1	16	16	16	--	--	--	--	--	--	1.65E+01	0.00E+00	1.65E+01	NC	NC	NC	NC	NC	NC	3E-06	0E+00	3E-06	--	--	--	--	--	--	2.86E-06	0.00E+00	2.86E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 8																																							
Juvenile Trespasser	10	0.22	0.22	0.22	--	--	--	--	--	--	2.16E-01	0.00E+00	2.16E-01	NC	NC	NC	NC	NC	NC	1E-07	0E+00	1E-07	--	--	--	--	--	--	1.28E-07	0.00E+00	1.28E-07	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	10	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	10	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 8																																							
Juvenile Trespasser	25	0.030	0.000	0.030	--	--	--	--	--	--	2.99E-02	0.00E+00	2.99E-02	NC	NC	NC	NC	NC	NC	2E-08	0E+00	2E-08	--	--	--	--	--	--	1.77E-08	0.00E+00	1.77E-08	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	25	5.0	0.0	5.0	--	--	--	--	--	--	5.00E+00	0.00E+00	5.00E+00	NC	NC	NC	NC	NC	NC	3E-06	0E+00	3E-06	--	--	--	--	--	--	2.93E-06	0.00E+00	2.93E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	25	16	0	16	--	--	--	--	--	--	1.64E+01	0.00E+00	1.64E+01	NC	NC	NC	NC	NC	NC	3E-06	0E+00	3E-06	--	--	--	--	--	--	3.04E-06	0.00E+00	3.04E-06	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 8																																							
Juvenile Trespasser	58	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 8																																							
Juvenile Trespasser	58	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Exposure Unit 9																																							
Juvenile Trespasser	58	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	**21**	6	**15**	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	2.07E+01	6.14E+00	1.45E+01	1E-05	4E-06	8E-06	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	1.18E-05	4.11E-06	7.73E-06	NC	NC	NC
Exposure Unit 9																																							
Juvenile Trespasser	1000	0.233	0.151	0.087	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	2.33E-01	1.51E-01	8.67E-02	2E-06	1E-06	7E-07	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	1.76E-06	1.14E-06	6.54E-07	NC	NC	NC
On-site Worker	1000	3.5	2.3	1.3	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	3.53E+00	2.29E+00	1.31E+00	7E-05	4E-05	2E-05	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	6.67E-05	4.31E-05	2.48E-05	NC	NC	NC
Construction Worker	1000	8.9	3.4	5.5	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	8.93E+00	3.41E+00	5.52E+00	6E-06	2E-06	4E-06	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	6.40E-06	2.45E-06	3.95E-06	NC	NC	NC
Exposure Unit 10																																							
Juvenile Trespasser	0	0.40	0.28	0.12	NA	NA	NA	--	--	--	--	--	--	--	--	--	4.01E-01	2.80E-01	1.21E-01	3E-06	2E-06	9E-07	NA	NA	NA	--	--	--	--	--	--	--	--	--	2.97E-06	2.06E-06	9.10E-07	**2E-03**	**1E-04**	2E-03
On-site Worker	0	6.1	4.3	1.8	NA	NA	NA	--	--	--	--	--	--	--	--	--	6.05E+00	4.26E+00	1.80E+00	**1E-04**	8E-05	3E-05	NA	NA	NA	--	--	--	--	--	--	--	--	--	**1.06E-04**	7.71E-05	2.93E-05	**7E-03**	**4E-04**	7E-03
Construction Worker	0	11.2	6.3	5.1	1.74E-01	2.83E-01	9.56E-02	--	--	--	--	--	--	--	--	--	1.10E+01	5.98E+00	5.01E+00	8E-06	5E-06	4E-06	6.23E-08	1.50E-07	2.68E-08	--	--	--	--	--	--	--	--	--	7.93E-06	4.39E-06	3.54E-06	**5E-02**	**4E-03**	4E-02
Resident - Adult	0	**32**	21	15	2.80E+00	4.56E+00	1.54E+00	--	--	--	--	--	--	--	--	--	**2.91E+01**	1.61E+01	1.31E+01	**6E-04**	**4E-04**	**3E-04**	3.01E-05	7.26E-05	1.29E-05	--	--	--	--	--	--	--	--	--	**6.20E-04**	**3.48E-04**	**2.71E-04**	**2E-01**	**3E-02**	1E-01
Resident - Child	0	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	NA	NA	NA	**3E-01**	**4E-02**	3E-01

