November 7, 2012

Mr. Michael J. Hinton, P.E.
New York State Department of Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203-2999

RE: UCC - NIACET FACILITY VOLUNTARY CLEANUP PROJECT
NIAGARA FALLS, NY (SITE #V00373-9)
RESPONSE TO OCTOBER 23, 2012 COMMENTS ON DRAFT IRM WORK PLAN

Dear Mr. Hinton:

URS Corporation (URS), on behalf of Union Carbide Corporation (UCC), has reviewed the comments provided by the New York State Department of Environmental Conservation (NYSDEC) in their correspondence dated October 23, 2012. These comments are related to the, "Draft Interim Remedial Measures Work Plan for the Property at The Niacet Corporation 47th Street Niagara Falls, New York" prepared by URS and dated September 2012. Our responses to the comments are provided below. For ease of review, we have provided the NYSDEC comment first, followed by our response.

1. *Engineer Certification: The IRM Work Plan must be signed and sealed by a registered New York State Professional Engineer.*

   The IRM Work Plan has been signed and sealed by a registered NYS PE.

2. *Section 5.2 Interim Remedial Measure - Dig and Haul: An additional bullet requiring scanning of the excavated soil for excessive radiation is required. In addition to confirmation soil sampling to determine the extent of soil excavation, observation of the remaining soil for visible mercury must also be performed.*

   Section 5.2 has been revised as noted.

3. *Section 6.1 Task 1 Determination of Landfill Disposal Criteria: The receiving landfill facility must be advised of the potential radiation issues with the contaminated soil and the implications or notifications required for the international border crossing of the waste material. The radiation management plans must be prepared with the landfill and border crossing concerns in mind.*

   Section 6.12 – Management of Potentially Radioactive Materials has been added to the text. This section indicates that any soil/slag encountered with radioactivity levels

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above background will be sampled and analyzed for disposal characterization based on the disposal facility requirements.

4. ***Section 6.2.3 Submittals:*** *An additional bullet is to be included that requires the submittal of radiation management plans that include a Site Operation Plan, Waste Management Plan and a Site Radiation Safety Plan for the proper handling of potential radiological materials.*

   Section 6.2.3 has been revised to include a bullet indicating that a Radiation Management Plan must be submitted for any potential radioactive materials that might be encountered.

5. ***Section 6.4 Task 4- Health and Safety/Community Air Monitoring Plan:*** *Include specific reference to the NYSDOH Community Air Monitoring Plan (CAMP) and the NYSDEC DEC-10 Guidance.*

   Reference has been added to Section 6.4 indicating that air monitoring must be conducted in accordance with the requirements of the HASP, NYSDOH CAMP and NYSDEC DER-10 guidance.

6. ***Section 6.8 Task 8 - Excavation:*** *Include reference to the potential involvement of radiologically contaminated soil/fill and refer to the radiation Site Operation Plan for the proper handling and management of the radiological material.*

   Section 6.8 has been revised to indicate there is a potential to encounter radiologically contaminated materials during excavation. Management of these materials is detailed in Section 6.12 of the IRM Work Plan

7. ***Section 6.9 Task 9- Backfilling:*** *The future use of this site will be restricted to industrial through the imposition of an environmental easement. Therefore, any soil imported to the site for fill must meet the chemical concentration requirements found in DER-10 Appendix 5, Allowable Constituent Levels for Imported Fill or Soil. Crushed stone imported from a commercial stone quarry is exempt from this requirement if less than 10% by volume will pass the #100 sieve.*

   Section 6.9 has been revised to indicate that backfill materials must be from a commercial supplier, contain less than 10% by volume passing the #100 sieve, or have chemical data showing that the material meets the applicable requirements of DER-10.

8. ***Appendix D Health and Safety Plan Requirements:*** *Include reference to the NYSDOH CAMP and the NYSDEC DER-10 guidance documents, and add the NYSDOH CAMP as an appendix to Appendix D along with a map indicating the route to the nearest hospital.*

   The Appendix B - HASP requirements have been revised to indicate that air monitoring must be conducted in accordance with the requirements of the HASP, NYSDOH CAMP and NYSDEC DER-10 guidance. Additionally, a copy of the NYSDOH CAMP has been included as Attachment A, and a map showing the route to the nearest hospital has been provided.

A copy of the revised IRM Work Plan with the revisions noted above is included with this letter for your review and approval.

Should you have any questions concerning the responses to your comments or the revised Work Plan, please call Tim King at (304) 747-3763, Colin Wasteneys at (716) 923-1164, or me at (716) 465-8127.

Sincerely,

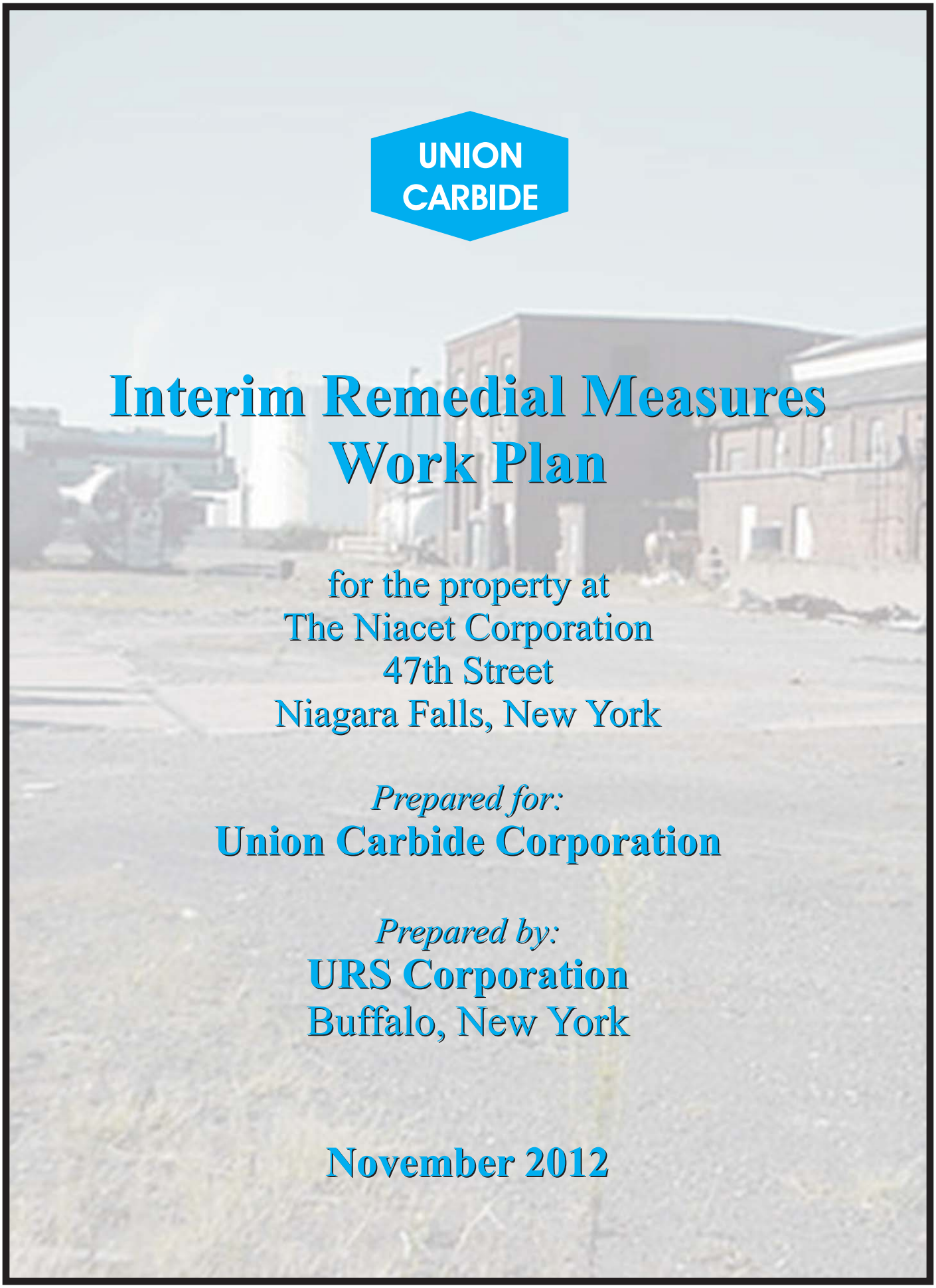
URS Corporation

Colin Wasteneys for

Robert R. Henschel, P.G.
Project Manager

cc: Tim King (UCC)
Matt Forcucci (NYS Department of Health)
Bill Corbett (URS)
Colin Wasteneys (URS)
File: 11171085 (C-1)

Enclosure



Interim Remedial Measures Work Plan

for the property at
The Niacet Corporation
47th Street
Niagara Falls, New York

Prepared for:
Union Carbide Corporation

Prepared by:
URS Corporation
Buffalo, New York

November 2012

G4057F

INTERIM REMEDIAL MEASURES
WORK PLAN
FOR THE PROPERTY AT
THE NIACET CORPORATION
47TH STREET
NIAGARA FALLS, NEW YORK

Prepared for:

UNION CARBIDE CORPORATION

Prepared by:

URS CORPORATION – NEW YORK, INC.
77 GOODELL STREET
BUFFALO, NEW YORK 14203

NOVEMBER 2012

ENGINEER CERTIFICATION

This Interim Remedial Measures Work Plan has been prepared by qualified individuals familiar with the relevant environmental regulations working under my direction. Information used in the development of this work plan was collected by URS using subcontractors, the findings from previous studies at the site, and our own staff. The recommendations included herein provide the basis for the responsible remediation of this site.