Scenario	Time (years)	Gross EPC Total Dose (mrem/yr)	Background Total Dose (mrem/yr)	Net EPC Total Dose (mrem/yr)	Gross Groundwater Dose	Background Groundwater Dose	Net Groundwater Dose	Gross Surface Water Dose	Background Surface Water Dose	Net Surface Water Dose	Gross Building Surface Dose	Background Building Surface Dose	Net Building Surface Dose	Gross Sediment Dose	Background Sediment Dose	Net Sediment Dose	Gross Soil Dose	Background Soil Dose	Net Soil Dose	Gross EPC Total Risk	Background Total Risk	Net EPC Total Risk	Gross Groundwater Risk	Background Groundwater Risk	Net Groundwater Risk	Gross Surface Water Risk	Background Surface Water Risk	Net Surface Water Risk	Gross Building Surface Risk	Background Building Surface Risk	Net Building Surface Risk	Gross Sediment Risk	Background Sediment Risk	Net Sediment Risk	Gross Soil Risk	Background Soil Risk	Net Soil Risk	Gross EPC Hazard Index	Background Hazard Index	Net EPC Hazard Index
Exposure Unit 10																																								
Juvenile Trespasser	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC
Construction Worker	58	22	6	16	1.04E+00	0.00E+00	1.04E+00	--	--	--	--	--	--	--	--	--	2.14E+01	6.14E+00	1.53E+01	1E-05	4E-06	6E-06	2.92E-07	0.00E+00	2.92E-07	--	--	--	--	--	--	--	--	--	1.02E-05	4.11E-06	6.08E-06	NC	NC	NC
Resident - Adult	58	187	25	162	1.67E+01	0.00E+00	1.67E+01	--	--	--	--	--	--	--	--	--	1.70E+02	2.45E+01	1.45E+02	2E-03	4E-04	1E-03	1.41E-04	0.00E+00	1.41E-04	--	--	--	--	--	--	--	--	--	1.71E-03	3.98E-04	1.31E-03	NC	NC	NC
Exposure Unit 10																																								
Juvenile Trespasser	1000	0.182	0.151	0.031	NA	NA	NA	--	--	--	--	--	--	--	--	--	1.82E-01	1.51E-01	3.11E-02	1E-06	1E-06	2E-07	NA	NA	NA	--	--	--	--	--	--	--	--	--	1.37E-06	1.14E-06	2.34E-07	NC	NC	NC
On-site Worker	1000	2.76	2.29	0.47	NA	NA	NA	--	--	--	--	--	--	--	--	--	2.76E+00	2.29E+00	4.71E-01	5E-05	4E-05	9E-06	NA	NA	NA	--	--	--	--	--	--	--	--	--	5.20E-05	4.31E-05	8.87E-06	NC	NC	NC
Construction Worker	1000	5.5	3.4	2.1	NC	NC	NC	--	--	--	--	--	--	--	--	--	5.52E+00	3.41E+00	2.10E+00	4E-06	2E-06	1E-06	NC	NC	NC	--	--	--	--	--	--	--	--	--	3.93E-06	2.45E-06	1.48E-06	NC	NC	NC
Resident - Adult	1000	15	9	6	NC	NC	NC	--	--	--	--	--	--	--	--	--	1.53E+01	9.02E+00	6.26E+00	3E-04	2E-04	1E-04	NC	NC	NC	--	--	--	--	--	--	--	--	--	3.37E-04	2.07E-04	1.30E-04	NC	NC	NC
Exposure Unit 11																																								
Juvenile Trespasser	0	0.53	0.29	0.25	NA	NA	NA	2.38E-02	1.24E-03	2.27E-02	--	--	--	3.22E-02	6.83E-03	2.59E-02	4.71E-01	2.80E-01	1.99E-01	4E-06	2E-06	2E-06	NA	NA	NA	7.14E-08	5.95E-09	6.57E-08	--	--	--	2.12E-07	4.04E-08	1.75E-07	3.42E-06	2.06E-06	1.41E-06	1E-02	2E-04	1E-02
On-site Worker	0	7.3	4.3	3.1	NA	NA	NA	1.24E-01	6.44E-03	1.18E-01	--	--	--	1.67E-01	3.56E-02	1.35E-01	7.03E+00	4.26E+00	2.89E+00	1E-04	8E-05	5E-05	NA	NA	NA	9.30E-07	7.74E-08	8.55E-07	--	--	--	2.77E-06	5.26E-07	2.28E-06	1.18E-04	7.71E-05	4.28E-05	4E-02	6E-04	4E-02
Construction Worker	0	11.4	6.3	5.3	5.09E-01	2.83E-01	4.39E-01	1.24E-01	6.44E-03	1.18E-01	--	--	--	1.67E-01	3.56E-02	1.35E-01	1.06E+01	5.98E+00	4.57E+00	8E-06	5E-06	3E-06	1.51E-07	1.50E-07	1.24E-07	3.72E-08	3.10E-09	3.42E-08	--	--	--	1.11E-07	2.10E-08	9.12E-08	7.27E-06	4.39E-06	2.88E-06	2E-01	4E-03	2E-01
Resident - Adult	0	35	21	18	8.20E+00	4.56E+00	7.07E+00	NA	NA	NA	--	--	--	NA	NA	NA	2.66E+01	1.61E+01	1.05E+01	6E-04	4E-04	2E-04	7.27E-05	7.26E-05	6.00E-05	NA	NA	NA	--	--	--	NA	NA	NA	5.29E-04	3.48E-04	1.81E-04	5E-01	3E-02	5E-01
Resident - Child	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	NA	NA	NA	NA	NA	NA	1E+00	4E-02	9E-01
Exposure Unit 11																																								
Juvenile Trespasser	58	NC	NC	NC	NA	NA	NA	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	NA	NA	NA	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	NC	NC	NC	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	44	6	38	1.04E+00	0.00E+00	1.04E+00	NC	NC	NC	--	--	--	NC	NC	NC	4.32E+01	6.14E+00	3.71E+01	2E-05	4E-06	1E-05	2.92E-07	0.00E+00	2.92E-07	NC	NC	NC	--	--	--	NC	NC	NC	1.57E-05	4.11E-06	1.16E-05	NC	NC	NC
Resident - Adult	58	461	25	436	1.67E+01	0.00E+00	1.67E+01	NA	NA	NA	--	--	--	NA	NA	NA	4.44E+02	2.45E+01	4.20E+02	4E-03	4E-04	4E-03	1.41E-04	0.00E+00	1.41E-04	NA	NA	NA	--	--	--	NA	NA	NA	3.84E-03	3.98E-04	3.44E-03	NC	NC	NC
Exposure Unit 11																																								
Juvenile Trespasser	1000	0.166	0.151	0.018	NA	NA	NA	NC	NC	NC	--	--	--	NC	NC	NC	1.66E-01	1.51E-01	1.77E-02	1E-06	1E-06	1E-07	NA	NA	NA	NC	NC	NC	--	--	--	NC	NC	NC	1.25E-06	1.14E-06	1.33E-07	NC	NC	NC
On-site Worker	1000	2.52	2.29	0.27	NA	NA	NA	NC	NC	NC	--	--	--	NC	NC	NC	2.52E+00	2.29E+00	2.68E-01	5E-05	4E-05	5E-06	NA	NA	NA	NC	NC	NC	--	--	--	NC	NC	NC	4.75E-05	4.31E-05	5.06E-06	NC	NC	NC
Construction Worker	1000	4.4	3.4	1.0	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	4.45E+00	3.41E+00	1.05E+00	3E-06	2E-06	7E-07	NC	NC	NC	NC	NC	NC	--	--	--	NC	NC	NC	3.10E-06	2.45E-06	6.55E-07	NC	NC	NC
Resident - Adult	1000	13.96	9.02	4.98	NC	NC	NC	NA	NA	NA	--	--	--	NA	NA	NA	1.40E+01	9.02E+00	4.98E+00	3E-04	2E-04	7E-05	NC	NC	NC	NA	NA	NA	--	--	--	NA	NA	NA	2.79E-04	2.07E-04	7.23E-05	NC	NC	NC
Exposure Unit 12																																								
Juvenile Trespasser	0	0.333	0.287	0.046	NA	NA	NA	--	--	--	--	--	--	9.84E-03	6.83E-03	3.01E-03	3.23E-01	2.80E-01	4.29E-02	2E-06	2E-06	3E-07	NA	NA	NA	--	--	--	--	--	--	6.12E-08	4.04E-08	2.08E-08	2.38E-06	2.06E-06	3.17E-07	2E-03	2E-04	2E-03
On-site Worker	0	4.93	4.29	0.64	NA	NA	NA	--	--	--	--	--	--	5.13E-02	3.56E-02	1.57E-02	4.88E+00	4.26E+00	6.24E-01	9E-05	8E-05	1E-05	NA	NA	NA	--	--	--	--	--	--	7.97E-07	5.26E-07	2.71E-07	8.71E-05	7.71E-05	1.01E-05	6E-03	6E-04	6E-03
Construction Worker	0	9.4	6.3	3.3	4.10E-01	2.83E-01	3.41E-01	--	--	--	--	--	--	5.13E-02	3.56E-02	1.57E-02	8.97E+00	5.98E+00	2.98E+00	6E-06	5E-06	2E-06	1.24E-07	1.50E-07	9.74E-08	--	--	--	--	--	--	3.19E-08	2.10E-08	1.08E-08	6.26E-06	4.39E-06	1.87E-06	1E-01	4E-03	1E-01
Resident - Adult	0	29	21	12	6.60E+00	4.56E+00	5.49E+00	--	--	--	--	--	--	NA	NA	NA	2.26E+01	1.61E+01	6.57E+00	5E-04	4E-04	2E-04	5.98E-05	7.26E-05	4.71E-05	--	--	--	--	--	--	NA	NA	NA	4.54E-04	3.48E-04	1.06E-04	5E-01	3E-02	4E-01
Resident - Child	0	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	7E-01	4E-02	7E-01
Exposure Unit 12																																								
Juvenile Trespasser	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	32	6	25	1.04E+00	0.00E+00	1.04E+00	--	--	--	--	--	--	NC	NC	NC	3.05E+01	6.14E+00	2.43E+01	1E-05	4E-06	8E-06	2.92E-07	0.00E+00	2.92E-07	--	--	--	--	--	--	NC	NC	NC	1.16E-05	4.11E-06	7.54E-06	NC	NC	NC
Resident - Adult	58	317	25	292	1.67E+01	0.00E+00	1.67E+01	--	--	--	--	--	--	NA	NA	NA	3.00E+02	2.45E+01	2.75E+02	3E-03	4E-04	2E-03	1.41E-04	0.00E+00	1.41E-04	--	--	--	--	--	--	NA	NA	NA	2.64E-03	3.98E-04	2.25E-03	NC	NC	NC
Exposure Unit 12																																								
Juvenile Trespasser	1000	0.1567	0.1512	0.0055	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	1.57E-01	1.51E-01	5.48E-03	1E-06	1E-06	4E-08	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	1.18E-06	1.14E-06	4.07E-08	NC	NC	NC
On-site Worker	1000	2.371	2.289	0.082	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	2.37E+00	2.29E+00	8.22E-02	4E-05	4E-05	2E-06	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	4.47E-05	4.31E-05	1.54E-06	NC	NC	NC
Construction Worker	1000	3.92	3.41	0.51	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	3.92E+00	3.41E+00	5.12E-01	3E-06	2E-06	3E-07	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	2.75E-06	2.45E-06	2.97E-07	NC	NC	NC
Resident - Adult	1000	11.9	9.0	2.8	NC	NC	NC	--	--	--	--	--	--	NA	NA	NA	1.19E+01	9.02E+00	2.83E+00	2E-04	2E-04	4E-05	NC	NC	NC	--	--	--	--	--	--	NA	NA	NA	2.43E-04	2.07E-04	3.63E-05	NC	NC	NC
Exposure Unit 13																																								
Juvenile Trespasser	0	0.37	0.29	0.12	NA	NA	NA	--	--	--	--	--	--	1.89E-02	6.83E-03	1.35E-02	3.52E-01	2.80E-01	1.06E-01	3E-06	2E-06	1E-06	NA	NA	NA	--	--	--	--	--	--	1.33E-07	4.04E-08	9.70E-08	2.76E-06	2.06E-06	9.53E-07	6E-03	2E-04	6E-03
On-site Worker	0	5.3	4.3	1.6	NA	NA	NA	--	--	--	--	--	--	9.86E-02	3.56E-02	7.04E-02	5.24E+00	4.26E+00	1.51E+00	1E-04	8E-05	4E-05	NA	NA	NA	--	--	--	--	--	--	1.73E-06	5.26E-07	1.26E-06	1.07E-04	7.71E-05	3.92E-05	2E-02	6E-04	2E-02
Construction Worker	0	12.2	6.3	6.4	4.40E-01	2.83E-01	3.71E-01	--	--	--	--	--	--	9.86E-02	3.56E-02	7.04E-02	1.16E+01	5.98E+00	5.96E+00	8E-06	5E-06	4E-06	1.32E-07	1.50E-07	1.04E-07	--	--	--	--	--	--	6.91E-08	2.10E-08	5.05E-08	7.51E-06	4.39E-06	3.37E-06	2E-01	4E-03	2E-01
Resident - Adult	0	34	21	18	7.09E+00	4.56E+00	5.97E+00	--	--	--	--	--	--	NA	NA	NA	2.71E+01	1.61E+01	1.20E+01	6E-04	4E-04	3E-04	6.38E-05	7.26E-05	5.01E-05	--	--	--	--	--	--	NA	NA	NA	5.60E-04	3.48E-04	2.31E-04	5E-01	3E-02	5E-01
Resident - Child	0	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	1E+00	4E-02	1E+00
Exposure Unit 13																																								
Juvenile Trespasser	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	75	6	69	1.04E+00	0.00E+00	1.04E+00	--	--	--	--	--	--	NC	NC	NC	7.38E+01	6.14E+00	6.79E+01	2E-05	4E-06	2E-05	2.92E-07	0.00E+00	2.92E-07	--	--	--	--	--	--	NC	NC	NC	2.46E-05	4.11E-06	2.06E-05	NC	NC	NC
Resident - Adult	58	813	25	789	1.67E+01	0.00E+00	1.67E+01	--	--	--	--	--	--	NA	NA	NA	7.96E+02	2.45E+01	7.72E+02	7E-03	4E-04	6E-03	1.41E-04	0.00E+00	1.41E-04	--	--	--	--	--	--	NA	NA	NA	6.62E-03	3.98E-04	6.24E-03	NC	NC	NC
Exposure Unit 13																																								
Juvenile Trespasser	1000	0.26	0.15	0.11	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	2.64E-01	1.51E-01	1.14E-01	2E-06	1E-06	9E-07	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	1.99E-06	1.14E-06	8.51E-07	NC	NC	NC
On-site Worker	1000	4.0	2.3	1.7	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	4.00E+00	2.29E+00	1.71E+00	8E-05	4E-05	3E-05	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	7.53E-05	4.31E-05	3.23E-05	NC	NC	NC
Construction Worker	1000	5.5	3.4	2.1	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	5.53E+00	3.41E+00	2.13E+00	4E-06	2E-06	1E-06	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	3.77E-06	2.45E-06	1.32E-06	NC	NC	NC
Resident - Adult	1000	18.8	9.0	9.8	NC	NC	NC	--	--	--	--	--	--	NA	NA	NA	1.88E+01	9.02E+00	9.81E+00	3E-04	2E-04	1E-04	NC	NC	NC	--	--	--	--	--	--	NA	NA	NA	3.49E-04	2.07E-04	1.43E-04	NC	NC	NC
Exposure Unit 14																																								
Juvenile Trespasser	0	0.2286	0.2802	0.0024	NA	NA	NA	--	--	--	--	--	--	--	--	--	2.29E-01	2.80E-01	2.43E-03	2E-06	2E-06	2E-08	NA	NA	NA	--	--	--	--	--	--	--	--	--	1.70E-06	2.06E-06	1.65E-08	3E-04	1E-04	1E-04
On-site Worker	0	3.472	4.257	0.035	NA	NA	NA	--	--	--	--	--	--	--	--	--	3.47E+00	4.26E+00	3.48E-02	6E-05	8E-05	6E-07	NA	NA	NA	--	--	--	--	--	--	--	--	--	6.13E-05	7.71E-05	5.64E-07	8E-04	4E-04	4E-04
Construction Worker	0	8.1	6.3	2.2	2.06E+00	2.83E-01	1.99E+00	--	--	--	--	--	--	--	--	--	6.00E+00	5.98E+00	2.01E-01	5E-06	5E-06	7E-07	5.99E-07	1.50E-07	5.67E-07	--	--	--	--	--	--	--	--	--	4.37E-06	4.39E-06	1.09E-07	1E-01	4E-03	1E-01
Resident - Adult	0	49	21	32	3.32E+01	4.56E+00	3.20E+01	--	--	--	--	--	--	--	--	--	1.60E+01	1.61E+01	3.83E-01	6E-04	4E-04	3E-04	2.89E-04	7.26E-05	2.74E-04	--	--	--	--	--	--	--	--	--	3.42E-04	3.48E-04	6.63E-06	2E+00	3E-02	2E+00
Resident - Child	0	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	NA	NA	NA	2E+00	4E-02	2E+00
Exposure Unit 14																																								
Juvenile Trespasser	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC
Construction Worker	58	9.6	6.1	3.7	1.04E+00	0.00E+00	1.04E+00	--	--	--	--	--	--	--	--	--	8.53E+00	6.14E+00	2.65E+00	5E-06	4E-06	1E-06	2.92E-07	0.00E+00	2.92E-07	--	--	--	--	--	--	--	--	--	4.71E-06	4.11E-06	7.94E-07	NC	NC	NC
Resident - Adult	58	71	25	47	1.67E+01	0.00E+00	1.67E+01	--	--	--	--	--	--	--	--	--	5.44E+01	2.45E+01	3.06E+01	8E-04	4E-04	4E-04	1.41E-04	0.00E+00	1.41E-04	--	--	--	--	--	--	--	--	--	6.30E-04	3.98E-04	2.47E-04	NC	NC	NC
Exposure Unit 14																																								
Juvenile Trespasser	1000	0.100353	0.151228	0.000010	NA	NA	NA	--	--	--	--	--	--	--	--	--	1.00E-01	1.51E-01	1.03E-05	8E-07	1E-06	7E-11	NA	NA	NA	--	--	--	--	--	--	--	--	--	7.54E-07	1.14E-06	7.39E-11	NC	NC	NC
On-site Worker	1000	1.51824	2.28872	0.00015	NA	NA	NA	--	--	--	--	--	--	--	--	--	1.52E+00	2.29E+00	1.51E-04	3E-05	4E-05	3E-09	NA	NA	NA	--	--	--	--	--	--	--	--	--	2.86E-05	4.31E-05	2.75E-09	NC	NC	NC
Construction Worker	1000	3.225	3.412	0.035	NC	NC	NC	--	--	--	--	--	--	--	--	--	3.23E+00	3.41E+00	3.52E-02	2E-06	2E-06	2E-08	NC	NC	NC	--	--	--	--	--	--	--	--	--	2.31E-06	2.45E-06	1.64E-08	NC	NC	NC
Resident - Adult	1000	8.71	9.02	0.26	NC	NC	NC	--	--	--	--	--	--	--	--	--	8.71E+00	9.02E+00	2.63E-01	2E-04	2E-04	3E-06	NC	NC	NC	--	--	--	--	--	--	--	--	--	1.96E-04	2.07E-04	2.66E-06	NC	NC	NC
Exposure Unit 15																																								
Juvenile Trespasser	0	0.347	0.287	0.061	--	--	--	--	--	--	--	--	--	1.30E-02	6.83E-03	7.42E-03	3.34E-01	2.80E-01	5.37E-02	3E-06	2E-06	5E-07	--	--	--	--	--	--	--	--	--	9.20E-08	4.04E-08	5.56E-08	2.48E-06	2.06E-06	4.20E-07	9E-04	2E-04	7E-04
On-site Worker	0	5.14	4.29	0.85	--	--	--	--	--	--	--	--	--	6.78E-02	3.56E-02	3.86E-02	5.07E+00	4.26E+00	8.12E-01	9E-05	8E-05	1E-05	--	--	--	--	--	--	--	--	--	1.20E-06	5.26E-07	7.24E-07	9.06E-05	7.71E-05	1.35E-05	4E-03	6E-04	3E-03
Construction Worker	0	8.3	6.0	2.2	--	--	--	--	--	--	--	--	--	6.78E-02	3.56E-02	3.86E-02	8.19E+00	5.98E+00	2.21E+00	6E-06	4E-06	2E-06	--	--	--	--	--	--	--	--	--	4.79E-08	2.10E-08	2.90E-08	6.02E-06	4.39E-06	1.63E-06	8E-03	3E-03	6E-03
Resident - Adult	0	22.2	16.1	6.1	--	--	--	--	--	--	--	--	--	NA	NA	NA	2.22E+01	1.61E+01	6.11E+00	5E-04	3E-04	1E-04	--	--	--	--	--	--	--	--	--	NA	NA	NA	4.67E-04	3.48E-04	1.19E-04	2E-03	1E-03	1E-03
Resident - Child	0	NA	NA	NA	--	--	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	2E-02	9E-03	1E-02
Exposure Unit 15																																								
Juvenile Trespasser	58	NC	NC	NC	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	8.9	6.1	2.7	--	--	--	--	--	--	--	--	--	NC	NC	NC	8.86E+00	6.14E+00	2.71E+00	6E-06	4E-06	1E-06	--	--	--	--	--	--	--	--	--	NC	NC	NC	5.57E-06	4.11E-06	1.46E-06	NC	NC	NC
Resident - Adult	58	43	25	18	--	--	--	--	--	--	--	--	--	NA	NA	NA	4.27E+01	2.45E+01	1.81E+01	6E-04	4E-04	2E-04	--	--	--	--	--	--	--	--	--	NA	NA	NA	6.00E-04	3.98E-04	2.02E-04	NC	NC	NC
Exposure Unit 15																																								
Juvenile Trespasser	1000	0.178	0.151	0.027	--	--	--	--	--	--	--	--	--	NC	NC	NC	1.78E-01	1.51E-01	2.70E-02	1E-06	1E-06	2E-07	--	--	--	--	--	--	--	--	--	NC	NC	NC	1.34E-06	1.14E-06	2.03E-07	NC	NC	NC
On-site Worker	1000	2.70	2.29	0.41	--	--	--	--	--	--	--	--	--	NC	NC	NC	2.70E+00	2.29E+00	4.08E-01	5E-05	4E-05	8E-06	--	--	--	--	--	--	--	--	--	NC	NC	NC	5.08E-05	4.31E-05	7.69E-06	NC	NC	NC
Construction Worker	1000	4.23	3.41	0.82	--	--	--	--	--	--	--	--	--	NC	NC	NC	4.23E+00	3.41E+00	8.16E-01	3E-06	2E-06	6E-07	--	--	--	--	--	--	--	--	--	NC	NC	NC	3.03E-06	2.45E-06	5.81E-07	NC	NC	NC
Resident - Adult	1000	11.3	9.0	2.2	--	--	--	--	--	--	--	--	--	NA	NA	NA	1.13E+01	9.02E+00	2.23E+00	3E-04	2E-04	5E-05	--	--	--	--	--	--	--	--	--	NA	NA	NA	2.57E-04	2.07E-04	4.96E-05	NC	NC	NC
Exposure Unit 16																																								
Juvenile Trespasser	0	0.40	0.29	0.12	NA	NA	NA	--	--	--	--	--	--	7.29E-03	6.83E-03	3.88E-03	3.94E-01	2.80E-01	1.14E-01	3E-06	2E-06	8E-07	NA	NA	NA				--	--	--	5.27E-08	4.04E-08	2.61E-08	2.86E-06	2.06E-06	8.01E-07	2E-03	2E-04	1E-03
On-site Worker	0	6.0	4.3	1.7	NA	NA	NA	--	--	--	--	--	--	3.80E-02	3.56E-02	2.02E-02	5.97E+00	4.26E+00	1.71E+00	1E-04	8E-05	3E-05	NA	NA	NA	--	--	--	--	--	--	6.86E-07	5.26E-07	3.40E-07	1.08E-04	7.71E-05	3.05E-05	5E-03	6E-04	5E-03
Construction Worker	0	10.5	6.3	4.4	8.91E-01	2.83E-01	8.11E-01	--	--	--	--	--	--	3.80E-02	3.56E-02	2.02E-02	9.56E+00	5.98E+00	3.58E+00	7E-06	5E-06	3E-06	2.66E-07	1.50E-07	2.30E-07	--	--	--	--	--	--	2.75E-08	2.10E-08	1.36E-08	6.93E-06	4.39E-06	2.54E-06	8E-02	4E-03	8E-02
Resident - Adult	0	40	21	22	1.43E+01	4.56E+00	1.31E+01	--	--	--	--	--	--	NA	NA	NA	2.53E+01	1.61E+01	9.25E+00	7E-04	4E-04	3E-04	1.29E-04	7.26E-05	1.11E-04	--	--	--	--	--	--	NA	NA	NA	5.58E-04	3.48E-04	2.09E-04	1E+00	3E-02	9E-01
Resident - Child	0	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	1E+00	4E-02	1E+00
Exposure Unit 16																																								
Juvenile Trespasser	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC	NC	NC	NC
Construction Worker	58	15.7	6.1	9.6	1.04E+00	0.00E+00	1.04E+00	--	--	--	--	--	--	NC	NC	NC	1.47E+01	6.14E+00	8.51E+00	8E-06	4E-06	4E-06	2.92E-07	0.00E+00	2.92E-07	--	--	--	--	--	--	NC	NC	NC	8.01E-06	4.11E-06	3.90E-06	NC	NC	NC
Resident - Adult	58	112	25	87	1.67E+01	0.00E+00	1.67E+01	--	--	--	--	--	--	NA	NA	NA	9.51E+01	2.45E+01	7.06E+01	1E-03	4E-04	8E-04	1.41E-04	0.00E+00	1.41E-04	--	--	--	--	--	--	NA	NA	NA	1.09E-03	3.98E-04	6.94E-04	NC	NC	NC
Exposure Unit 16																																								
Juvenile Trespasser	1000	0.229	0.151	0.077	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	2.29E-01	1.51E-01	7.74E-02	2E-06	1E-06	6E-07	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	1.72E-06	1.14E-06	5.83E-07	NC	NC	NC
On-site Worker	1000	3.5	2.3	1.2	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	3.46E+00	2.29E+00	1.17E+00	7E-05	4E-05	2E-05	NA	NA	NA	--	--	--	--	--	--	NC	NC	NC	6.53E-05	4.31E-05	2.21E-05	NC	NC	NC
Construction Worker	1000	5.6	3.4	2.2	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	5.63E+00	3.41E+00	2.22E+00	4E-06	2E-06	2E-06	NC	NC	NC	--	--	--	--	--	--	NC	NC	NC	4.03E-06	2.45E-06	1.58E-06	NC	NC	NC
Resident - Adult	1000	15.2	9.0	6.2	NC	NC	NC	--	--	--	--	--	--	NA	NA	NA	1.52E+01	9.02E+00	6.16E+00	3E-04	2E-04	1E-04	NC	NC	NC	--	--	--	--	--	--	NA	NA	NA	3.42E-04	2.07E-04	1.35E-04	NC	NC	NC