Jack Wilcox, P.E.

11/2/12
Date

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ACRONYM LIST

AMSL	above mean sea level
AOC	area of concern
AST	above ground storage tank
bgs	below ground surface
C&D	Construction and Demolition
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
cm/sec	centimeters per second
COI	constituents of interest
CQA	construction quality assurance
DER-10	Draft Technical Guidance for Site Investigation and Remediation
EPA	Environmental Protection Agency
FCR	field change request
gpm	gallons per minute
HASP	Health and Safety Plan
IRM	Interim Remedial Measures
ISCO	in-situ chemical oxidation
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NCR	non-conformance report
NYCRR	New York Code Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
O&M	Operation and Maintenance
PPE	personal protective equipment
PA	Preliminary Assessment
RAS	Remedial Action Selection report
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
SCG	standards, criteria and guidance

SI	Site Investigation
SI/RAR	Site Investigation/Remedial Alternatives Report
SPCC	Spill Prevention, Control and Countermeasures
SVE	soil vapor extraction
TAGM	Technical and Administrative Guidance Memorandum
TCLP	toxicity characteristic leaching procedure
TDC	Transportation and Disposal Coordinator
TOC	total organic carbon
TOGS	Technical and Operational Guidance Series
UCC	Union Carbide Corporation
URS	URS Corporation
USDOT	United States Department of Transportation
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program
VOC	volatile organic compound

1.0 INTRODUCTION

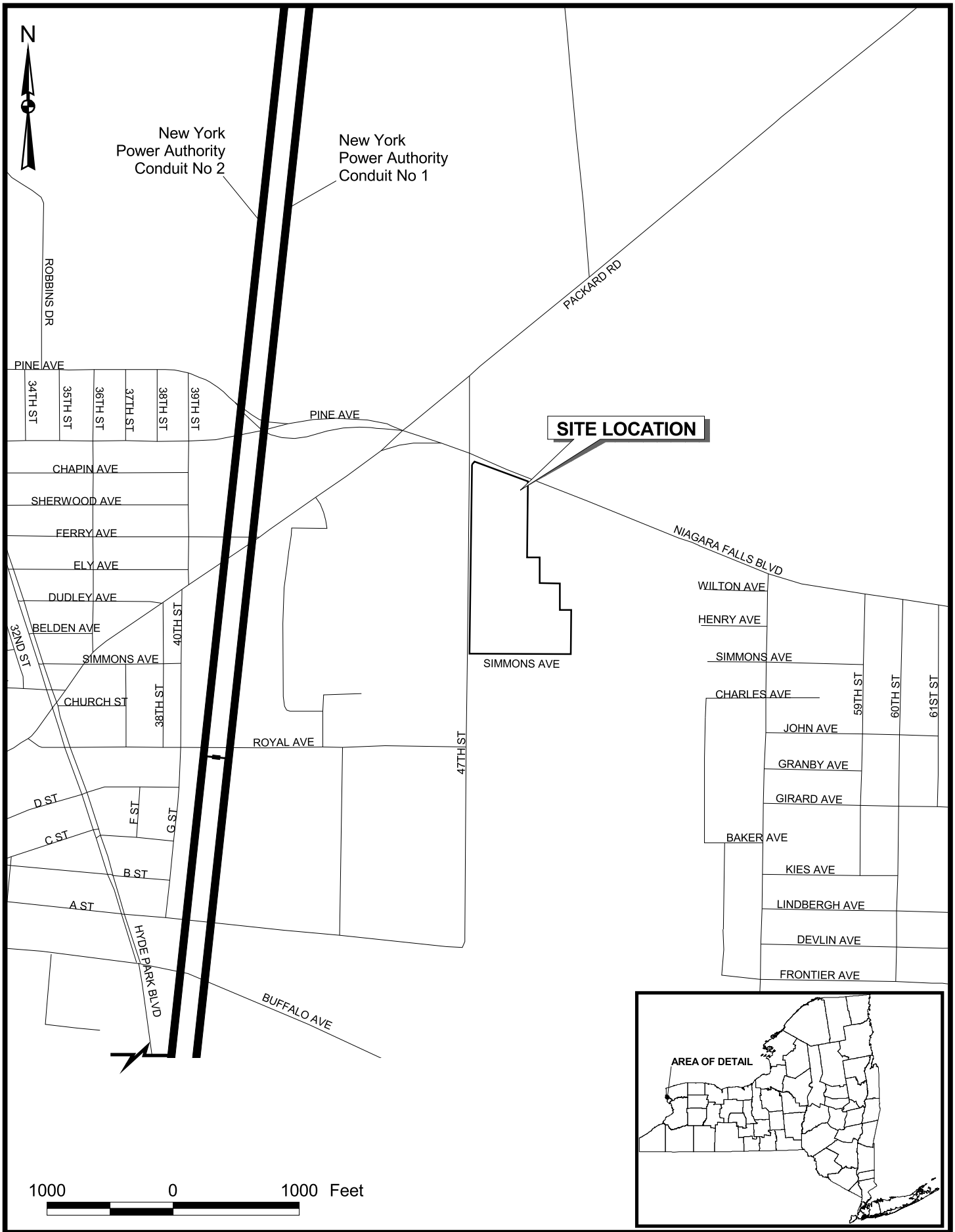
1.1 General

The Union Carbide Corporation (UCC) previously owned and operated a chemical manufacturing facility at 400 47th Street in Niagara Falls, New York (Figure 1-1). The property was sold to Niacet Corporation (Niacet) in 1978. In 1998 and 2001, Niacet discovered visible mercury contamination in the onsite soils during excavation activities. UCC subsequently entered into a Voluntary Cleanup Agreement with the New York State Department of Environmental Conservation (NYSDEC) in 2001 to remediate the mercury contamination.

UCC contracted URS Corporation – New York, Inc. (URS) to characterize the extent of mercury contamination discovered at the Niacet Property. An initial Site Investigation (SI) was conducted by URS during the spring of 2002. SI results were presented in the *Site Investigation Summary Report*, dated October 2002 (URS, 2002). Based on the results of the SI, it was determined that supplemental investigations would be necessary to fully delineate the extent of mercury contamination at the site. A Work Plan for the Supplemental Site Investigation/Remedial Alternatives Report (SI/RAR) was prepared and submitted to the NYSDEC in January 2003. The Work Plan was revised to address NYSDEC comments and submitted as final in September 2003 (URS, 2003). The Work Plan subsequently was approved by the Department on December 12, 2003. The field investigations were conducted during the period May 10 through June 1, 2004. A Final SI Report was issued for the site in March 2006.

A Remedial Action Selection (RAS) Report was submitted by URS in November 2006 in accordance with the requirements of the NYSDEC guidance document "*Draft DER-10 Technical Guidance for Site Investigation and Remediation*" as it relates to Voluntary Cleanup Program (VCP) sites, dated December 25, 2002 (NYSDEC, 2002). As outlined in Section 4.0 – Remedy Selection, the action selection process consisted of the following steps: 1) identification of remedial action objectives; 2) identification and evaluation of remedial action alternatives; and, 3) selection and documentation that the selected remedy is compliant with the applicable criteria.

On December 14, 2006, the NYSDEC adopted new Part 375 regulations that set revised soil cleanup standards which superseded the previously applicable TAGM 4046 cleanup criteria that were used as a basis for the RAS. The Part 375 cleanup standard for mercury of 5.7 milligrams per



N:\11171085.00000\DB\gis\sitelocation.apr SITE LOCATION
4/14/2005

URS

NIACET CORPORATION
SITE LOCATION MAP

FIGURE 1-1

kilogram (mg/kg) has been used for the Niacet site from that point forward. At the same time, the NYSDEC indicated that the mercury-contaminated soils at the site should be classified and managed as a U151 listed hazardous waste. This determination was discussed with the Department during the period from December 2006 through January 2010. Based on additional data provided by UCC regarding the probable source of the elemental mercury on site, the Department issued a final ruling that the mercury-contaminated soils would be classified as a non-hazardous waste and could be disposed in a sanitary landfill, assuming that the soils were treated as necessary to prevent "free" elemental mercury from being placed in the landfill (Appendix A).

In May 2011, a sample of some of the most highly contaminated soil (i.e. containing visible beads of mercury) was provided to four potential remedial contractors for performance of bench-scale treatability studies. The objective of the studies was to determine if any reagent mixes could be developed that would stabilize the visible mercury. Initial results indicated that two of the contractors had developed at least one, or more, reagent mixes that achieved the desired results. The studies also indicated that the sample exceeded the TCLP mercury criteria of 0.2 mg/L. As such, the sample would be classified as hazardous based on the leaching characteristic for mercury. Up until this time all previously tested samples had not failed TCLP, which is consistent with the assumption that the mercury contained in the onsite soils was elemental mercury, which has a very low solubility.