TABLE 6-13
SELECTED CARCINOGENIC RISKS, RADIATION DOSES, AND HAZARD INDICES BY EU
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Scenario	Time (years)	Gross EPC Total Dose (mrem/yr)	Background Total Dose (mrem/yr)	Net EPC Total Dose (mrem/yr)	Gross Groundwater Dose	Background Groundwater Dose	Net Groundwater Dose	Gross Surface Water Dose	Background Surface Water Dose	Net Surface Water Dose	Gross Building Surface Dose	Background Building Surface Dose	Net Building Surface Dose	Gross Sediment Dose	Background Sediment Dose	Net Sediment Dose	Gross Soil Dose	Background Soil Dose	Net Soil Dose	Gross EPC Total Risk	Background Total Risk	Net EPC Total Risk	Gross Groundwater Risk	Background Groundwater Risk	Net Groundwater Risk	Gross Surface Water Risk	Background Surface Water Risk	Net Surface Water Risk	Gross Building Surface Risk	Background Building Surface Risk	Net Building Surface Risk	Gross Sediment Risk	Background Sediment Risk	Net Sediment Risk	Gross Soil Risk	Background Soil Risk	Net Soil Risk	Gross EPC Hazard Index	Background Hazard Index	Net EPC Hazard Index
Exposure Unit 17																																								
Juvenile Trespasser	0	7.4	0.3	7.1	--	--	--	--	--	--	--	--	--	--	--	--	7.43E+00	2.80E-01	7.15E+00	5E-05	2E-06	5E-05	--	--	--	--	--	--	--	--	--	--	--	--	5.47E-05	2.06E-06	5.26E-05	**3E-01**	**1E-04**	3E-01
On-site Worker	0	**109**	4	**104**	--	--	--	--	--	--	--	--	--	--	--	--	**1.09E+02**	4.26E+00	**1.04E+02**	**2E-03**	8E-05	**2E-03**	--	--	--	--	--	--	--	--	--	--	--	--	**1.74E-03**	7.71E-05	**1.66E-03**	**8E-01**	**4E-04**	8E-01
Construction Worker	0	**81**	6	**75**	--	--	--	--	--	--	--	--	--	--	--	--	**8.06E+01**	5.98E+00	**7.46E+01**	5E-05	4E-06	5E-05	--	--	--	--	--	--	--	--	--	--	--	--	5.04E-05	4.39E-06	4.60E-05	**2E+00**	**2E-03**	**2E+00**
Resident - Adult	0	**182**	16	**166**	--	--	--	--	--	--	--	--	--	--	--	--	**1.82E+02**	1.61E+01	**1.66E+02**	**3E-03**	**3E-04**	**3E-03**	--	--	--	--	--	--	--	--	--	--	--	--	**3.41E-03**	**3.48E-04**	**3.06E-03**	**8E-01**	**1E-03**	8E-01
Resident - Chilc	0	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA	**9E-03**	**8E+00**	
Exposure Unit 17																																								
Juvenile Trespasser	58	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--	**NC**	**NC**	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--	**NC**	**NC**	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC
Construction Worker	58	**660**	6	**653**	--	--	--	--	--	--	--	--	--	--	--	--	**6.60E+02**	6.14E+00	**6.53E+02**	**2E-04**	4E-06	**2E-04**	--	--	--	--	--	--	--	--	--	--	--	--	**2.08E-04**	4.11E-06	**2.04E-04**	NC	NC	NC
Resident - Adult	58	**7393**	25	**7368**	--	--	--	--	--	--	--	--	--	--	--	--	**7.39E+03**	2.45E+01	**7.37E+03**	**6E-02**	**4E-04**	**6E-02**	--	--	--	--	--	--	--	--	--	--	--	--	**6.08E-02**	**3.98E-04**	**6.04E-02**	NC	NC	NC
Exposure Unit 17																																								
Juvenile Trespasser	1000	1.6	0.2	1.4	--	--	--	--	--	--	--	--	--	--	--	--	1.55E+00	1.51E-01	1.40E+00	1E-05	1E-06	1E-05	--	--	--	--	--	--	--	--	--	--	--	--	1.17E-05	1.14E-06	1.06E-05	NC	NC	NC
On-site Worker	1000	24	2	21	--	--	--	--	--	--	--	--	--	--	--	--	2.36E+01	2.29E+00	2.13E+01	**4E-04**	4E-05	**4E-04**	--	--	--	--	--	--	--	--	--	--	--	--	**4.45E-04**	4.31E-05	**4.01E-04**	NC	NC	NC
Construction Worker	1000	**25**	3	22	--	--	--	--	--	--	--	--	--	--	--	--	**2.51E+01**	3.41E+00	2.17E+01	2E-05	2E-06	1E-05	--	--	--	--	--	--	--	--	--	--	--	--	1.63E-05	2.45E-06	1.38E-05	NC	NC	NC
Resident - Adult	1000	**105**	9	**96**	--	--	--	--	--	--	--	--	--	--	--	--	**1.05E+02**	9.02E+00	**9.61E+01**	**2E-03**	**2E-04**	**1E-03**	--	--	--	--	--	--	--	--	--	--	--	--	**1.67E-03**	**2.07E-04**	**1.47E-03**	NC	NC	NC
Exposure Unit 18																																								
Juvenile Trespasser	0	0.318	0.280	0.038	NA	NA	NA	--	--	--	--	--	--	--	--	--	3.18E-01	2.80E-01	3.76E-02	2E-06	2E-06	3E-07	NA	NA	NA	--	--	--	--	--	--	--	--	--	2.37E-06	2.06E-06	3.06E-07	**1E-04**	**1E-04**	7E-07
On-site Worker	0	4.83	4.26	0.57	NA	NA	NA	--	--	--	--	--	--	--	--	--	4.83E+00	4.26E+00	5.71E-01	9E-05	8E-05	1E-05	NA	NA	NA	--	--	--	--	--	--	--	--	--	8.69E-05	7.71E-05	9.89E-06	**4E-04**	**4E-04**	2E-06
Construction Worker	0	7.16	6.27	0.90	3.07E-01	2.83E-01	2.35E-02	--	--	--	--	--	--	--	--	--	6.86E+00	5.98E+00	8.74E-01	5E-06	5E-06	7E-07	1.62E-07	1.50E-07	1.13E-08	--	--	--	--	--	--	--	--	--	5.04E-06	4.39E-06	6.53E-07	**5E-03**	**4E-03**	5E-04
Resident - Adult	0	23.5	20.6	2.9	4.94E+00	4.56E+00	3.79E-01	--	--	--	--	--	--	--	--	--	1.86E+01	1.61E+01	2.51E+00	**5E-04**	**4E-04**	5E-05	7.80E-05	7.26E-05	5.45E-06	--	--	--	--	--	--	--	--	--	**3.95E-04**	**3.48E-04**	4.65E-05	**3E-02**	**2E-03**	9E-03
Resident - Chilc	0	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	NA	NA	NA	**5E-02**	**4E-02**	9E-03
Exposure Unit 18																																								
Juvenile Trespasser	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	**NC**	**NC**	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	**NC**	**NC**	NC	NC	NC	NC	NA	NA	NA	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC
Construction Worker	58	7.7	6.1	1.6	1.04E+00	0.00E+00	1.04E+00	--	--	--	--	--	--	--	--	--	6.70E+00	6.14E+00	5.64E-01	5E-06	4E-06	7E-07	2.92E-07	0.00E+00	2.92E-07	--	--	--	--	--	--	--	--	--	4.49E-06	4.11E-06	3.87E-07	NC	NC	NC
Resident - Adult	58	**43**	25	19	1.67E+01	0.00E+00	1.67E+01	--	--	--	--	--	--	--	--	--	**2.64E+01**	2.45E+01	1.94E+00	**6E-04**	**4E-04**	**2E-04**	**1.41E-04**	0.00E+00	**1.41E-04**	--	--	--	--	--	--	--	--	--	**4.33E-04**	**3.98E-04**	3.52E-05	NC	NC	NC
Exposure Unit 18																																								
Juvenile Trespasser	1000	0.172	0.151	0.021	NA	NA	NA	--	--	--	--	--	--	--	--	--	1.72E-01	1.51E-01	2.12E-02	1E-06	1E-06	2E-07	NA	NA	NA	--	--	--	--	--	--	--	--	--	1.30E-06	1.14E-06	1.60E-07	NC	NC	NC
On-site Worker	1000	2.61	2.29	0.32	NA	NA	NA	--	--	--	--	--	--	--	--	--	2.61E+00	2.29E+00	3.22E-01	5E-05	4E-05	6E-06	NA	NA	NA	--	--	--	--	--	--	--	--	--	4.92E-05	4.31E-05	6.07E-06	NC	NC	NC
Construction Worker	1000	3.84	3.41	0.43	NC	NC	NC	--	--	--	--	--	--	--	--	--	3.84E+00	3.41E+00	4.30E-01	3E-06	2E-06	3E-07	NC	NC	NC	--	--	--	--	--	--	--	--	--	2.76E-06	2.45E-06	3.10E-07	NC	NC	NC
Resident - Adult	1000	10.1	9.0	1.1	NC	NC	NC	--	--	--	--	--	--	--	--	--	1.01E+01	9.02E+00	1.13E+00	**2E-04**	**2E-04**	3E-05	NC	NC	NC	--	--	--	--	--	--	--	--	--	**2.33E-04**	**2.07E-04**	2.61E-05	NC	NC	NC
Exposure Unit 19																																								
Juvenile Trespasser	0	0.0095	0.0081	0.0014	--	--	--	1.92E-03	1.24E-03	6.83E-04	--	--	--	7.57E-03	6.83E-03	7.55E-04	--	--	--	6E-08	5E-08	1E-08	--	--	--	9.90E-09	5.95E-09	3.95E-09	--	--	--	4.77E-08	4.04E-08	7.37E-09	--	--	--	5E-05	4E-05	7E-06
On-site Worker	0	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA
Construction Worker	0	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA
Resident - Adult	0	0.00475	0.00403	0.00072	--	--	--	9.59E-04	6.18E-04	3.41E-04	--	--	--	3.79E-03	3.41E-03	3.78E-04	--	--	--	9E-08	7E-08	2E-08	--	--	--	1.48E-08	8.92E-09	5.93E-09	--	--	--	7.16E-08	6.06E-08	1.11E-08	--	--	--	2E-05	2E-05	3E-06
Resident - Chilc	0	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	NA	NA	NA	--	--	--	**2E-04**	**2E-04**	3E-05
Exposure Unit 20																																								
Juvenile Trespasser	0	0.362	0.280	0.082	--	--	--	--	--	--	--	--	--	--	--	--	3.62E-01	2.80E-01	8.17E-02	3E-06	2E-06	6E-07	--	--	--	--	--	--	--	--	--	--	--	--	6.01E-07	6.01E-07	6.01E-07	**3E-04**	**1E-04**	2E-04
On-site Worker	0	5.5	4.3	1.2	--	--	--	--	--	--	--	--	--	--	--	--	5.50E+00	4.26E+00	1.24E+00	1E-04	8E-05	2E-05	--	--	--	--	--	--	--	--	--	--	--	--	1.83E-05	1.83E-05	1.83E-05	**9E-04**	**4E-04**	5E-04
Construction Worker	0	6.95	5.98	0.96	--	--	--	--	--	--	--	--	--	--	--	--	6.95E+00	5.98E+00	9.65E-01	5E-06	4E-06	7E-07	--	--	--	--	--	--	--	--	--	--	--	--	7.01E-07	7.01E-07	7.01E-07	**7E-03**	**2E-03**	5E-03
Resident - Adult	0	18.8	16.1	2.7	--	--	--	--	--	--	--	--	--	--	--	--	1.88E+01	1.61E+01	2.69E+00	**4E-04**	**3E-04**	5E-05	--	--	--	--	--	--	--	--	--	--	--	--	4.59E-05	4.59E-05	4.59E-05	**3E-03**	**1E-03**	2E-03
Resident - Chilc	0	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA	**3E-02**	**9E-03**	2E-02
Exposure Unit 20																																								
Juvenile Trespasser	58	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--	**NC**	**NC**	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC
On-site Worker	58	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--	**NC**	**NC**	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--	NC	NC	NC	NC	NC	NC
Construction Worker	58	8.2	6.1	2.1	--	--	--	--	--	--	--	--	--	--	--	--	8.24E+00	6.14E+00	2.09E+00	5E-06	4E-06	8E-07	--	--	--	--	--	--	--	--	--	--	--	--	4.91E-06	4.11E-06	8.01E-07	NC	NC	NC
Resident - Adult	58	**45**	25	21	--	--	--	--	--	--	--	--	--	--	--	--	**4.51E+01**	2.45E+01	2.06E+01	**6E-04**	**4E-04**	**2E-04**	--	--	--	--	--	--	--	--	--	--	--	--	**5.79E-04**	**3.98E-04**	**1.81E-04**	NC	NC	NC
Exposure Unit 20																																								
Juvenile Trespasser	1000	0.174	0.151	0.022	--	--	--	--	--	--	--	--	--	--	--	--	1.74E-01	1.51E-01	2.23E-02	1E-06	1E-06	2E-07	--	--	--	--	--	--	--	--	--	--	--	--	1.30E-06	1.14E-06	1.67E-07	NC	NC	NC
On-site Worker	1000	2.62	2.29	0.34	--	--	--	--	--	--	--	--	--	--	--	--	2.62E+00	2.29E+00	3.36E-01	5E-05	4E-05	6E-06	--	--	--	--	--	--	--	--	--	--	--	--	4.95E-05	4.31E-05	6.32E-06	NC	NC	NC
Construction Worker	1000	3.66	3.41	0.25	--	--	--	--	--	--	--	--	--	--	--	--	3.66E+00	3.41E+00	2.52E-01	3E-06	2E-06	2E-07	--	--	--	--	--	--	--	--	--	--	--	--	2.62E-06	2.45E-06	1.73E-07	NC	NC	NC
Resident - Adult	1000	9.80	9.02	0.78	--	--	--	--	--	--	--	--	--	--	--	--	9.80E+00	9.02E+00	7.79E-01	**2E-04**	**2E-04**	2E-05	--	--	--	--	--	--	--	--	--	--	--	--	**2.22E-04**	**2.07E-04**	1.54E-05	NC	NC	NC