This new data raised the possibility that some of the onsite soils previously identified as containing visible and/or high concentrations of disseminated mercury might also fail TCLP, thereby resulting in them being classified as hazardous for disposal. Consequently, in January 2012 URS collected 19 soil samples from those areas previously identified as containing visible mercury or disseminated mercury at concentrations >260 mg/kg. The samples were submitted for total/TCLP mercury and speciation analysis to determine the concentrations and type of mercury present in the soils. The results indicated that 3 of the 19 samples tested exceeded the TCLP criteria; two samples containing visible mercury and one containing high concentrations of disseminated mercury. Additionally, it was determined that the mercury in the samples was comprised primarily of elemental mercury and mineral-bound mercury (low solubility), with lesser amounts of mercury salts (high solubility).

Subsequently, soil samples from four of the areas containing visible mercury and/or failing TCLP were provided to one of the contractors that had successfully treated the soil during the initial study for performance of additional treatability studies. The objective of the studies was to determine

if any of the reagent mixes would stabilize the visible mercury and/or reduce the TCLP values to less than the regulatory limit (i.e. 0.2 mg/L).

Duplicate soil samples also were sent to Stablex for evaluation of direct treatment/disposal at their facility in Blaineville, Quebec, Canada.

The supplemental treatability studies achieved varying degrees of success in stabilizing the visible mercury and/or reducing TCLP levels to acceptable levels. However, the results were somewhat inconsistent and highly dependent on a number of variables (e.g. reagent mixes, mixing/curing time, moisture content, soil composition/grain size, etc.). It was subsequently concluded that it would be very difficult to obtain consistent results meeting the remediation goals under real field conditions. Additionally, preliminary cost estimates for utilizing onsite treatment methods indicated that they would be less cost-effective than traditional 'dig and haul' methods. Consequently, it was determined that onsite treatment approaches did not warrant further evaluation. As such, UCC intends to remediate the onsite soil containing visible mercury and/or failing TCLP by use of excavation and offsite disposal methods.

UCC Proposes to implement the site remediation in two phases:

- Phase I will consist of an interim remedial measure (IRM) that will be designed to remove the 'hot-spots' identified during previous site investigations as containing visible mercury and/or failing TCLP. This phase would be implemented during the fall of 2012 and utilize traditional 'dig and haul' methods.
- Phase II will consist of the final site remediation and will address the remaining soil onsite with mercury contamination > 5.7 mg/kg. Remedial methods to be employed during this phase are still being evaluated. This phase will be implemented during 2013.

1.2 Purpose

URS has prepared this IRM Work Plan in accordance with the requirements of NYSDEC DER-10. The purpose of this IRM Work Plan is to provide guidelines for remediation of 'hot-spots' (i.e. surface and near-surface soils containing visible mercury and/or failing TCLP) in various areas

of the Site. This IRM Work Plan was developed with sufficient detail to serve as a construction work plan while satisfying the guidance provided in Section 5.3 of NYSDEC DER-10.

URS will serve as the lead engineer (Engineer) for this project. The Remedial Contractor has not been determined at this time. The excavated soils containing visible mercury and/or failing TCLP will be transported to the Stablex facility in Blainville, Quebec for treatment/disposal.

1.3 Remedial Action Objectives

The primary objectives of the IRM are to:

- Reduce or eliminate the potential exposure of existing and/or future site users to surface and near-surface soils containing visible mercury and/or failing TCLP.
- Minimize UCC's long-term liabilities, O&M costs/efforts and impacts on potential future site use or reuse due to mercury-contaminated soils on site.

2.0 SITE HISTORY AND DESCRIPTION

2.1 Site History

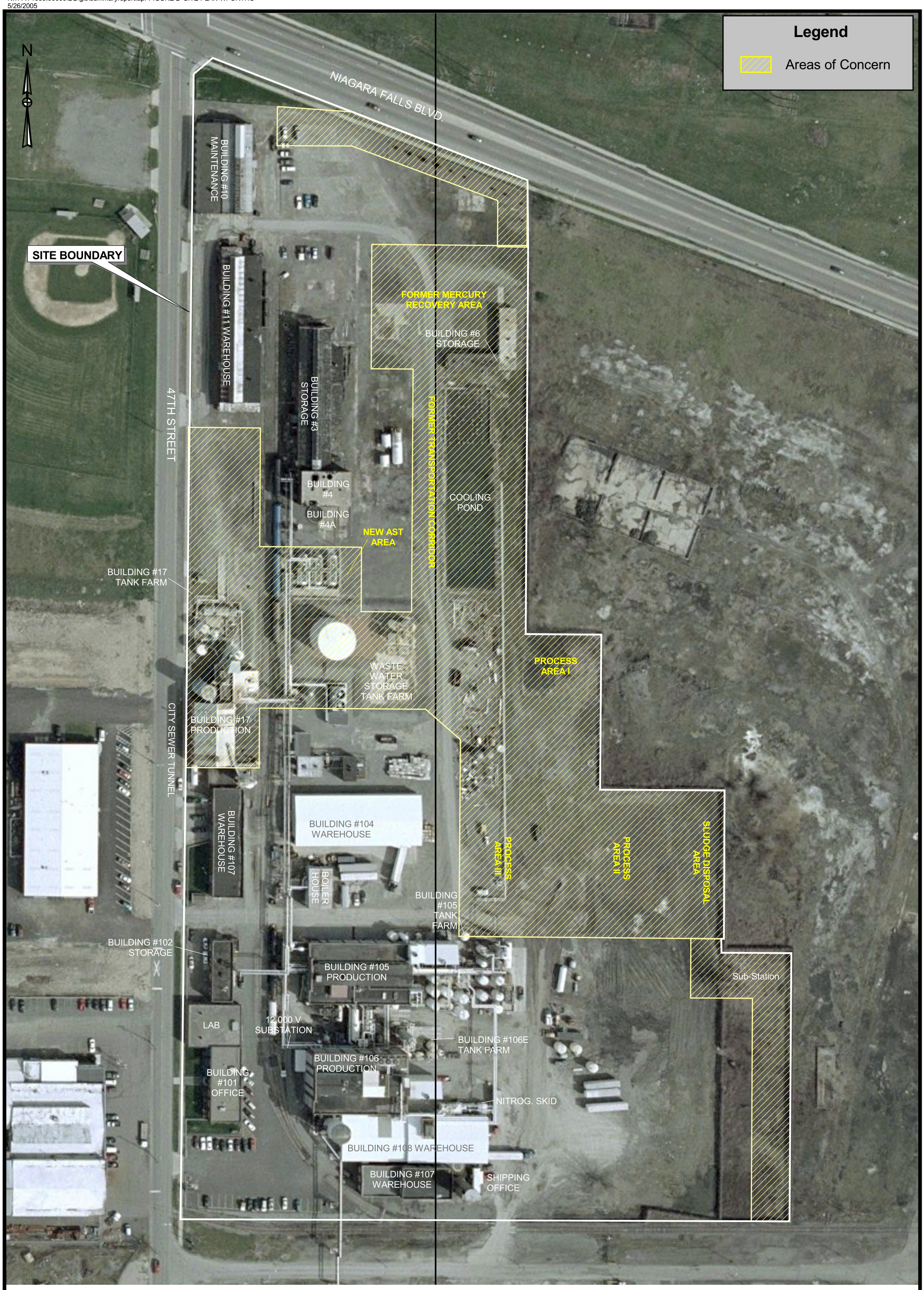
The Niacet facility, formerly owned and operated by the Union Carbide Corporation, is located on 19.42 acres at the intersection of 47th Street and Niagara Falls Boulevard (Figure 2-1) in Niagara Falls, New York. Historical documentation indicates that the facility was initially constructed in 1925-26 and operated as the Niacet Chemical Company. The plant originally produced acetaldehyde, paraldehyde, aldol, and crotonaldehyde. Production of acetic acid by the oxidation of acetaldehyde was begun in 1928. The manufacture of sodium acetate and other acetates was begun in 1935. Vinyl acetate production was added in 1937 and increased steadily up through the late 1950's. Mercury salts were utilized as a catalyst in the acetate production process. In 1945 the Niacet Chemicals Company became the Niacet Chemicals Division of U.S. Vanadium Corporation. In 1951 the Niacet Chemicals Division became the Niacet Plant of the Union Carbide and Carbon Corporation. About the same time the idle Carbide and Carbon Chemicals Company methanol plant was added to the Niacet Plant. A fumigant known as Carboxide was manufactured in the old methanol plant. Production of acetaldehyde and acetic acid was discontinued in 1952. In 1957 the name of the facility owner/operator was changed to Union Carbide Corporation (UCC).

In 1978, Niacet purchased the property from UCC. Niacet currently manufactures specialty chemical products for food, pharmaceutical and industrial applications

During 1998, a new aboveground storage tank (AST) Farm was constructed in the area southeast of Building #4/4A (Figure 2-1). Niacet personnel stated that visible elemental mercury was observed at the bedrock surface at the bottom of the new AST pad excavation. The fill/soil in this area also was contaminated with disseminated mercury. A total of 32,520 lbs. of mercury-contaminated soil from the excavation was transported and disposed at CWM Chemical Services Facility (CWM) in Model City, NY.

Additionally, in 2001, soils contaminated with visible mercury were encountered during installation of a trench drain in the floor of Building #17. A total of 2,100 lbs of mercury–contaminated soils were drummed and transported to CWM for treatment and disposal.