Notes:
Dose and Risk from Appendix V tables. Hazard Index from Table 6-14.
Bolded values exceed the target dose of 25mremr/yr, the target risk of 1x 10 $^{-4}$, or the target hazard index of 1.
Soil is surface soil for juvenile trespasser and on-site worker and total soil forconstruction worker and resident receptors.
EU = Exposure Unit
mremr/yr = millirem per year
-- = Media was not sampled or doesn't exist in this exposure unit.
NA = Not applicable; the receptor is assumed to not be exposed to this media.
NC = Not Calculated; this calculation is not performed for this receptor at this year.

TABLE 6-14
ESTIMATED HAZARD INDEXES FOR HYPOTHETICAL EXPOSURES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Scenario	Gross EPC Oral Intake[a] (mg)	Background Oral Intake[a] (mg)	Net EPC Oral Intake[a] (mg)	Body Weight[b] (kg)	Averaging Time[b] (days)	Reference Dose[c] (mg/kg-day)	Gross EPC Hazard Index[d]	Background Hazard Index[d]	Net EPC Hazard Index[d]
Exposure Unit 1									
Juvenile Trespasser	2.63E+00	2.65E-02	2.60E+00	61.7	3,650	3E-03	4E-03	4E-05	4E-03
On-site Worker	3.42E+01	3.45E-01	3.39E+01	70	9,125	3E-03	2E-02	2E-04	2E-02
Construction Worker	1.47E+00	5.58E-01	1.36E+00	70	365	3E-03	2E-02	7E-03	2E-02
Exposure Unit 2									
Juvenile Trespasser	5.65E+00	1.15E-01	5.53E+00	61.7	3,650	3E-03	8E-03	2E-04	8E-03
On-site Worker	6.63E+01	1.11E+00	6.52E+01	70	9,125	3E-03	3E-02	6E-04	3E-02
Construction Worker	5.81E+00	7.41E-01	5.07E+00	70	365	3E-03	8E-02	1E-02	7E-02
Exposure Unit 3									
Juvenile Trespasser	5.17E+00	1.15E-01	5.06E+00	61.7	3,650	3E-03	8E-03	2E-04	7E-03
On-site Worker	5.66E+01	1.11E+00	5.55E+01	70	9,125	3E-03	3E-02	6E-04	3E-02
Construction Worker	2.57E+01	7.39E-01	2.50E+01	70	365	3E-03	3E-01	1E-02	3E-01
Exposure Unit 4									
Juvenile Trespasser	2.34E+00	1.15E-01	2.22E+00	61.7	3,650	3E-03	3E-03	2E-04	3E-03
On-site Worker	2.45E+01	1.11E+00	2.34E+01	70	9,125	3E-03	1E-02	6E-04	1E-02
Construction Worker	3.21E+00	7.41E-01	2.47E+00	70	365	3E-03	4E-02	1E-02	3E-02
Exposure Unit 5									
Juvenile Trespasser	3.54E-06	1.53E-05	0.00E+00	61.7	3,650	3E-03	5E-09	2E-08	0E+00
On-site Worker	1.85E-04	8.01E-04	0.00E+00	70	9,125	3E-03	1E-07	4E-07	0E+00
Construction Worker	1.26E-01	5.44E-01	0.00E+00	70	365	3E-03	2E-03	7E-03	0E+00
Exposure Unit 6									
Juvenile Trespasser	9.14E+00	1.11E-01	9.00E+00	61.7	3,650	3E-03	1E-02	2E-04	1E-02
On-site Worker	8.73E+01	1.06E+00	8.60E+01	70	9,125	3E-03	5E-02	6E-04	4E-02
Construction Worker	1.71E+01	7.39E-01	1.64E+01	70	365	3E-03	2E-01	1E-02	2E-01
Exposure Unit 7									
Juvenile Trespasser	1.95E+03	1.15E-01	1.95E+03	61.7	3,650	3E-03	**3E+00**	2E-04	**3E+00**
On-site Worker	1.69E+04	1.11E+00	1.69E+04	70	9,125	3E-03	**9E+00**	6E-04	**9E+00**
Construction Worker	1.43E+03	7.41E-01	1.43E+03	70	365	3E-03	**2E+01**	1E-02	**2E+01**
Exposure Unit 8									
Juvenile Trespasser	2.12E+00	1.11E-01	2.01E+00	61.7	3,650	3E-03	3E-03	2E-04	3E-03
On-site Worker	2.27E+01	1.06E+00	2.17E+01	70	9,125	3E-03	1E-02	6E-04	1E-02
Construction Worker	6.79E+02	7.39E-01	6.78E+02	70	365	3E-03	**9E+00**	1E-02	**9E+00**

TABLE 6-14
ESTIMATED HAZARD INDEXES FOR HYPOTHETICAL EXPOSURES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Scenario	Gross EPC Oral Intake[a] (mg)	Background Oral Intake[a] (mg)	Net EPC Oral Intake[a] (mg)	Body Weight[b] (kg)	Averaging Time[b] (days)	Reference Dose[c] (mg/kg-day)	Gross EPC Hazard Index[d]	Background Hazard Index[d]	Net EPC Hazard Index[d]
Exposure Unit 9									
Juvenile Trespasser	7.11E-01	8.83E-02	6.23E-01	61.7	3,650	3E-03	1E-03	1E-04	9E-04
On-site Worker	6.17E+00	7.67E-01	5.41E+00	70	9,125	3E-03	3E-03	4E-04	3E-03
Construction Worker	1.67E+00	7.27E-01	1.45E+00	70	365	3E-03	2E-02	9E-03	2E-02
Exposure Unit 10									
Juvenile Trespasser	1.65E+00	8.83E-02	1.56E+00	61.7	3,650	3E-03	2E-03	1E-04	2E-03
On-site Worker	1.43E+01	7.66E-01	1.35E+01	70	9,125	3E-03	7E-03	4E-04	7E-03
Construction Worker	3.59E+00	3.26E-01	3.26E+00	70	365	3E-03	5E-02	4E-03	4E-02
Resident - Adult	3.58E+02	7.16E+01	2.87E+02	70	10,950	3E-03	2E-01	3E-02	1E-01
Resident - Child	2.89E+01	3.94E+00	2.49E+01	15	2,190	3E-03	3E-01	4E-02	3E-01
Exposure Unit 11									
Juvenile Trespasser	8.00E+00	1.15E-01	7.89E+00	61.7	3,650	3E-03	1E-02	2E-04	1E-02
On-site Worker	8.10E+01	1.11E+00	7.99E+01	70	9,125	3E-03	4E-02	6E-04	4E-02
Construction Worker	1.25E+01	3.40E-01	1.22E+01	70	365	3E-03	2E-01	4E-03	2E-01
Resident - Adult	1.24E+03	7.16E+01	1.17E+03	70	10,950	3E-03	5E-01	3E-02	5E-01
Resident - Child	9.40E+01	3.94E+00	9.00E+01	15	2,190	3E-03	1E+00	4E-02	9E-01
Exposure Unit 12									
Juvenile Trespasser	1.32E+00	1.11E-01	1.21E+00	61.7	3,650	3E-03	2E-03	2E-04	2E-03
On-site Worker	1.19E+01	1.06E+00	1.08E+01	70	9,125	3E-03	6E-03	6E-04	6E-03
Construction Worker	7.77E+00	3.38E-01	7.43E+00	70	365	3E-03	1E-01	4E-03	1E-01
Resident - Adult	1.08E+03	7.16E+01	1.01E+03	70	10,950	3E-03	5E-01	3E-02	4E-01
Resident - Child	7.25E+01	3.94E+00	6.85E+01	15	2,190	3E-03	7E-01	4E-02	7E-01
Exposure Unit 13									
Juvenile Trespasser	4.18E+00	1.11E-01	4.06E+00	61.7	3,650	3E-03	6E-03	2E-04	6E-03
On-site Worker	3.92E+01	1.06E+00	3.82E+01	70	9,125	3E-03	2E-02	6E-04	2E-02
Construction Worker	1.69E+01	3.38E-01	1.66E+01	70	365	3E-03	2E-01	4E-03	2E-01
Resident - Adult	1.13E+03	7.16E+01	1.06E+03	70	10,950	3E-03	5E-01	3E-02	5E-01
Resident - Child	1.15E+02	3.94E+00	1.11E+02	15	2,190	3E-03	**1E+00**	4E-02	**1E+00**