N:\11171085.00000\DB\gis\summaryreport.apr FIGURE 2 SITE PLAN W/ ORTHO
5/26/2005



URS

NIACET
SITE PLAN

FIGURE 2-1

2.2 Site Description

The Niacet facility consists of a roughly L-shaped area with brick and cinder block buildings occupying the western portion of the property. New cooling towers and aboveground storage tanks (ASTs) were installed in the central portion of the parcel within the past few years. During these construction activities, elemental mercury was discovered in some of the new structure excavations. The remainder of the property consists of asphalt and concrete roadways, parking lots, foundations from former buildings, a concrete-lined cooling pond, and open areas containing industrial fill. An active railroad spur is located on the west side of the site. Adjacent properties are primarily industrial. The site is bordered on the east by the former Electro Metals facility and on the south by Simmons Avenue and other industrial properties. Niagara Falls Boulevard borders the north side of the site. 47th Street is west of the site, with recreational baseball diamonds on the west side of 47th Street.

2.3 Regional Geology

The Niacet Facility rests on glacial deposits consisting of lake bottom sediments and/or glacial till. Underlying the glacial deposits is the Lockport Dolomite formation. The Lockport formation underlies the entire city of Niagara Falls, and extends from the Niagara escarpment south to Grand Island. The overlying glacial deposits are typically very thin, with an average thickness of approximately 10 feet, throughout the region. Groundwater within the Lockport formation is fracture controlled, as groundwater is present in wells that intercept fractures within the bedrock. The overlying glacial deposits are insignificant producers of groundwater. Groundwater flow is to the west, influenced by the New York Power Authority water conduit (Figure 1-1).

2.4 Site Geology

2.4.1 Stratigraphy

Based on the results of the investigations described above, the site stratigraphy is as follows:

- A fill layer extends across the whole site. The fill layer is thin (i.e. 2.0 feet) in the northwest corner of the site and gradually thickens to the south – reaching a thickness

of 11 feet near Pikes Creek and areas further south. The upper few inches to two feet consists of coarse granular materials (coal, slag, rock, cinder and clinker) with industrial construction and demolition (C&D) debris. The lower portion consists of reworked silty clay with rock and C&D debris.

- Bedrock is encountered at shallow depths (approximately 2 feet) at the north end of the site and slopes gradually to the south, reaching depths greater than 11 feet.
- Groundwater occurs below the top of bedrock in the northern and western portions of the site. In the remainder of the site, groundwater was observed within the overburden materials. In general groundwater flow is from north to south-southeast in the eastern half of the site. In the southeastern corner and the western half of the site, flow is to the west and is strongly influenced by the unlined brick sewer tunnel running north-south under 47th Street.

3.0 SUMMARY OF SITE INVESTIGATION ACTIVITIES

3.1 Applicable Standards, Criteria, and Guidance

For all of the activities conducted, the analytical data obtained from soil and groundwater samples at the site were compared to the applicable New York State standards, criteria, and guidance (SCG) values. The following SCGs were utilized in evaluating the levels of mercury contamination detected in soil and groundwater at the site:

Soil

Prior to December 2007, the NYSDEC Technical Administrative Guidance Memorandum (TAGM) 4046: *Determination of Soil Cleanup Objectives and Cleanup Levels*, January 1994/January 2000 (TAGM 4046) were utilized. However, in December 2007, the NYSDEC adopted the new Title 6 New York Code Rules and Regulations Subpart 375 (6NYCRR Part 375) for remedial programs. These regulations contain "look-up" tables with soil cleanup objectives (SCOs) for both unrestricted and restricted use scenarios. Based on discussions with the NYSDEC, TAGM 4046 criteria for soil are no longer applicable to this site, and the new Part 375-6.8(b) restricted use SCOs for industrial sites are to be applied. As such, all soils onsite with mercury concentrations >5.7 mg/kg must be addressed by the remediation.

Groundwater

For groundwater and surface water NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 *"Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*" (April, 2000) define the applicable SCGs. For potable groundwater (i.e. Class GA) the mercury limit is < 0.7 µg/L.

3.2 Previous Site Investigation Activities

The nature and extent of mercury contamination at the site was characterized through the completion of two site investigations in 2002 and 2004.

The initial Site Investigation (SI) was conducted between April 29 and May 23, 2002. The SI consisted of a soil gas survey, excavation of test trenches and collection/analysis of soil samples in accordance with a NYSDEC-approved Work Plan.

Based on the initial SI, disseminated and/or visible mercury was identified in all areas of the site that were investigated. Consequently, in order to determine the full extent of mercury contamination at the site, a Supplemental SI was performed in the remaining areas of the site that were not included during the initial SI. Additionally, the extent of the visible mercury areas was further delineated so that possible IRM could be evaluated. The Supplemental SI was conducted during the period between May 10 and June 1, 2004.

The locations sampled during both investigations are shown on Figure 3-1.

3.3 Nature and Extent of Contamination

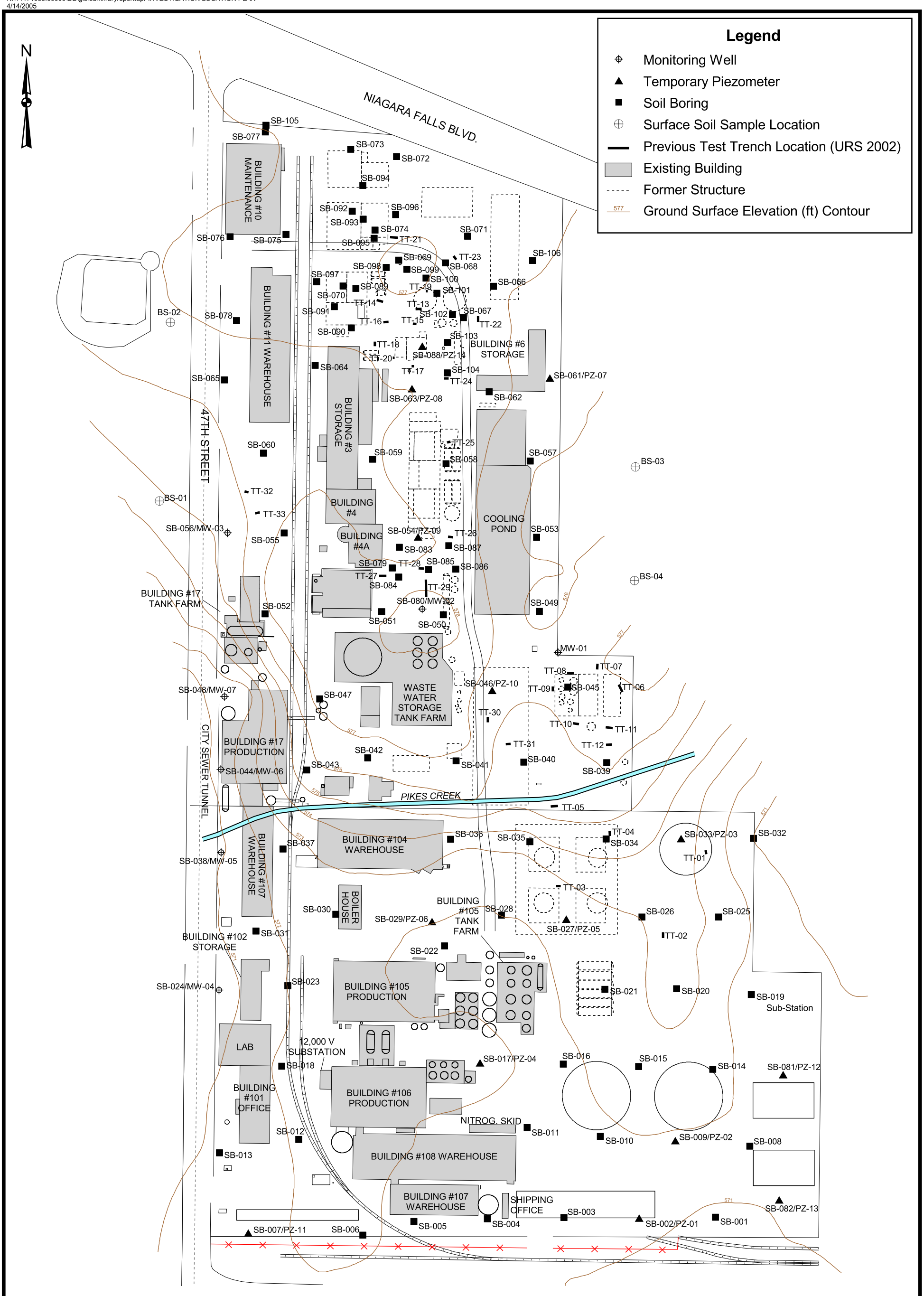
The results of the initial site investigation are presented in "*Site Investigation Summary Report*" prepared by URS dated October 2002. The results of the supplemental investigation are presented in, "*Final Supplemental Site Investigation Report*" prepared by URS dated March 2006.

3.3.1 Soil Analytical Results

Analytical results for mercury in surface soil and fill material are shown on Figures 3-2 and 3-3, respectively. A summary of the results based on the two site investigations is presented below.

- Mercury concentrations observed in soil/fill materials at the site typically reflect the historical usage areas of the site. Disseminated mercury, at relatively low concentrations, occurs in soil/fill materials throughout the site. The highest observed concentrations occur in the vicinity of the Former Mercury Recovery Area and along the Former Transportation Corridor in the north-central portion of the site.
- Visible elemental mercury occurs in three areas of the site: under the concrete floor in Building #17, east of the new AST Farm and in the vicinity of the Former Mercury Recovery Area. The area in the vicinity of the Former Mercury Recovery Area posed a potential for exposure of onsite workers, so it was covered in 2004 with a geotextile and 6-inches of crushed stone to eliminate the possibility of dermal contact.
- Detectable concentrations of mercury occur in surface soil across the site. The concentrations exceed the SCGs (i.e. 5.7 mg/kg) in all but 11 locations.
- Mercury concentrations in 69 of the 125 subsurface soil/fill materials samples exceeded the SCGs. These exceedances are generally limited to the upper 2 feet of the soil/fill

N:\11171085.00000\DB\gis\summaryreport.apr INVESTIGATION LOCATION PLAN
4/14/2005



NOTE:
- Contours are based on ground surface elevations measured at each soil boring / monitoring well location.

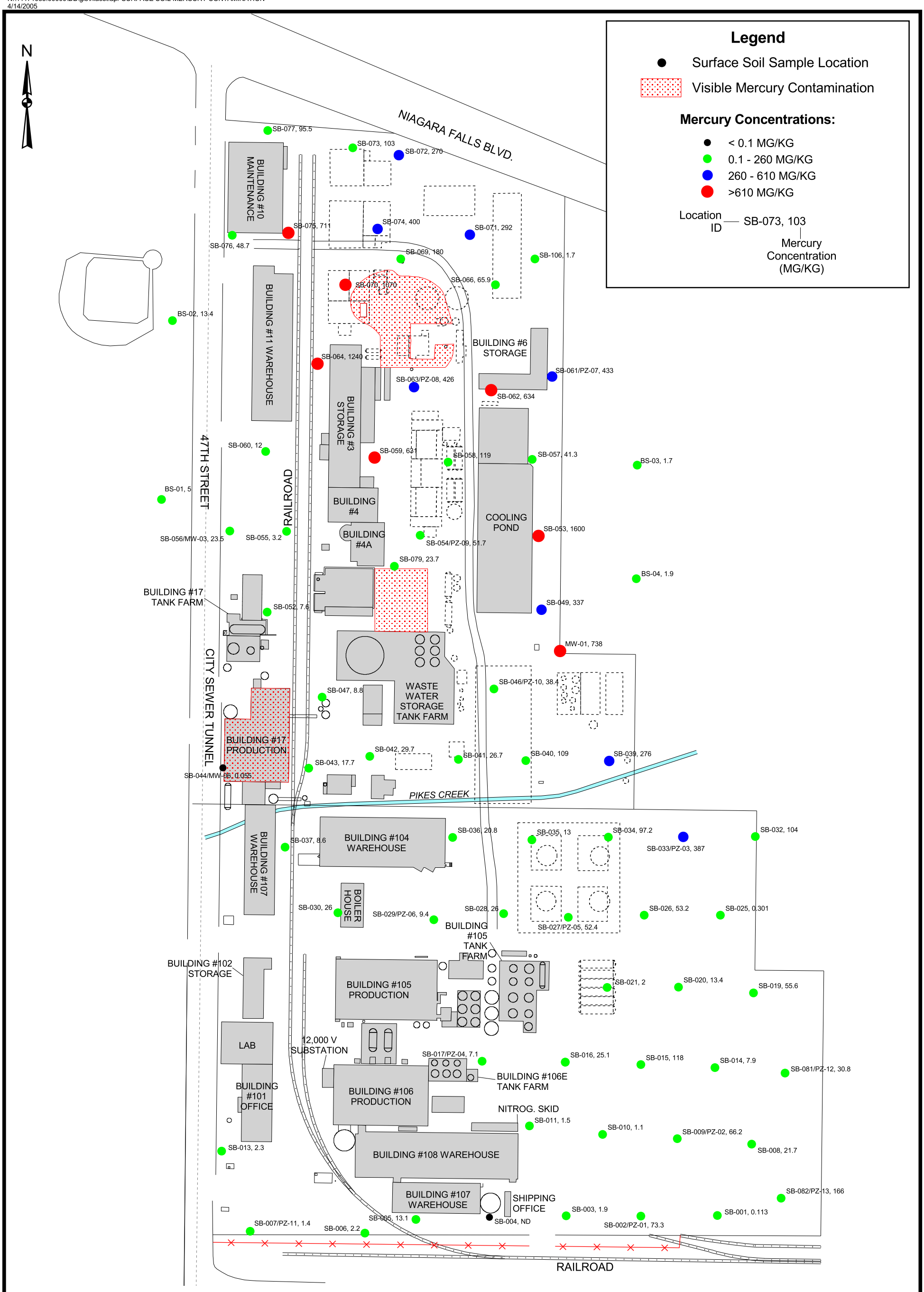
120 0 120 Feet

URS

NIACET
INVESTIGATION LOCATION PLAN

FIGURE 3-1

N:\11171085.00000\DB\gis\niacet.apr SURFACE SOIL MERCURY CONTAMINATION
4/14/2005



URS

NIACET
SURFACE SOIL ANALYTICAL RESULTS
MERCURY

FIGURE 3-2

N:\11171085.00000\DB\gis\niacet.apr FILL MATERIAL MERCURY CONTAMINATION
4/15/2005

N

Legend

- Soil Boring (2004)
- Test Trench (2002)
- Visible Mercury Contamination

Mercury Concentrations:

- 0 - 0.1 MG/KG
- 0.101 - 260 MG/KG
- 260 - 610 MG/KG
- >610 MG/KG

Location ID — SB-073 (0 - 1), 2110 (0 - 2), 1030 — Mercury Concentration (MG/KG)
Sample Depth Interval (ft)

NIAGARA FALLS BLVD.
47TH STREET
RAILROAD
CITY SEWER TUNNEL
PIKES CREEK

BUILDING #10 MAINTENANCE
BUILDING #11 WAREHOUSE
BUILDING #3 STORAGE
BUILDING #4
BUILDING #4A
BUILDING #6 STORAGE
COOLING POND
BUILDING #17 TANK FARM
BUILDING #17 PRODUCTION
WASTE WATER STORAGE TANK FARM
BUILDING #104 WAREHOUSE
BUILDING #107 WAREHOUSE
BOILER HOUSE
BUILDING #105 TANK FARM
BUILDING #102 STORAGE
BUILDING #105 PRODUCTION
LAB
12,000 V SUBSTATION
BUILDING #106E TANK FARM
BUILDING #106 PRODUCTION
BUILDING #101 OFFICE
NITROG. SKID
BUILDING #108 WAREHOUSE
BUILDING #107 WAREHOUSE
SHIPPING OFFICE