TABLE 6-14
ESTIMATED HAZARD INDEXES FOR HYPOTHETICAL EXPOSURES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Scenario	Gross EPC Oral Intake[a] (mg)	Background Oral Intake[a] (mg)	Net EPC Oral Intake[a] (mg)	Body Weight[b] (kg)	Averaging Time[b] (days)	Reference Dose[c] (mg/kg-day)	Gross EPC Hazard Index[d]	Background Hazard Index[d]	Net EPC Hazard Index[d]
Exposure Unit 14									
Juvenile Trespasser	1.84E-01	8.83E-02	9.61E-02	61.7	3,650	3E-03	3E-04	1E-04	1E-04
On-site Worker	1.60E+00	7.66E-01	8.34E-01	70	9,125	3E-03	8E-04	4E-04	4E-04
Construction Worker	1.14E+01	3.26E-01	1.11E+01	70	365	3E-03	1E-01	4E-03	1E-01
Resident - Adult	5.15E+03	7.16E+01	5.08E+03	70	10,950	3E-03	**2E+00**	3E-02	**2E+00**
Resident - Child	2.27E+02	3.94E+00	2.23E+02	15	2,190	3E-03	**2E+00**	4E-02	**2E+00**
Exposure Unit 15									
Juvenile Trespasser	5.86E-01	1.11E-01	4.75E-01	61.7	3,650	3E-03	9E-04	2E-04	7E-04
On-site Worker	6.77E+00	1.06E+00	5.70E+00	70	9,125	3E-03	4E-03	6E-04	3E-03
Construction Worker	6.41E-01	1.95E-01	4.46E-01	70	365	3E-03	8E-03	3E-03	6E-03
Resident - Adult	5.59E+00	2.33E+00	3.27E+00	70	10,950	3E-03	2E-03	1E-03	1E-03
Resident - Child	2.24E+00	9.30E-01	1.31E+00	15	2,190	3E-03	2E-02	9E-03	1E-02
Exposure Unit 16									
Juvenile Trespasser	1.03E+00	1.11E-01	9.17E-01	61.7	3,650	3E-03	2E-03	2E-04	1E-03
On-site Worker	9.97E+00	1.06E+00	8.91E+00	70	9,125	3E-03	5E-03	6E-04	5E-03
Construction Worker	6.12E+00	3.38E-01	5.79E+00	70	365	3E-03	8E-02	4E-03	8E-02
Resident - Adult	2.20E+03	7.16E+01	2.12E+03	70	10,950	3E-03	1E+00	3E-02	9E-01
Resident - Child	1.02E+02	3.94E+00	9.83E+01	15	2,190	3E-03	**1E+00**	4E-02	1E+00
Exposure Unit 17									
Juvenile Trespasser	1.71E+02	8.83E-02	1.71E+02	61.7	3,650	3E-03	3E-01	1E-04	3E-01
On-site Worker	1.49E+03	7.66E-01	1.49E+03	70	9,125	3E-03	8E-01	4E-04	8E-01
Construction Worker	1.48E+02	1.83E-01	1.48E+02	70	365	3E-03	**2E+00**	2E-03	**2E+00**
Resident - Adult	1.89E+03	2.33E+00	1.89E+03	70	10,950	3E-03	8E-01	1E-03	8E-01
Resident - Child	7.55E+02	9.30E-01	7.54E+02	15	2,190	3E-03	**8E+00**	9E-03	**8E+00**
Exposure Unit 18									
Juvenile Trespasser	7.98E-02	8.83E-02	4.96E-04	61.7	3,650	3E-03	1E-04	1E-04	7E-07
On-site Worker	6.92E-01	7.66E-01	4.30E-03	70	9,125	3E-03	4E-04	4E-04	2E-06
Construction Worker	3.65E-01	3.26E-01	4.19E-02	70	365	3E-03	5E-03	4E-03	5E-04
Resident - Adult	9.14E+01	7.16E+01	1.99E+01	70	10,950	3E-03	4E-02	3E-02	9E-03
Resident - Child	4.79E+00	3.94E+00	8.68E-01	15	2,190	3E-03	5E-02	4E-02	9E-03

TABLE 6-14
ESTIMATED HAZARD INDEXES FOR HYPOTHETICAL EXPOSURES
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Scenario	Gross EPC Oral Intake[a] (mg)	Background Oral Intake[a] (mg)	Net EPC Oral Intake[a] (mg)	Body Weight[b] (kg)	Averaging Time[b] (days)	Reference Dose[c] (mg/kg-day)	Gross EPC Hazard Index[d]	Background Hazard Index[d]	Net EPC Hazard Index[d]
Exposure Unit 19									
Juvenile Trespasser	3.09E-02	2.65E-02	4.46E-03	61.7	3,650	3E-03	5E-05	4E-05	7E-06
Resident - Adult	4.64E-02	3.97E-02	6.70E-03	70	10,950	3E-03	2E-05	2E-05	3E-06
Resident - Child	1.86E-02	1.59E-02	2.68E-03	15	2,190	3E-03	2E-04	2E-04	3E-05
Exposure Unit 20									
Juvenile Trespasser	2.00E-01	8.83E-02	1.12E-01	61.7	3,650	3E-03	3E-04	1E-04	2E-04
On-site Worker	1.74E+00	7.66E-01	9.72E-01	70	9,125	3E-03	9E-04	4E-04	5E-04
Construction Worker	5.64E-01	1.83E-01	3.81E-01	70	365	3E-03	7E-03	2E-03	5E-03
Resident - Adult	7.18E+00	2.33E+00	4.85E+00	70	10,950	3E-03	3E-03	1E-03	2E-03
Resident - Child	2.87E+00	9.30E-01	1.94E+00	15	2,190	3E-03	3E-02	9E-03	2E-02

Notes:
Bolded values exceed the target hazard index of 1.0.
[a] Oral Intakes are taken from Table 6-10.
[b] Body weight and averaging time table are taken from Table 6-8.
[c] The reference dose for uranium metal is taken from EPA's on-line Integrated Risk Information System (EPA 2008).
[d] Hazard indexes (HI) estimated by dividing the oral intake (OI) by the body weight (BW) times averaging time (AT) times reference dose (RfD): HI = OI/(BWxATxRfD)

kg = kilogram
mg = milligram
mg/kg-day = milligram per kilogram per day

Table 7-1
Biota Concentration Guidelines
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Radionuclide	Terrestrial Animal	Terrestrial Plant	Aquatic Animal		Riparian Animal	
	Soil	Soil	Sediment	Water	Water	Sediment
^{226}Ra	5.06E+01	2.88E+02	1.45E+04	1.02E+01	4.08E+00	1.01E+02
^{228}Ra	4.39E+01	2.45E+02	2.90E+04	8.49E+00	3.40E+00	8.78E+01
^{228}Th	5.30E+02	6.42E+03	1.64E+04	3.74E+02	2.04E+03	8.05E+02
^{230}Th	9.98E+03	1.75E+05	2.74E+06	2.57E+03	1.39E+04	1.04E+04
^{232}Th	1.51E+03	2.35E+04	3.29E+06	3.04E+02	1.68E+03	1.30E+03
^{234}U	5.13E+03	5.16E+04	3.08E+06	2.02E+02	6.83E+02	5.27E+03
^{235}U	2.77E+03	2.74E+04	1.05E+05	2.17E+02	7.36E+02	3.73E+03
^{238}U	1.58E+03	1.57E+04	4.28E+04	2.23E+02	7.56E+02	2.49E+03

Source: USDOE (2002)

Table 7-2
RESRAD Plant Uptake Factors
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Radionuclide	Terrestrial Plant Uptake Factors
^{226}Ra	1E-01
^{228}Ra	1E-01
^{228}Th	1E-03
^{230}Th	1E-03
^{232}Th	1E-03
^{234}U	4E-03
^{235}U	4E-03
^{238}U	4E-03

Table 7-3
RESRAD Deer Mouse Life History Parameters
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

	Terrestrial Receptor
Body Mass (g)	22
Food Intake Rate (g/d)	3.6351
Soil/Sediment Intake Rate (g/d)	0.3635
Maximum Life Span (years)	0.022
Inhalation Rate (m^3/d)	0.0264
Soil Inhalation Rate (g/d)	2.644E-06
Water Consumption Rate (L/d)	0.00319

Notes:
d = day
g = grams
L = liter
m^3 = cubic meters

Table 7-4
RESRAD Raccoon and River Otter Life History Parameters
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

	Raccoon and River Otter Life History Parameters
Body Mass (g)	8800
Food Intake Rate (g/d)	325.137
Soil/Sediment Intake Rate (g/d)	32.5137
Maximum Life Span (years)	1.958
Inhalation Rate (m^3/d)	2.51
Soil Inhalation Rate (g/d)	0.000251
Water Consumption Rate (L/d)	0.7009

Notes:
d = day
g = grams
L = liter
m^3 = cubic meters

Table 7-5
RESRAD Aquatic Biota Uptake Factors
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Radionuclide	Aquatic Biota Uptake Factors	Organism Basis
^{226}Ra	3200	*Gammarus*
^{228}Ra	80	
^{228}Th	80	Fish
^{230}Th	80	
^{232}Th	80	
^{234}U	1000	Mollusks
^{235}U	1000	
^{238}U	1000	

Table 7-6
0 to 6 Inch Soil Depth - Terrestrial Animal and Plant Exposures
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Radionuclide	Concentration (pCi/g) [a]	Terrestrial Animal		Terrestrial Plant	
		BCG (pCi/g)	Ratio [b, c]	BCG (pCi/g)	Ratio [b, c]
^{226}Ra	11	5.06E+01	2E-01	2.88E+02	4E-02
^{228}Ra	41	4.39E+01	9E-01	2.45E+02	2E-01
^{228}Th	46	5.30E+02	9E-02	6.42E+03	7E-03
^{230}Th	9.48	9.98E+03	1E-03	1.75E+05	5E-05
^{232}Th	46	1.51E+03	3E-02	2.35E+04	2E-03
^{234}U	18513	5.13E+03	4E+00	5.16E+04	4E-01
^{235}U	1022	2.77E+03	4E-01	2.74E+04	4E-02
^{238}U	17918	1.58E+03	1E+01	1.57E+04	1E+00
		Summed	**2E+01**		**2E+00**

Notes:

[a] Maximum Ra and Th concentrations (weighted average) occurred in EU17/IA05A (A05ASL-301-01); maximum U concentrations (weighted average) occurred in EU7/Bldg. 8 (B08SL-017-01).

[b] Ratio is determined by dividing BCG by soil concentration.

[c] Ratio rounded to the nearest whole number.

pCi/g = picocuries per gram

BCG = biota concentration guidelines

Table 7-7
Total Soil Depth - Terrestrial Animal and Plant Exposures
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Radionuclide	Concentration (pCi/g) [a]	Terrestrial Animal		Terrestrial Plant	
		BCG (pCi/g)	Ratio [b, c]	BCG (pCi/g)	Ratio [b, c]
^{226}Ra	11	5.06E+01	2E-01	2.88E+02	4E-02
^{228}Ra	41	4.39E+01	9E-01	2.45E+02	2E-01
^{228}Th	46	5.30E+02	9E-02	6.42E+03	7E-03
^{230}Th	9.48	9.98E+03	1E-03	1.75E+05	5E-05
^{232}Th	46	1.51E+03	3E-02	2.35E+04	2E-03
^{234}U	18513	5.13E+03	4E+00	5.16E+04	4E-01
^{235}U	1022	2.77E+03	4E-01	2.74E+04	4E-02
^{238}U	17918	1.58E+03	1E+01	1.57E+04	1E+00
		Summed	**2E+01**		**2E+00**

Notes:

[a] Maximum Ra and Th concentrations (weighted average) occurred in EU17/IA05A (A05ASL-301-01); maximum U concentrations (weighted average) occurred in EU7/Bldg. 8 (B08SL-017-01).

[b] Ratio is determined by dividing BCG by soil concentration.

[c] Ratio rounded to the nearest whole number.

pCi/g = picocuries per gram

BCG = biota concentration guidelines

Table 7-8
Aquatic Animal Water and Sediment Exposure
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

	WATER			SEDIMENT		
Radionuclide	**Water Conc. (pCi/L) [a]**	**BCG (pCi/L)**	**Ratio [b, c]**	**Sediment Conc. (pCi/g) [a]**	**BCG (pCi/g)**	**Ratio [b, c]**
^{226}Ra	0.2	1.02E+01	2E-02	1.2	1.45E+04	8E-05
^{228}Ra	1.1	8.49E+00	1E-01	0.9	2.90E+04	3E-05
^{228}Th	0.4	3.74E+02	1E-03	1.1	1.64E+04	7E-05
^{230}Th	0.4	2.57E+03	2E-04	1.0	2.74E+06	4E-07
^{232}Th	0.07	3.04E+02	2E-04	1.1	3.29E+06	3E-07
^{234}U	0.2	2.02E+02	1E-03	0.9	3.08E+06	3E-07
^{235}U	0.06	2.17E+02	3E-04	0.2	1.05E+05	2E-06
^{238}U	0.3	2.23E+02	1E-03	0.8	4.28E+04	2E-05
		Summed	**2E-01**			**2E-04**

Notes:
[a] Water (pCi/L) and sediment (pCi/g) concentrations are based on maximum detected in EU19/IA09 Erie Canal; see Table 6-3.
[b] Ratio is determined by dividing BCG by water or sediment concentration, as appropriate.
[c] Ratio rounded to the nearest whole number.
pCi/g = picocuries per gram
pCi/L = picocuries per liter
BCG = biota concentration guidelines

Table 7-9
Riparian Animal Water and Sediment Exposure
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

	WATER			SEDIMENT		
Radionuclide	**Water Conc. (pCi/L) [a]**	**BCG (pCi/L)**	**Ratio [b, c]**	**Sediment Conc. (pCi/g) [a]**	**BCG (pCi/g)**	**Ratio [b, c]**
^{226}Ra	0.2	4.08E+00	5E-02	1.2	1.01E+02	1E-02
^{228}Ra	1.1	3.40E+00	3E-01	0.9	8.78E+01	1E-02
^{228}Th	0.4	2.04E+03	2E-04	1.1	8.05E+02	1E-03
^{230}Th	0.4	1.39E+04	3E-05	1.0	1.04E+04	1E-04
^{232}Th	0.07	1.68E+03	4E-05	1.1	1.30E+03	8E-04
^{234}U	0.2	6.83E+02	3E-04	0.9	5.27E+03	2E-04
^{235}U	0.06	7.36E+02	8E-05	0.2	3.73E+03	5E-05
^{238}U	0.3	7.56E+02	4E-04	0.8	2.49E+03	3E-04
		Summed	**4E-01**			**2E-02**

Notes:
[a] Water (pCi/L) and sediment (pCi/g) concentrations are based on maximum detected in EU19/IA09 Erie Canal; see Table 6-3.
[b] Ratio is determined by dividing BCG by water or sediment concentration, as appropriate.
[c] Ratio rounded to the nearest whole number.
pCi/g = picocuries per gram
pCi/L = picocuries per liter
BCG = biota concentration guidelines

TABLE 7-10
URANIUM RADIOLOGICAL BCG COMPARISON TO EPCs IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPEC	EPCs (pCi/g) [a]	Exceed ^{234}U BCG 5130 (pCi/g) [b]	Exceed ^{238}U BCG 1580 (pCi/g) [b]
EU2/Bldg. 2:				
Surface Soil	Uranium-234	14.36	--	
	Uranium-238	14.55		--
Total Soil	Uranium-234	12.03	--	
	Uranium-238	12.14		--
EU3/Bldg. 3:				
Surface Soil	Uranium-234	20.64	--	
	Uranium-238	22.22		--
Total Soil	Uranium-234	94.09	--	
	Uranium-238	94.76		--
EU4/Bldg. 4&9:				
Surface Soil	Uranium-234	9.06	--	
	Uranium-238	11.87		--
Total Soil	Uranium-234	7.94	--	
	Uranium-238	7.93		--
EU6/Bldg. 6:				
Surface Soil	Uranium-234	65.07	--	
	Uranium-238	66.54		--
Total Soil	Uranium-234	56.51	--	
	Uranium-238	59.04		--
EU7/Bldg. 8:				
Surface Soil	Uranium-234	18513	**Yes**	
	Uranium-238	17918		**Yes**
Total Soil	Uranium-234	6034	**Yes**	
	Uranium-238	5721		**Yes**
EU8/Bldg. 24:				
Surface Soil	Uranium-234	11.39	--	
	Uranium-238	11.13		--
Total Soil	Uranium-234	7.32	--	
	Uranium-238	7.08		--
EU9/Bldg. 35:				
Surface Soil	Uranium-234	5.94	--	
	Uranium-238	5.76		--
Total Soil	Uranium-234	6.01	--	
	Uranium-238	5.84		--
EU10/IA02 East:				
Surface Soil	Uranium-234	13.08	--	
	Uranium-238	14.45		--
Total Soil	Uranium-234	10.43	--	
	Uranium-238	11.11		--
EU11/IA02 Between Bldgs.:				
Surface Soil	Uranium-234	48.36	--	
	Uranium-238	48.63		--
Total Soil	Uranium-234	31.60	--	
	Uranium-238	34.80		--

TABLE 7-10
URANIUM RADIOLOGICAL BCG COMPARISON TO EPCs IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPEC	EPCs (pCi/g) [a]	Exceed ^{234}U BCG 5130 (pCi/g) [b]	Exceed ^{238}U BCG 1580 (pCi/g) [b]
EU12/IA03:				
Surface Soil	Uranium-234	9.95	--	
	Uranium-238	10.46		--
Total Soil	Uranium-234	21.23	--	
	Uranium-238	22.01		--
EU13/IA04A:				
Surface Soil	Uranium-234	30.66	--	
	Uranium-238	31.40		--
Total Soil	Uranium-234	63.27	--	
	Uranium-238	58.25		--
EU14/IA04B:				
Surface Soil	Uranium-234	0.66	--	
	Uranium-238	0.88		--
Total Soil	Uranium-234	2.33	--	
	Uranium-238	2.48		--
EU15/IA04C:				
Surface Soil	Uranium-234	1.08	--	
	Uranium-238	1.02		--
Total Soil	Uranium-234	1.08	--	
	Uranium-238	1.03		--
EU16/IA04D:				
Surface Soil	Uranium-234	5.05	--	
	Uranium-238	6.46		--
Total Soil	Uranium-234	4.51	--	
	Uranium-238	5.30		--
EU17/IA05A:				
Surface Soil	Uranium-234	1491	--	
	Uranium-238	1591		**Yes**
Total Soil	Uranium-234	561	--	
	Uranium-238	599		--
EU18/IA05B:				
Surface Soil	Uranium-234	0.05	--	
	Uranium-238	0.00		--
Total Soil	Uranium-234	0.06	--	
	Uranium-238	0.00		--
EU20/IA10:				
Surface Soil	Uranium-234	0.93	--	
	Uranium-238	1.04		--
Total Soil	Uranium-234	1.53	--	
	Uranium-238	1.54		--

Notes:
[a] EPCs are taken from Table 6-3.
[b] Biota concentration guidelines (BCG) per Department of Energy (DOE) Order 5400.5.
COPEC = constituent of potential ecological concern
EPC = exposure point concentration
pCi/g = picocuries per gram
pCi/L = picocuries per liter
mg = milligram
EU = exposure unit

Table 7-11
Uranium Toxicological Endpoints for Aquatic Organisms and Plants
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

	Water Benchmark (µg/L)[a]	Soil Benchmark (mg/kg)[b]
	Secondary Chronic Value	**Plants**
Uranium	2.6	5

Notes:
[a] Cushman et al. (1977) as cited in Suter and Tsao (1996)
[b] Efroymson et al. (1997a)
µg/L = micrograms per liter
mg/kg = milligrams per kilogram

Table 7-12
Uranium Toxicological Endpoints for Wildlife
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Species	Uranium NOAEL (mg/kg/day)
Short-tailed Shrew [a]	3.588
Cottontail Rabbit [a]	1.2
Red Fox [a]	0.862
Mink [a]	1.256
American Robin [b]	16
Belted Kingfisher [b]	16
Great Blue Heron [b]	16

Notes:

[a] Paternain et al. (1989) as cited in Sample et al. (1996)

[b] Haseltine and Sileo (1983) as cited in Sample et al. (1996)

Mammalian NOAELs are scaled for body weight.

mg/kg/day = milligrams per kilogram per day

NOAEL = no observed adverse effects level

Table 7-13
Avian Life History Parameters
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Life History Data	Units	American Robin	Red-Tailed Hawk	Belted Kingfisher	Great Blue Heron
Body Weight (minimum)	kg	0.077[a]	0.957[b]	0.136[c]	2.200[d]
Food Ingestion Rate (FIR) [e]	kg /kg-day	0.142	0.055	0.117	0.044
Dietary Composition					
Fish	%			100	100
Invertebrates	%	100			
Small Mammals	%		100		
Vegetation	%				
Water Ingestion Rates (WIR) [f]	L/kg-day	0.138	0.06	0.114	0.045
Fraction of Diet soil/sediment (SIR) [g]	%FIR	2.4	2	1	2
Area Use Factor [h]	Unitless	1	1	1	1

Notes:
[a] Clench and Leberman (1978) as cited in USEPA (1993)
[b] Steenhof (1983) as cited in USEPA (1993)
[c] Brooks and Davis (1987)
[d] Dunning (1993)
[e] FIR based on Nagy (1987) – Birds: FI (g/day) = 0.648 Wt. $^{0.651}$ (g).
[f] WIR based on Calder and Braun (1983) – Birds: WI (L/day) = 0.059 Wt. $^{0.67}$ (kg).
[g] SIR based on Beyer et al. (1994) and/or professional judgment.
[h] Temporal and area use are assumed to be 100%.
% = percent
g = gram
kg = kilogram
L = liter

Table 7-14
Mammalian Life History Parameters
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

Life History Data	Units	Short-tailed Shrew	Eastern Cottontail	Red Fox	Mink
Body Weight (minimum)	kg	0.015[a]	1.24[b]	4.13[c]	0.55[d]
Food Ingestion Rate (FIR) [e]	kg /kg-day	0.145	0.067	0.053	0.076
Dietary Composition					
Fish	%				100
Invertebrates	%	100			
Small Mammals	%			100	
Vegetation	%		100		
Water Ingestion Rates (WIR) [f]	L/kg-day	0.151	0.097	0.086	0.105
Fraction of Diet soil/sediment (SIR) [g]	%FIR	13	13	2,8	1
Area Use Factor [h]	Unitless	1	1	1	1

Notes:

[a] Clench and Leberman (1978) as cited in USEPA (1993)

[b] Steenhof (1983) as cited in USEPA (1993)

[c] Brooks and Davis (1987)

[d] Dunning (1993)

[e] FIR based on Nagy (1987) – Birds: FI (g/day) = 0.648 Wt. $^{0.651}$ (g).

[f] WIR based on Calder and Braun (1983) – Birds: WI (L/day) = 0.059 Wt. $^{0.67}$ (kg).

[g] SIR based on Beyer et al. (1994) and/or professional judgment.

[h] Temporal and area use are assumed to be 100%.

% = percent

g = gram

kg = kilogram

Table 7-15
Food Item Tissue Concentrations
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

	Soil /Water Concentration (mg/kg or ug/L)[a]	Uptake Factor or BCF	Tissue Concentration (mg/kg)
Plants	53,871	1.75[b]	94,274
Earthworm	53,871	0.455[c]	24,511
Small Mammal	53,871	0.001[d]	53.87
Fish	0.922	10[e]	9.22

Notes:

[a] Soil (mg/kg) and water (µg/L) concentrations are based on the maximum detected values detected (EU7/Bldg. 8 and EU19/IA09 Erie Canal, respectively).

[b] Shanandeh and Hossner 2002 as cited in Canadian Soil Quality Guidelines for Uranium (CCME, 2007)

[c] Sheppard and Evenden 1992 as cited in Canadian Soil Quality Guidelines for Uranium (CCME, 2007)

[d] Efroymson et al. 1997b

[e] IAEA, 1994

mg - milligrams

ug - micrograms

kg - kilograms

L - liter

BCF - bioconcentration facor

Table 7-16
Screening Level Food Web Modeling Results for Inorganic Uranium Toxicity
Remedial Investigation Former Guterl Specialty Steel Corporation FUSRAP Site

	a	b	c=a*b	d	e	f=d*e	g	h	i=b*g*(h/100)	j=c+f+i	k	j/k
	Food Conc. (mg/kg)	**Ingestion Rate (kg/kg-day)**	**Uranium Ingested from Food (mg/kg)**	**Water Conc. (mg/L)**	**Water Ingestion Rates (L/kg-day)**	**Uranium Ingested from Water**	**Soil/Sed Conc. (mg/kg)**	**Fraction of Diet Soil/Sed (%FIR)**	**Uranium Ingested from Soil/Sed**	**TOTAL Uranium Ingested (mg/kg-day)**	**NOAEL TRV (mg/kg –day)**	**Hazard Quotient[a]**
Short-tailed Shrew	24,513	0.145	3554	N/A	0.151	N/A	53,875	13	1,016	4,569.93	3.59	**1E+03**
American Robin	24,513	0.142	3481	N/A	0.138	N/A	53,875	2.4	183.6	3,664.45	16	**2E+02**
Eastern Cotton Tail	94,281	0.067	6317	N/A	0.097	N/A	53,875	13	469.3	6,786.08	1.2	**6E+03**
Red Fox	53.87	0.053	2.86	N/A	0.086	N/A	53,875	2.8	79.95	82.81	0.86	**1E+02**
Red-Tailed Hawk	53.87	0.055	2.96	N/A	0.06	N/A	53,875	2	59.26	62.23	16	**4E+00**
Mink	7.67	0.076	0.58	0.0009	0.105	0.00010	2.33	1	0.023	0.61	1.256	5E-01
Belted Kingfisher	7.67	0.117	0.90	0.0009	0.114	0.00011	2.33	1	0.023	0.92	16	6E-02
Great Blue Heron	7.67	0.044	0.34	0.0009	0.045	0.00004	2.33	2	0.047	0.38	16	2E-02

Notes:
[a] Hazard quotient rounded to the nearest whole number.
Bolded hazard quotient exceeds benchmark of 1.0
% = percent
FIR = food ingestion rates
kg = kilogram
L = liter
mg = milligram
sed = sediment
NOAEL = no observable adverse effects level
TRV = toxicity reference value