SB-105 (0 - 2), 6.3
SB-077 (0 - 2), 54.4
SB-073 (0 - 1), 2110 (0 - 2), 1030
SB-072 (0 - 2), 477
SB-094 (0 - 2), 7130 (2 - 4), 0.644
SB-092 (0 - 2), 4040 (2 - 4), 50.1
SB-096 (0 - 2), 1490 (2 - 4), 0.751
SB-076 (0 - 4.5), 29.4
SB-075 (0 - 2), 90.4
SB-093 (0 - 2), 141 (2 - 4), 5.3
SB-074 (0 - 1), 421
SB-095 (0 - 1), 7330 (1 - 2), 238 (2 - 3), 4.7
SB-071 (0 - 3), 194
TT-23, 3.3
SB-106 (0 - 1.6), 0.162
SB-098 (0 - 1), 558
SB-069 (0 - 1), 63.1
SB-097 (0 - 1), 0.792 (1 - 3), 1.9
SB-068 (0 - 1.3), 139
SB-066 (0 - 1.9), 638
SB-079 (0 - 4), 278
SB-101 (0 - 10), 671 (1 - 2), 95.8 (2 - 3), 57.2
SB-091 (0 - 2), 496 (2 - 4), 158
SB-067 (0 - 4.5), 170
SB-078 (0 - 4), 0.046
TT-16, 5870
SB-102 (0 - 2), 7790 (2 - 3.9), 7.5
TT-22, 4.9
SB-090 (0 - 2), 3930 (2 - 4), 5.8
SB-103 (0 - 2), 21.9 (2 - 4), 16.9
SB-065 (0 - 3), 15.5
SB-064 (0 - 3.5), 1.7
SB-104 (0 - 2), 13100 (2 - 4), 19.3
SB-061/PZ-07 (0 - 6), 34.2
SB-063/PZ-08 (0 - 4.5), 40.3
SB-062 (0 - 7), 1.4
SB-060 (0 - 4.5), 0.465
SB-059 (0 - 5), 13.5
SB-058 (0 - 6), 1.5
SB-057 (0 - 5), 104
TT-33, 117
SB-056/MW-03 (0 - 5), 0.335
SB-055 (0 - 7), 1
SB-054/PZ-09 (0 - 6), 1.7
TT-26, 111
SB-053 (0 - 8), 28.7
SB-087 (0 - 2), 96.3
SB-083 (0 - 2), 26.1
SB-086 (2 - 4), 4.3
TT-28, 2190
SB-079 (0 - 7), 7.5
SB-084 (4 - 6), 1200
SB-052 (0 - 8), 0.049
SB-050 (0 - 9), 277
SB-049 (0 - 8), 35.8
SB-051 (0 - 9), 598
SB-080/MW-02 (0 - 9), 4110
MW-01 (0 - 9), 277
TT-08, 43.1
TT-07, 192
TT-09, 33.1
SB-048/MW-07 (0 - 2), 53.9 (0 - 4), 22.8
SB-047 (0 - 9), 0.87
SB-046/PZ-10 (0 - 9), 23.2
SB-045 (0 - 11.5), 0.132
TT-11, 20.3
TT-31, 134
TT-12, 2070
SB-042 (0 - 10), 62.1
SB-040 (0 - 9), 13.6
SB-044/MW-06 (0 - 2), 24.1 (0 - 4.5), 0.746
SB-043 (0 - 9), 0.129
SB-041 (0 - 11), 10.3 (7 - 8), 4160
SB-039 (0 - 11), 1.6
TT-05, 251
SB-037 (0 - 7), 0.091
SB-036 (0 - 8.5), 3
SB-035 (0 - 7.5), 19.7
TT-04, 0.077
SB-033/PZ-03 (0 - 7), 0.371 (6 - 7), 0.23
SB-032 (0 - 2), 14.8
SB-034 (0 - 8), 0.056
SB-038/MW-05 (0 - 4.5), 0.383
TT-03, 0.058
SB-028 (0 - 7.5), 0.029
SB-026 (0 - 8.5), 33.2
SB-025 (0 - 5), 44.5
SB-030 (0 - 8), 1.1
SB-029/PZ-06 (0 - 7), 0.076
SB-027/PZ-05 (0 - 5), 0.022
TT-02, 1320
SB-031 (0 - 8), 0.026
SB-022 (0 - 6.5), 0.043
SB-023 (0 - 9), 0.021
SB-021 (0 - 2), 23 (2 - 2.75), 0.03
SB-020 (0 - 7), 23 (7 - 11), 0.317
SB-019 (0 - 2), 59.3
SB-024/MW-04 (0 - 2), 0.516
SB-018 (0 - 11.5), 0.237
SB-017/PZ-04 (0 - 6), 0.22
SB-016 (2 - 7), ND
SB-015 (0 - 3), 14.2
SB-014 (0 - 2.3), 1.1
SB-081/PZ-12 (0 - 1), 0.041
SB-013 (0 - 2), 0.046
SB-012 (0 - 10), 0.011
SB-011 (0 - 10.5), 0.082
SB-010 (1 - 10.4), 2.3
SB-009/PZ-02 (0 - 10), ND
SB-008 (0 - 1.6), 1.3
SB-082/PZ-13 (0 - 4), 0.249
SB-007/PZ-11 (0 - 5), 0.015
SB-006 (0 - 5), ND
SB-005 (0 - 4), 0.068
SB-004 (0 - 3.5), 0.014
SB-003 (0 - 12), 0.011
SB-002/PZ-01 (0 - 3), 43.2
SB-001 (0 - 0.4), 0.763

100 0 100 Feet

URS	NIACET FILL MATERIAL ANALYTICAL RESULTS MERCURY	FIGURE 3-3

materials with the exception of the area east of the new AST farm where they extend to the top of the natural soil. Below 2 feet, the mercury concentrations are generally less than the SCGs.

- Based on TCLP testing performed during the initial (2002) and supplemental (2004) investigation programs (Table 3-1) the soils are not hazardous based on Resource Recovery and Conservation Act (RCRA) characteristics (i.e. ignitability, corrosivity and reactivity).
- Only 3 areas (SB-020, SB-033 and SB–041) were encountered during drilling wherein stained soils with elevated FID readings were observed. The analytical data for soil samples from these locations indicated several chlorobenzene compounds in SB-020 at concentrations exceeding the SCGs. No exceedances of the SCGs were observed in SB-033 and SB–041.
- SB-033 exhibited significant off-gassing of VOCs during drilling. These were associated with the presence of isopropylbenzene, Methyl ethyl ketone, methylene chloride and 1,2-dichlorobenzene in the soil/fill.

3.3.2 Groundwater Analytical Results

- Groundwater exhibited detectable concentrations of total mercury in the three wells sampled (i.e. MW-01, MW-02 and MW–06). The soluble concentrations were below the TOGS 1.1.1 criteria with the exception of MW-02 in the north central portion of the site. In MW-02, the soluble mercury concentration was approximately two times the allowable criteria. Soluble concentrations in the upgradient (MW-01) and downgradient (MW-06) wells were almost identical, indicating that the groundwater at the site is not being impacted by mercury contamination in the soils/fill materials.

Table 3-1

Soil Analytical Results
Total and TCLP Mercury

	Units	Regulation Criteria	TT-5	TT-12	TT-16	TT-28A
Mercury (Total)	mg/Kg	5.7[(1)]	85.5	2070	5380	2190
Mercury (TCLP)	µg/L	200[(2)]	50 U	98.3	87.2	66.7

References:

(1) - 6NYCRR Part 375-6.8(b) - Restricted use Soil Cleanup objectives for industrial sites.
(2) - 40 CFR Part 261, Subpart C. Characteristics of Hazardous Waste, February 19, 2010.
(3) - Split Samples Analyzed by NYSDEC.

4.0 TREATABILITY STUDIES

4.1 Initial Bench-Scale Treatability Studies

In May 2011, bench-scale treatability studies were performed to develop and evaluate various stabilization methods/procedures to determine the most cost-effective remedial approach for the site. A brief summary of the treatability testing and results is presented in the following paragraphs.

Four potential remedial contractors were retained to perform the studies. A sample of some of the most highly contaminated soil (i.e. containing visible beads of mercury) was collected from the site and provided to the contractors for testing. Analysis of this soil by URS indicated a total mercury concentration of 11,400 mg/kg and a TCLP mercury concentration of 1.89 mg/L. Testing by the remedial contractors also showed their soil samples with visible mercury failing TCLP. As such, this soil would be classified as characteristically hazardous for mercury. This is a significant change from the initial TCLP testing performed during the previous site investigations which showed all soils, even those containing visible mercury, passing TCLP, and being non-hazardous. This result raised the question of whether or not other soils on site containing visible mercury and/or high concentrations of disseminated mercury might also fail TCLP.

All four contractors found it extremely difficult to find a reagent mix that would eliminate the visible beads of mercury and reduce the TCLP results for mercury to < 0.2 mg/L following treatment. Only two of the four contractors were able to achieve this result, and in each case, only one formulation out of several dozen mixes, was successful. This indicated that it may be very difficult to stabilize the most highly contaminated soils under the variable field conditions that will be encountered during remediation (e.g. mercury type/concentrations, moisture content, grain size, visible vs disseminated mercury, temperature, etc.).

4.2 Supplemental Investigations

Based on the results obtained during the treatability studies, it was concluded that some supplemental investigation activities should be performed. The objective of the investigation was to determine if any of the soils in the areas previously identified as containing visible mercury or high concentrations of disseminated mercury (i.e. >260 mg/kg) would exceed the TCLP criteria.

Additionally, the type(s) of mercury present in the soils were to be analyzed. A Supplemental Investigation Work Plan was developed (URS, August 2010) and subsequently approved by NYSDEC.

4.2.1 Field Investigation Activities

The field work was conducted during the period of January 24 – 26, 2012. A summary of the field activities conducted and the findings are described below:

- URS provided oversight and general direction of the field activities.
- Pinto Construction Services, Inc. (Pinto) provided a Kubota mini-excavator equipped with a 1' wide bucket, an operator, and a laborer to assist with the field work.
- IYER Environmental Group (IEG), in conjunction with Pinto, provided an Environmental Technician to assist with field work.
- Field screening equipment included a Jerome mercury vapor analyzer and an X-ray Fluorescence (XRF) instrument to make field determinations of total mercury concentrations in air and soils.
- A total of 19 test pits were excavated at the locations shown on Figure 4-1. The locations were selected to correspond to previous sampling locations where mercury concentrations were determined to be > 260 mg/kg or visible. The pits were generally about 2' X 4' X 1' deep. In areas of visible mercury that had previously been capped with geotextile and crushed stone, the stone was carefully removed and placed adjacent to the pit. The geotextile was cut and rolled back to one side of the excavation to expose the underlying soil. After sampling and backfilling, the geotextile and stone were replaced to restore the cap. All test pits were backfilled with the excavated soils and regraded to original contours. The equipment was decontaminated after each excavation by power washing. The decon water was allowed to fall directly onto the ground over each test pit.
- Soil consisted primarily of industrial fill (i.e. cinders, gravel, sand, silt, brick fragments, etc.). In general, the upper 12-inches of soil was excavated and placed on cardboard sheets adjacent to the excavation. The excavation and soils were screened with the Jerome meter to determine levels of mercury vapors in the breathing zone. If concentrations >0.025 mg/m^3 were detected, the geologist wore a full face respirator equipped with Mersorb P100

N:\11171085.00000\DB\gis\niacet.apr TEST PITS 3/7/2012

N

Legend

- Test Pit Sampling Location
- Surface Soil Sample Location
- Visible Mercury Contamination

Mercury Concentrations:

- < 5.7 MG/KG
- 5.7 - 23 MG/KG
- > 23 - 260 MG/KG
- >260 MG/KG

Location ID — SB-073, 103 — Mercury Concentration (MG/KG)

NIAGARA FALLS BLVD.

SB-077, 95.5
SB-073, 103
SB-072, 270
SB-072R
BUILDING #10 MAINTENANCE
SB-075, 711
SB-075R
SB-074, 400
SB-074R
SB-071, 292
SB-071R
SB-076, 48.7
SB-069, 180
SB-106, 1.7
SB-070R
SB-070, 1070
SB-066, 65.9
VIS-2
VIS-1
BS-02, 13.4
BUILDING #11 WAREHOUSE
BUILDING #6 STORAGE
SB-064, 1240
SB-064R
VIS-3
SB-063/PZ-08, 426
SB-063R
SB-061/PZ-07, 433
SB-061R
SB-062, 634
SB-062R
47TH STREET
SB-060, 12
SB-059, 631
SB-059R
SB-058, 119
SB-057, 41.3
BS-03, 1.7
RAILROAD
BUILDING #3 STORAGE
BS-01, 5
BUILDING #4
BUILDING #4A
COOLING POND
SB-053, 1600
SB-053R
SB-056/MW-03, 23.5
SB-055, 3.2
SB-054/PZ-09, 51.7
SB-079, 23.7
BS-04, 1.9
BUILDING #17 TANK FARM
SB-052, 7.6
VIS-4
SB-049, 337
SB-049R
MW-01, 738
MW-01R
CITY SEWER TUNNEL
WASTE WATER STORAGE TANK FARM
SB-046/PZ-10, 38.4
SB-047, 8.8
BUILDING #17 PRODUCTION
SB-042, 29.7
SB-041, 26.7
SB-040, 109
SB-039, 276
SB-039R
SB-043, 17.7
SB-044/MW-06, 0.055
PIKES CREEK
BUILDING #107 WAREHOUSE
SB-037, 8.6
BUILDING #104 WAREHOUSE
SB-036, 20.8
SB-035, 13
SB-034, 97.2
SB-033/PZ-03, 387
SB-033R
SB-032, 104
SB-030, 26
BOILER HOUSE
SB-029/PZ-06, 9.4
SB-028, 26
SB-027/PZ-05, 52.4
SB-026, 53.2
SB-025, 0.301
BUILDING #105 TANK FARM
BUILDING #102 STORAGE
BUILDING #105 PRODUCTION
SB-021, 2
SB-020, 13.4
SB-019, 55.6
LAB
12,000 V SUBSTATION
SB-017/PZ-04, 7.1
SB-016, 25.1
SB-015, 118
SB-014, 7.9
SB-081/PZ-12, 30.8
BUILDING #106E TANK FARM
BUILDING #101 OFFICE
BUILDING #106 PRODUCTION
NITROG. SKID
SB-011, 1.5
SB-010, 1.1
SB-009/PZ-02, 66.2
SB-008, 21.7
SB-013, 2.3
BUILDING #108 WAREHOUSE
SB-082/PZ-13, 166
BUILDING #107 WAREHOUSE
SHIPPING OFFICE
SB-003, 1.9
SB-001, 0.113
SB-007/PZ-11, 1.4
SB-005, 13.1
SB-004, ND
SB-002/PZ-01, 73.3
SB-006, 2.2
RAILROAD

120 0 120 Feet

URS

NIACET
SUPPLEMENTAL SAMPLING INVESTIGATION
TEST PIT LOCATION PLAN (JANUARY 2012)

FIGURE 4-1

cartridges. All other personnel remained upwind of the work zone during sampling. The excavation also was screened with the XRF to determine relative concentrations of total mercury in the soil.

- The excavated soil was then run through a manually operated mechanical soil splitter to produce four equal and presumably homogeneous aliquots of soil. The soil was placed in four 2-gallon plastic buckets for storage and future testing. The buckets were labeled with the sampling location number, sealed, placed on a pallet and stored in Bldg #3 (unheated warehouse). Samples of the soil also were placed in glass sample jars, labeled, and put in a cooler for shipment to the lab. An additional sample of the soil was placed in a 1-gallon ziplock bag for screening with the XRF. The XRF readings were recorded in the field book and are summarized on Table 4-1.
- After screening with the XRF, soil samples were placed in pre-cleaned, labeled glass jars and submitted under proper chain-of-custody to Test America, Inc. for analysis. A total of 19 soil samples were submitted for analysis of total and TCLP mercury. The objective was to determine 1) which, if any samples, would fail TCLP, thereby making them characteristically hazardous for disposal, and 2) if any correlation between TCLP values and total Hg concentrations could be identified.
- Additionally, two soil samples (VIS 1 and SB-072R) containing visible levels of mercury were shipped to the Frontier Global Sciences, Inc. lab for speciation analysis to determine the types/amounts of mercury present in the soil.

4.2.2 Results

- Visible mercury was observed in test pits VIS-1 and VIS-3 that were excavated in the northern area previously identified as containing visible mercury (Figure 4-1). However, no visible mercury was observed in VIS-2 and VIS-4, which also were excavated in areas previously identified as containing visible mercury. Additionally, visible mercury was observed in three new areas – SB-070R, SB-072R, and SB-075R (Figure 1). All three of these areas were sampled during earlier investigations, but no visible mercury was noted in any of the three locations at that time. This is most likely due to the small areal extent sampled during the previous investigations (i.e. geoprobe) as compared to the larger area exposed by the test pits.

- Mercury vapors above action levels (i.e. > 0.025 mg/m^3) were recorded in the immediate work zone during excavation of the test pits in the areas containing visible mercury and during splitting of the soil samples in these areas. A full face respirator was utilized during this work. No elevated readings were recorded outside the immediate work zone.
- In the 5 samples containing visible mercury, total mercury concentrations ranged from 3,450 to 44,200 mg/kg, with the highest level in VIS-1 (Table 4-1). TCLP mercury levels in these samples ranged from 0.0093 – 1.6 mg/L. Two samples (VIS-1 and SB-072R exceeded the TCLP criteria (0.2 mg/L). The highest concentration was in SB-072R.
- In the 12 samples containing disseminated mercury (no visible), total mercury concentrations ranged from 94.2 to 6,840 mg/kg, with the highest level in VIS-4. TCLP mercury levels ranged from 0.00027 – 0.25 mg/L. Only one of these samples, SB-074R exceeded the TCLP criteria.
- XRF values typically ranged from 0.5 to 1.5X the lab values for total mercury. They appear to be useful for screening purposes during remediation, but do not provide definitive values suitable for confirmation testing.
- A comparison of total vs TCLP mercury levels (Table 4-1) did not show any useable correlation. The only valid observation was that it appears that samples exceeding the TCLP criteria contained visible mercury and/or exhibited XRF readings > 3000 mg/kg.
- The speciation analysis, as summarized in Table 4-2 indicates that both samples are comprised of multiple fractions/species of mercury. However, the majority of the mercury (92 – 98%) is comprised of the lower solubility fractions (i.e. F-4 to F-5). These fractions may be comprised of elemental mercury, along with other mineral bound forms of mercury. The remaining 2 – 8% is comprised of fractions F-1 – F-3 which contain the more soluble forms of mercury, and more specifically, mercury salts. In general, the F-2 and F-3 fractions represent about the same proportion of the total sample in each case (i.e. about 4 %). However, in sample SB-072R, the F-1 fraction (the most soluble) is about 4X greater than in sample VIS-1 (i.e. 3.2% vs 0.8%). This may explain why the TCLP result for sample SB-072R (1.6 mg/L) is considerably higher than the TCLP result for VIS-1 (0.97 mg/L), even though the total mercury concentration in SB-072R (7,780 mg/kg) is significantly lower than in VIS-1 (44,200 mg/kg). These results would be consistent with known forms of mercury historically utilized onsite, which included mercury salts as a catalyst for vinyl acetate film production and elemental mercury recovered from the onsite retort facility.