TABLE 7-17
URANIUM PRG COMPARISON TO EPCs IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPEC	EPCs [a] (pCi/g)	Conversion Factors [b]	COPEC Concentration (mg/kg) [b]	Total Uranium (mg/kg)	Exceed Plant PRG (5 mg/kg)	Exceed Short Tailed Shrew PRG (43.3 mg/kg)	Exceed American Robin PRG (235.2 mg/kg)	Exceed Eastern Cottontail PRG (9.5 mg/kg)	Exceed Fox PRG (560.3 mg/kg)
EU2/Bldg. 2:										
Surface Soil	Uranium-234	15.14	1.64E-07	2.48E-03		---	---	---	---	---
	Uranium-235	0.81	4.62E-04	3.74E-01	45.5	**Yes**	**Yes**	---	**Yes**	---
	Uranium-238	15.14	2.98E-03	4.51E+01		---	---	---	---	---
Total Soil	Uranium-234	12.74	1.64E-07	2.09E-03		---	---	---	---	---
	Uranium-235	0.68	4.62E-04	3.14E-01	38.7	**Yes**	---	---	**Yes**	---
	Uranium-238	12.88	2.98E-03	3.84E+01		---	---	---	---	---
EU3/Bldg. 3:										
Surface Soil	Uranium-234	21.42	1.64E-07	3.51E-03		---	---	---	---	---
	Uranium-235	1.11	4.62E-04	5.13E-01	69.2	**Yes**	**Yes**	---	**Yes**	---
	Uranium-238	23.04	2.98E-03	6.87E+01		---	---	---	---	---
Total Soil	Uranium-234	94.80	1.64E-07	1.55E-02		---	---	---	---	---
	Uranium-235	4.54	4.62E-04	2.10E+00	286.7	**Yes**	**Yes**	**Yes**	**Yes**	---
	Uranium-238	95.50	2.98E-03	2.85E+02		---	---	---	---	---
EU4/Bldg. 4&9:										
Surface Soil	Uranium-234	9.84	1.64E-07	1.61E-03		---	---	---	---	---
	Uranium-235	0.41	4.62E-04	1.89E-01	38.0	**Yes**	---	---	**Yes**	---
	Uranium-238	12.69	2.98E-03	3.78E+01		---	---	---	---	---
Total Soil	Uranium-234	8.65	1.64E-07	1.42E-03		---	---	---	---	---
	Uranium-235	0.34	4.62E-04	1.57E-01	26.0	**Yes**	---	---	**Yes**	---
	Uranium-238	8.67	2.98E-03	2.58E+01		---	---	---	---	---
EU6/Bldg. 6:										
Surface Soil	Uranium-234	66.00	1.64E-07	1.08E-02		---	---	---	---	---
	Uranium-235	3.07	4.62E-04	1.42E+00	202.9	**Yes**	**Yes**	---	**Yes**	---
	Uranium-238	67.60	2.98E-03	2.01E+02		---	---	---	---	---
Total Soil	Uranium-234	57.22	1.64E-07	9.38E-03		---	---	---	---	---
	Uranium-235	3.02	4.62E-04	1.40E+00	179.5	**Yes**	**Yes**	---	**Yes**	---
	Uranium-238	59.78	2.98E-03	1.78E+02		---	---	---	---	---
EU7/Bldg. 8:										
Surface Soil	Uranium-234	18514	1.64E-07	3.04E+00		---	---	---	---	---
	Uranium-235	1022	4.62E-04	4.72E+02	53873.8	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
	Uranium-238	17919	2.98E-03	5.34E+04		---	---	---	---	---
Total Soil	Uranium-234	6035	1.64E-07	9.90E-01		---	---	---	---	---
	Uranium-235	329	4.62E-04	1.52E+02	17204.7	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
	Uranium-238	5722	2.98E-03	1.71E+04		---	---	---	---	---
EU8/Bldg. 24:										
Surface Soil	Uranium-234	12.17	1.64E-07	2.00E-03		---	---	---	---	---
	Uranium-235	0.51	4.62E-04	2.36E-01	35.8	**Yes**	---	---	**Yes**	---
	Uranium-238	11.95	2.98E-03	3.56E+01		---	---	---	---	---
Total Soil	Uranium-234	8.03	1.64E-07	1.32E-03		---	---	---	---	---
	Uranium-235	0.35	4.62E-04	1.62E-01	23.5	**Yes**	---	---	**Yes**	---
	Uranium-238	7.82	2.98E-03	2.33E+01		---	---	---	---	---
EU9/Bldg. 35:										
Surface Soil	Uranium-234	6.72	1.64E-07	1.10E-03		---	---	---	---	---
	Uranium-235	0.30	4.62E-04	1.39E-01	19.7	**Yes**	---	---	**Yes**	---
	Uranium-238	6.58	2.98E-03	1.96E+01		---	---	---	---	---
Total Soil	Uranium-234	6.72	1.64E-07	1.10E-03		---	---	---	---	---
	Uranium-235	0.30	4.62E-04	1.39E-01	19.7	**Yes**	---	---	**Yes**	---
	Uranium-238	6.58	2.98E-03	1.96E+01		---	---	---	---	---
EU10/IA02 East:										
Surface Soil	Uranium-234	13.86	1.64E-07	2.27E-03		---	---	---	---	---
	Uranium-235	0.48	4.62E-04	2.22E-01	45.7	**Yes**	---	---	**Yes**	---
	Uranium-238	15.27	2.98E-03	4.55E+01		---	---	---	---	---
Total Soil	Uranium-234	11.14	1.64E-07	1.83E-03		---	---	---	---	---
	Uranium-235	0.32	4.62E-04	1.48E-01	35.5	**Yes**	---	---	**Yes**	---
	Uranium-238	11.85	2.98E-03	3.53E+01		---	---	---	---	---
EU11/IA02 Between Bldgs.:										
Surface Soil	Uranium-234	49.14	1.64E-07	8.06E-03		---	---	---	---	---
	Uranium-235	2.33	4.62E-04	1.08E+00	148.4	**Yes**	**Yes**	---	**Yes**	---
	Uranium-238	49.45	2.98E-03	1.47E+02		---	---	---	---	---
Total Soil	Uranium-234	32.31	1.64E-07	5.30E-03		---	---	---	---	---
	Uranium-235	1.00	4.62E-04	4.62E-01	106.5	**Yes**	**Yes**	---	**Yes**	---
	Uranium-238	35.58	2.98E-03	1.06E+02		---	---	---	---	---

TABLE 7-17
URANIUM PRG COMPARISON TO EPCs IN EXPOSURE UNITS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE

Exposure Unit/ Sample Medium	COPEC	EPCs [a] (pCi/g)	Conversion Factors [b]	COPEC Concentration (mg/kg) [b]	Total Uranium (mg/kg)	Exceed Plant PRG (5 mg/kg)	Exceed Short Tailed Shrew PRG (43.3 mg/kg)	Exceed American Robin PRG (235.2 mg/kg)	Exceed Eastern Cottontail PRG (9.5 mg/kg)	Exceed Fox PRG (560.3 mg/kg)
EU12/IA03:										
Surface Soil	Uranium-234	10.73	1.64E-07	1.76E-03		---	---	---	---	---
	Uranium-235	0.58	4.62E-04	2.68E-01	33.9	**Yes**	---	---	**Yes**	---
	Uranium-238	11.28	2.98E-03	3.36E+01		---	---	---	---	---
Total Soil	Uranium-234	21.94	1.64E-07	3.60E-03		---	---	---	---	---
	Uranium-235	0.97	4.62E-04	4.48E-01	68.2	**Yes**	**Yes**	---	**Yes**	---
	Uranium-238	22.75	2.98E-03	6.78E+01		---	---	---	---	---
EU13/IA04A:										
Surface Soil	Uranium-234	31.44	1.64E-07	5.16E-03		---	---	---	---	---
	Uranium-235	1.57	4.62E-04	7.25E-01	96.7	**Yes**	---	---	**Yes**	---
	Uranium-238	32.22	2.98E-03	9.60E+01		---	---	---	---	---
Total Soil	Uranium-234	63.98	1.64E-07	1.05E-02		---	---	---	---	---
	Uranium-235	2.67	4.62E-04	1.23E+00	177.0	**Yes**	**Yes**	---	**Yes**	---
	Uranium-238	58.99	2.98E-03	1.76E+02		---	---	---	---	---
EU14/IA04B:										
Surface Soil	Uranium-234	1.44	1.64E-07	2.36E-04		---	---	---	---	---
	Uranium-235	0.11	4.62E-04	5.08E-02	5.1	**Yes**	---	---	---	---
	Uranium-238	1.70	2.98E-03	5.07E+00		---	---	---	---	---
Total Soil	Uranium-234	3.03	1.64E-07	4.97E-04		---	---	---	---	---
	Uranium-235	0.17	4.62E-04	7.85E-02	9.7	**Yes**	---	---	---	---
	Uranium-238	3.22	2.98E-03	9.60E+00		---	---	---	---	---
EU15/IA04C:										
Surface Soil	Uranium-234	1.86	1.64E-07	3.05E-04		---	---	---	---	---
	Uranium-235	0.15	4.62E-04	6.93E-02	5.6	**Yes**	---	---	---	---
	Uranium-238	1.84	2.98E-03	5.48E+00		---	---	---	---	---
Total Soil	Uranium-234	1.78	1.64E-07	2.92E-04		---	---	---	---	---
	Uranium-235	0.13	4.62E-04	6.01E-02	5.3	**Yes**	---	---	---	---
	Uranium-238	1.77	2.98E-03	5.27E+00		---	---	---	---	---
EU16/IA04D:										
Surface Soil	Uranium-234	5.83	1.64E-07	9.56E-04		---	---	---	---	---
	Uranium-235	0.32	4.62E-04	1.48E-01	21.8	**Yes**	---	---	**Yes**	---
	Uranium-238	7.28	2.98E-03	2.17E+01		---	---	---	---	---
Total Soil	Uranium-234	5.22	1.64E-07	8.56E-04		---	---	---	---	---
	Uranium-235	0.18	4.62E-04	8.32E-02	18.1	**Yes**	---	---	**Yes**	---
	Uranium-238	6.04	2.98E-03	1.80E+01		---	---	---	---	---
EU17/IA05A:										
Surface Soil	Uranium-234	1492	1.64E-07	2.45E-01		---	---	---	---	---
	Uranium-235	39.00	4.62E-04	1.80E+01	4759.4	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
	Uranium-238	1591	2.98E-03	4.74E+03		---	---	---	---	---
Total Soil	Uranium-234	562	1.64E-07	9.21E-02		---	---	---	---	---
	Uranium-235	22.62	4.62E-04	1.05E+01	1797.9	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
	Uranium-238	600	2.98E-03	1.79E+03		---	---	---	---	---
EU18/IA05B:										
Surface Soil	Uranium-234	0.82	1.64E-07	1.34E-04		---	---	---	---	---
	Uranium-235	0.07	4.62E-04	3.23E-02	2.208	---	---	---	---	---
	Uranium-238	0.73	2.98E-03	2.18E+00		---	---	---	---	---
Total Soil	Uranium-234	0.77	1.64E-07	1.26E-04		---	---	---	---	---
	Uranium-235	0.05	4.62E-04	2.31E-02	2.199	---	---	---	---	---
	Uranium-238	0.73	2.98E-03	2.18E+00		---	---	---	---	---
EU20/IA10:										
Surface Soil	Uranium-234	1.70	1.64E-07	2.79E-04		---	---	---	---	---
	Uranium-235	0.09	4.62E-04	4.16E-02	5.6	**Yes**	---	---	---	---
	Uranium-238	1.85	2.98E-03	5.51E+00		---	---	---	---	---
Total Soil	Uranium-234	2.24	1.64E-07	3.67E-04		---	---	---	---	---
	Uranium-235	0.08	4.62E-04	3.70E-02	6.8	**Yes**	---	---	---	---
	Uranium-238	2.28	2.98E-03	6.79E+00		---	---	---	---	---

Notes:

[a] EPCs are taken from Table 6-3.

[b] This table summarized the conversion of uranium intakes from activity to mass to support calculation of the hazard index. The activities (in pCi) were converted to mass (in mg) using the factors shown in this column; the resulting value is multipled by 1,000 to convert mg/g to mg/kg.

COPEC = constituent of potential ecological concern
EPC = exposure point concentration
EU = exposure unit
PRG = preliminary remediation goal
pCi/g = picocuries per gram
g = gram
mg = milligram
kg = kiligram

TABLE 8-1
SELECTED PRELIMINARY REMEDIATION GOALS
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

Medium	Units	Year	Parameter [a]	Building Interiors (EUs 1 - 9)			Terrestrial (EUs 10 - 20)		
				Dose PRG (25 mrem/yr)	Risk PRG (1E-04)	Receptor Basis [b]	Dose PRG (25 mrem/yr)	Risk PRG (1E-04)	Receptor Basis [b]
Building Material [c]	pCi/m^2	t = 16.57	**Radium-226**	1.28E+01	5.29E+01	Construction Worker	---	---	---
	pCi/m^2	t = 2.135	**Radium-228**	1.52E+01	--	Construction Worker	---	---	---
	pCi/m^2	t = 82.3	**Thorium-232**	2.82E-01	4.16E+01	Construction Worker	---	---	---
	pCi/m^2	t = 57.9	**Uranium-234**	3.50E+00	1.50E+02	Construction Worker	---	---	---
	pCi/m^2	t = 58	**Uranium-235**	3.71E+00	1.52E+02	Construction Worker	---	---	---
	pCi/m^2	t = 57.9	**Uranium-238**	3.90E+00	1.69E+02	Construction Worker	---	---	---
Surface Soil	pCi/g	t = 16.57	**Radium-226**	9.98E+00	3.04E+00	Dose = CW; risk = OW	3.38E+00	6.98E-01	Resident
	pCi/g	t = 2.135	**Radium-228**	1.15E+01	8.08E+00	Dose = CW; risk = OW	4.15E+00	1.91E+00	Resident
	pCi/g	t = 0	**Thorium-228**	1.29E+01	2.84E+01	Dose = CW; risk = OW	5.55E+00	8.87E+00	Resident
	pCi/g	t = 57.9	**Uranium-234**	4.66E+01	7.45E+02	Dose = CW; risk = CW	3.96E+00	2.27E+00	Resident
	pCi/g	t = 58	**Uranium-235**	4.06E+01	4.86E+01	Dose = CW; risk = OW	4.01E+00	2.01E+00	Resident
	pCi/g	t = 57.9	**Uranium-238**	4.72E+01	2.25E+02	Dose = CW; risk = OW	4.13E+00	1.80E+00	Resident
Total Soil	pCi/g	t = 16.57	**Radium-226**	9.98E+00	5.28E+01	Construction Worker	3.38E+00	6.98E-01	Resident
	pCi/g	t = 2.135	**Radium-228**	1.15E+01	6.02E+01	Construction Worker	4.15E+00	1.91E+00	Resident
	pCi/g	t = 0	**Thorium-228**	1.29E+01	6.81E+01	Construction Worker	5.55E+00	8.87E+00	Resident
	pCi/g	t = 57.9	**Uranium-234**	4.66E+01	7.45E+02	Construction Worker	3.96E+00	2.27E+00	Resident
	pCi/g	t = 58	**Uranium-235**	4.06E+01	4.68E+02	Construction Worker	4.01E+00	2.01E+00	Resident
	pCi/g	t = 57.9	**Uranium-238**	4.72E+01	5.51E+02	Construction Worker	4.13E+00	1.80E+00	Resident
Groundwater [d]	pCi/L	t = 0	**Radium-226**	6.06E+01	5.18E+03	Construction Worker	3.76E+00	1.07E+01	Resident
	pCi/L	t = 0	**Radium-228**	5.55E+01	1.92E+03	Construction Worker	3.45E+00	3.98E+00	Resident
	pCi/L	t = 0	**Thorium-232**	2.93E+01	1.98E+04	Construction Worker	1.82E+00	4.10E+01	Resident
	pCi/L	t = 0	**Uranium-234**	2.83E+02	2.83E+04	Construction Worker	1.76E+01	5.86E+01	Resident
	pCi/L	t = 0	**Uranium-235**	2.99E+02	2.79E+04	Construction Worker	1.86E+01	5.77E+01	Resident
	pCi/L	t = 0	**Uranium-238**	2.98E+02	2.30E+04	Construction Worker	1.85E+01	4.75E+01	Resident
Sediment	pCi/g	t = 0	**Radium-226**	3.03E+03	8.77E+02	Dose=CW/OW; risk=OW	3.03E+03	8.77E+02	Onsite Worker
	pCi/g	t = 0	**Radium-228**	2.77E+03	2.79E+02	Dose=CW/OW; risk=OW	2.77E+03	2.79E+02	Onsite Worker
	pCi/g	t = 0	**Thorium-232**	1.47E+03	2.77E+03	Dose=CW/OW; risk=OW	1.47E+03	2.77E+03	Onsite Worker
	pCi/g	t = 0	**Uranium-234**	1.41E+04	4.05E+03	Dose=CW/OW; risk=OW	1.41E+04	4.05E+03	Onsite Worker
	pCi/g	t = 0	**Uranium-235**	1.50E+04	3.93E+03	Dose=CW/OW; risk=OW	1.50E+04	3.93E+03	Onsite Worker
	pCi/g	t = 0	**Uranium-238**	1.49E+04	3.05E+03	Dose=CW/OW; risk=OW	1.49E+04	3.05E+03	Onsite Worker
Surface Water [d]	pCi/L	t = 0	**Radium-226**	4.84E+02	1.66E+03	Dose=CW/OW; risk=OW	4.84E+02	1.66E+03	Onsite Worker
	pCi/L	t = 0	**Radium-228**	4.44E+02	6.15E+02	Dose=CW/OW; risk=OW	4.44E+02	6.15E+02	Onsite Worker
	pCi/L	t = 0	**Thorium-232**	2.34E+02	6.34E+03	Dose=CW/OW; risk=OW	2.34E+02	6.34E+03	Onsite Worker
	pCi/L	t = 0	**Uranium-234**	2.26E+03	9.05E+03	Dose=CW/OW; risk=OW	2.26E+03	9.05E+03	Onsite Worker
	pCi/L	t = 0	**Uranium-235**	2.39E+03	8.91E+03	Dose=CW/OW; risk=OW	2.39E+03	8.91E+03	Onsite Worker
	pCi/L	t = 0	**Uranium-238**	2.38E+03	7.35E+03	Dose=CW/OW; risk=OW	2.38E+03	7.35E+03	Onsite Worker

Notes:
--- = Not applicable
CW = construction worker
EU = exposure unit
mrem/yr = millirems per year
OW = onsite worker
pCi/g = picocuries per gram
pCi/L = picocuries per liter
PRG = preliminary remediation goal. Dose PRG is based upon 25 mrem/yr for solid sources and 4 mrem/yr for water sources. Risk PRGs are based upon $1x10^{-4}$ risk.

[a] PRGs presented in this table are only for isotopes with exceedances of target risks or doses. Radium-226 and -228 exceedances were only detected in EU17. Full PRG development is presented in Tables V4-1 through V4-4.

[b] PRG for each isotope for each medium was selected based on the most health-protective PRG among all the receptors.

[c] Building material PRGs are based on beta allocations from static measurements taken from building interiors.

[d] The dose PRGs for groundwater and surface water are based on the drinking water maximum contaminant level of 4 mrem/yr.

TABLE 8-2
FEDERAL POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

MEDIUM/AUTHORITY	CITATION	STATUS	REQUIREMENT SYNOPSIS
WATER			
Safe Drinking Water Act 42 USC § 300f et seq.: *National Primary Drinking Water Regulations*	40 CFR § 141	ARAR	Regulations (40 CFR Part 141) promulgated under the Safe Drinking Water Act establish enforceable MCLs for chemical contaminants and non-enforceable maximum contaminant level goals (MCLGs) for finished water provided to consumers. The MCLs for radionuclides are specified in 40 CFR 141.66; analytical methodologies to demonstrate compliance with the MCL are identified in 40 CFR 141.25. The drinking water MCL for radionuclides is an ARAR because groundwater in the State of New York has a default classification of "GA", for which potable water supply is the best usage. In addition, runoff from the site flows indirectly into the Erie Canal, immediately upstream of the City of Lockport's emergency water supply. The MCL for uranium is 30 µg/L (40 CFR 141.66(e)). The MCL for gross alpha particle activity (excluding radon and uranium but including radium 226) is 15 pCi/L (40 CFR 141.66(c)); and the MCL for beta particle and photon radioactivity from man-made radionuclides must not produce an annual dose to the total body or any internal organ greater than 4 millirem/ year (40 CFR 141.66(d)).
AIR			
No promulgated Federal ARARs identified for air.			
SOIL/SEDIMENT			
US NRC: *Radiation Protection Programs*	10 CFR 20 Subpart B	ARAR	To implement the ALARA requirements, a constraint on air emissions of radioactive material to the environment, excluding Radon-222 and its daughters, shall be established by licensees such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 10 mrem per year from these emissions.
US NRC: *Radiation Protection Programs*	10 CFR 20 Subpart C	ARAR	The licensee shall control the occupational dose to individual adults, except for planned special exposures, to the following dose limits. (1) An annual limit, which is the more limiting of: (i) The total effective dose equivalent to 5 rems; or (ii) The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rems. (2) The annual limits to the lens of the eye, to the skin of the whole body, and to the skin of the extremities, which are: (i) A lens dose equivalent of 15 rems, and (ii) A shallow-dose equivalent of 50 rem to the skin of any extremity.

TABLE 8-2
FEDERAL POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

MEDIUM/AUTHORITY	CITATION	STATUS	REQUIREMENT SYNOPSIS
SOIL/SEDIMENT (CONTINUED)			
US NRC: *Radiation Dose Limits for Individual Members of the Public*	10 CFR 20 Subpart D	ARAR	The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem in a year, exclusive of the dose contributions from background radiation and certain other sources. The dose in any unrestricted area from external sources, (with some exceptions) does not exceed 0.002 rem/hr, and 0.05 rem/yr (10 CRF 20.1302).
US NRC: *Environmental Radiation Protection Standards for Nuclear Power Operations - Standards for normal operations.*	40 CFR §190.10	ARAR	The limits in the relevant part of this regulation state that the annual dose equivalent should not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public as the result of exposures to planned discharges of radioactive materials, radon and its daughters excepted, to the general environment from uranium fuel cycle operations and to radiation from these operations. The Guterl site is not covered by this definition (applicable to the nuclear fuel cycle) so these regulations are not 'applicable'. However, the specification of maximum dose to members of the public may be relevant and appropriate.

TABLE 8-3
NEW YORK STATE POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

MEDIUM/AUTHORITY	CITATION	STATUS	REQUIREMENT SYNOPSIS
WATER			
New York State Department of Environmental Conservation: *Environmental Conservation Law (ECL) Article 15, Title 3 and Article 17, Titles 3 and 8; Surface Water And Groundwater Quality Standards and Groundwater Effluent Limitations*	6 NYCRR Parts 700 though 706	ARAR	Groundwater classification (GA) and best usage (potable water supply) established at § 701.15. New York Ambient Water Quality Standards (including groundwater) established at § 703.5. For radiation in groundwater the values for protection of human health as a water source are (a) 15 pCi/L for gross alpha radiation, excluding radon and uranium; and (b) 1,000 pCi/L gross beta radiation, excluding strontium-90 and alpha emitters. Limits for radium are 3 pCi/L for Ra-226 and 5 pCi/ for Ra 226/228 combined.
AIR			
No promulgated New York ARARs identified for air.			
SOIL/SEDIMENT			
New York State Department of Labor: *Regulations for Ionizing Radiation Protection*	12 NYCRR Part 38	ARAR	Appendix A-10, Table 5 of Part 38 specifies acceptable levels of surface radiological contamination when decontamination of a licensed facility occurs. May be relevant for structures at Guterl site.

TABLE 8-4
FEDERAL AND STATE
CRITERIA, ADVISORIES AND GUIDANCE TO BE CONSIDERED (TBCs)
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

MEDIUM/AUTHORITY	CITATION	STATUS	REQUIREMENT SYNOPSIS
WATER			
NYSDEC *Ambient Water Quality Standards and Guidance Values*	TOGS 1.1.1	TBC	Summarizes NYSDEC water quality criteria promulgated in 6 NYCRR parts 700-706 (including guidance values) and provides guidance for developing discharge limitations and monitoring conditions for discharges to surface waters.
AIR			
NYSDEC Division of Air Resources: Guidelines for the Control of Toxic Ambient Air Contaminants	DAR-1 (Air Guide-1) AGC/SGC Tables (2007)	TBC	This document provides guidance for the control of toxic ambient air contaminants in New York State. The current annual guideline concentration (AGC) for uranium is 0.48 µg/m^3 with a short-term guidance concentration (SGC) of 60 µg/m^3; no criteria for thorium or radium were identified.
SOIL/SEDIMENT			
NYSDEC *Cleanup Guidelines for Soils Contaminated with Radioactive Waste*	DHSM-RAD-05-01	TBC	Note: formerly TAGM 4003; no technical changes. The proposed remediation should meet the "As Low As Reasonably Achievable" (ALARA) principles for unrestricted use. DHSM-RAD-05-01 describes the policy and procedure to be followed by Division of Hazardous Substances Regulation, Bureau of Hazardous Waste and Radiation staff in evaluating cleanup plans for soils contaminated with radioactive materials. The total effective dose equivalent to the maximally-exposed Individual of the general public, from radioactive material remaining at a site after cleanup, shall be as low as reasonably achievable and less than 10 mrem above that received from background levels of radiation in any one year.
USEPA Regional Screening Levels (RSL) Master Table	RSL Table (December 2009)	TBC	The RSL Table replaces screening tables previously maintained by Region 3, Region 6, and Region 9. RSLs are risk-based concentrations for non-radiological chemicals that are intended to assist in initial screening-level evaluations of environmental measurements. They are used for site "screening" and as initial cleanup goals if applicable. The RSL tables present criteria for uranium – soluble salts (industrial soil and residential soil) based on both the USEPA IRIS toxicity data, and more restrictive criteria based on provisional toxicity data for USEPA National Center for Environmental Assessment (NCEA). No RSLs are published for thorium in any form.
USEPA *Superfund Radionuclide Preliminary Remediation Goals*	Radionuclide PRG Tables (2002 or later)	TBC	EPA has a website for the purpose of developing exclusively radionuclide PRGs: epa.prgs.ornl.gov/radionuclides. These PRGs may be used for as general screening values for radionuclides.

TABLE 8-4
FEDERAL AND STATE
CRITERIA, ADVISORIES AND GUIDANCE TO BE CONSIDERED (TBCs)
REMEDIAL INVESTIGATION FORMER GUTERL SPECIALTY STEEL CORPORATION FUSRAP SITE
LOCKPORT, NEW YORK

MEDIUM/AUTHORITY	CITATION	STATUS	REQUIREMENT SYNOPSIS
SOIL/SEDIMENT (CONTINUED)			
NYSDEC *Recommended Soil Cleanup Objectives; 6 NYCRR Part 375-6.8 (Soil Cleanup Objectives)*	TAGM 4046; 6 NYCRR Part 375-6	TBC	Tables 1 through 4 of TAGM 4046 identify the state's "Recommended Soil Cleanup Objectives" for a number of volatile and semivolatile organics, pesticides, PCBs, and metals. Largely superseded by new NYSDEC regulations at 6 NYCRR 375-6.8 (Soil Cleanup Objectives). Neither has criteria for any of the radionuclides (U, Th, or Ra) potentially present at Guterl.
USEPA Office of Solid Waste and Emergency Response *Memorandum on Establishing Cleanup Levels at Sites with Radioactive Contamination*	OSWER No. 9200.4-18 (1997)	TBC	Presents clarifying guidance for establishing protective cleanup levels for radiation at CERCLA sites. Based on dose assessment, exposure should not exceed 15 mrem/yr, corresponding to a cancer risk of 3 x 10^{-4}
USEPA: *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*	EPA 400-R-92-001	TBC	Discusses protective action guides (PAGs) in safeguarding public health.
US Department of Energy: *Radiation Protection of the Public and the Environment*	DOE Order 5400.5	TBC	Establishes standards and requirements for operations of the Department of Energy (DOE) and DOE contractors with respect to protection of members of the public and the environment against undue risk from radiation. The generic guidelines for residual concentrations of Th-230, and Th-232 are: (a) 5 pCi/g, averaged over the first 15 cm of soil below the surface (b) 15 pCi/g, averaged over 5 cm thick layers of soil more than 15 cm below the surface.
US Department of Energy	DOE Order 5480.11	TBC	Establishes radiation protection standards and program requirements for workers.
Nuclear Regulatory Commission	NUREG-1757	TBC	Consolidates the NRC's policies and procedures for decommissioning licensed sites. This guidance was revised September 2006.