TABLE 4-1
UCC NIACET - SUPPLEMENTAL INVESTIGATIONS
SUMMARY OF FIELD AND LABORATORY DATA

Sample ID	XRF Hg (mg/kg)	Laboratory Hg (mg/kg)	% Difference Field vs Lab	Laboratory TCLP Hg (mg/L)*	Comments
MW-01R	273	213	28%	0.00047	
SB-033R	613	405	51%	0.0019	
SB-039R	246	94.2	161%	0.00045	
SB-049R	1014	835	21%	0.002	
SB-053R	405	754	-46%	0.00043	
SB-059R	400	313	28%	0.00027	
SB-061R	756	1110	-32%	0.0009	
SB-062R	395	336	18%	0.0003	
SB-063R	2195	1160	89%	0.003	
SB-064R	552	512	8%	0.00048	
SB-070R	3356	3450	-3%	0.11	Contains Visible Hg
SB-071R	210	351	-40%	0.0048	
SB-072R	3835	7780	-51%	**1.6**	Contains Visible Hg
SB-074R	3152	2500	26%	**0.25**	
SB-075R	6337	10600	-40%	0.077	Contains Visible Hg
VIS-1	25767	44200	-42%	**0.97**	Contains Visible Hg
VIS-2	1486	1170	27%	0.0018	
VIS-3	15105	12700	19%	0.0093	Contains Visible Hg
VIS-4	9662	6840	41%	0.17	

* TCLP Hg Criteria - 0.2 mg/L

Table 4-2
Summary of Mercury Speciation Analytical Results
UCC/Niacet Site, Niagara Falls, New York

Sample ID				VIS-1		SB-072R			
Date of Collection				1/25/2012		1/25/2012			
Laboratory	Parameter	Fraction	Units	Total Hg/ Fraction	% Hg	Total Hg/ Fraction	% Hg	Fraction Description	Typical Compounds
Frontier Global Services	Mercury by SSE	F-1	ng/g	288,000	0.77	367,000	3.24	Water-soluble Hg, typical inorganic Hg salts	$HgCl_2$, $HgSO_4$, HgO
		F-2	ng/g	149,000	0.40	99,700	0.88	Weak acid-soluble Hg/"stomach acid" soluble Hg	HgO
		F-3	ng/g	1,240,000	3.30	385,000	3.39	Organo-complexed Hg	Hg-humics, Hg_2Cl_2, CH_3Hg (Methyl Hg)
		F-4	ng/g	27,400,000	72.82	6,510,000	57.40	Strongly-complexed Hg	Mineral lattice, Hg_2Cl_2, Hg° (liq. elemental)
		F-5	ng/g	8,550,000	22.72	3,980,000	35.09	Mineral bound Hg/cinnabar (HgS)	HgS, m-HGS, HgSe, HGAu
	Total Mercury	F-1 to F-5	ng/g	37,627,000		11,341,700			
TestAmerica	Total Mercury		ng/g	44,200,000		7,780,000			
	TCLP Mercury		mg/L	**0.97**		**1.6**		Exceeds Regulatory Criteria (0.2 mg/L)	

Notes:
ng/g - nanograms per gram (parts per billion)
mg/L - micrograms per liter (parts per million)
SSE - Selective Sequential Extraction procedure for Hg speciation.
TCLP - Toxicity Charcteristic Leaching Procedure

4.3 Supplemental Bench-Scale Treatability Studies

Following completion of the supplemental investigations, 4 soil samples (VIS-1, VIS-2, SB-72R, & SB-74R) containing visible mercury and/or failing TCLP were submitted to Pinto/IEG for additional bench-scale treatability studies.

The objective of the studies was to determine if the treatment methods/reagent mixes they developed during the initial treatability studies would work on the wider range of mercury contaminated soils collected during the recent field program, including in particular soils that contained visible mercury and/or failed TCLP testing. Additionally, reagent dosages, mixing time, handling methods, etc. were to be further evaluated to develop the most cost-effective approach for onsite treatment.

In parallel with the treatability studies, split samples of the soils that were provided to Pinto/IEG were provided to Stablex for evaluation and approval for treatment/disposal at their facility in Blainville, Quebec - Canada.

The results of the supplemental bench-scale treatability studies indicated that calcium polysulfide (at 5% to 10%) and cement (Type I or III at 15% to 20%) can stabilize and solidify soil mercury values below regulatory limits, particularly for samples with 1,000 to 10,000 mg/kg mercury that would otherwise not pass TCLP. However, acceptable TCLP results were not achievable in soil samples with the highest levels of mercury (i.e. > 10,000 mg/kg). The studies showed that the treatment process is sensitive to a variety of factors including reagent concentrations, mixing time/procedures, soil composition/grain size, moisture content, and curing times.

Based on the somewhat inconsistent results achieved during the supplemental bench-scale treatability studies, it was concluded that it would be very difficult to obtain consistent results meeting the remediation goals under full-scale field conditions. Additionally, preliminary cost estimates for utilizing onsite treatment methods indicated that they would be less cost-effective than traditional ‘dig and haul’ methods. Consequently, it was determined that onsite treatment approaches did not warrant further evaluation, and dig and haul’ methods should be utilized.

The ‘dig and haul’ approach offers the following benefits compared to onsite stabilization:

- Comparable or lower overall cost per ton than onsite treatment
- Less variability during remediation (known technology)
- Excavation/disposal rate can be varied to meet site conditions, Stablex acceptance rates, etc.; Stockpiling of soils or temporary storage in intermodal containers is possible
- If Stablex provides transportation, they take title to the wastes once they leave the site
- Once the soils are treated by Stablex they are disposed in a landfill owned by the Canadian Government, which then takes title to the wastes
- Excavation can be accomplished in most weather conditions
- Less handling of soils will result in less volatilization of mercury vapors. There is a lower potential for air quality issues, including occupational exposure issues.
- Shorter time required for remediation
- Lower engineering/oversight costs

5.0 PROPOSED REMEDIAL ALTERNATIVE

5.1 General

Based on the results of the supplemental investigations and bench-scale treatability studies, UCC will implement the site remediation in two phases:

- Phase I will consist of an IRM designed to remove the 'hot-spots' identified during previous site investigations as containing visible mercury and/or failing TCLP. This phase will be implemented during the fall of 2012 and utilize traditional 'dig and haul' methods.
- Phase II will consist of the final site remediation and will address the remaining soil onsite with mercury contamination > 5.7 mg/kg. Remedial methods to be employed during this phase are still being evaluated. This phase will be implemented during 2013.

The following sections describe the IRM to be implemented during the Phase I remediation.

5.2 Interim Remedial Measure - Dig and Haul

As noted previously, the NYSDEC ruled that mercury-contaminated soils from the site would be classified as non-hazardous for purposes of disposal. However, based on discussions with operators of the local Subtitle C (i.e. non-hazardous) landfills, they will not accept any soils with visible mercury present. Additionally, since the NYSDEC ruling, some of the soils have been shown to be characteristically hazardous for mercury, which requires that they be managed as a hazardous waste.

Consequently, it is proposed that all the soils containing visible mercury and/or exceeding the TCLP criteria be managed during the IRM. This will include the following:

- Excavation of contaminated soils
- Screening of excavated soils for radioactivity levels above background
- Direct loading (i.e. no onsite treatment) into trucks or intermodal containers

- Transportation via truck or rail to the Stablex treatment and disposal facility in Blainville, Quebec, Canada.
- Treatment as hazardous waste at Stablex
- Disposal in landfill owned by Canadian Government following treatment by Stablex

Excavation confirmation soil sampling and visual examination will be conducted upon completion of excavation to determine the presence of visible mercury and both the total and TCLP concentration of mercury in soils in the bottom and sides of the excavation. Following such sampling, on-site areas will be backfilled with clean fill and graded to be congruent with the surrounding area. All onsite activities will be coordinated with Niacet, as necessary, to minimize interference with plant operations.

6.0 SCOPE OF WORK

6.1 Task 1 – Determination of Landfill Disposal Criteria

Based on review of the available data and evaluation of representative soil samples contaminated with visible mercury and/or failing TCLP, Stablex has approved disposal of the soils to be excavated during the IRM at their facility in Blaineville, Quebec, Canada. The mercury-contaminated soils will be loaded directly, without onsite treatment, into trucks and/or intermodal containers for transport to Stablex.

As such, an Export Notification has been prepared and submitted to Stablex for processing. This will allow the soils to be transported from the UCC Niacet Site across the US/Canada border directly to the Stablex facility.

Other restrictions such as quantities/day that can be disposed, tarping requirements, etc. also will be discussed and implemented, as necessary.

Any soils exhibiting radioactivity levels above background will be managed and disposed as outlined in Section 6.12.

6.2 Task 2 - Remedial Action

As stated in Section 1.2, the purpose of this IRM is to address soils exhibiting the toxicity characteristic for mercury and/or soils containing visible mercury. Based on the results of investigation completed to-date, soils expected to be remediated during this IRM have been identified at six locations as shown on Figure 6-1. Approximately 3,500 cubic yards of mercury contaminated soil are contained within these areas. A brief description of these areas follows:

- SB-070R – Visible mercury observed in 1-foot deep test pit completed during the 2012 Supplemental SI. Located south of the site access road and west of Building 11.

- SB-072R – Visible mercury observed in 1-foot deep test pit completed during the 2012 Supplemental SI. Located at the far north area of the property and east of Building 10.

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SB-077, 95.5
SB-073, 103
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SB-076, 48.7
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SB-064, 1240
VIS-3
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SB-061/PZ-07, 433
SB-064R
SB-063R
SB-062R
SB-061R
SB-062, 634
SB-063/PZ-08, 426
BUILDING #3 STORAGE
SB-060, 12
SB-059, 631
SB-059R
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SB-057, 41.3
BS-03, 1.7
BS-01, 5
BUILDING #4
SB-056/MW-03, 23.5
SB-055, 3.2
BUILDING #4A
SB-054/PZ-09, 51.7
SB-053, 1600
SB-053R
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BS-04, 1.9
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SB-049R
SB-052, 7.6
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MW-01R
WASTE WATER STORAGE TANK FARM
SB-046/PZ-10, 38.4
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SB-040, 109
SB-039, 276
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SB-044/MW-06, 0.055
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SB-036, 20.8
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SB-034, 97.2
SB-032, 104
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SB-037, 8.6
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SB-028, 26
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SB-027/PZ-05, 52.4
BUILDING #102 STORAGE
BUILDING #105 PRODUCTION
SB-021, 2
SB-020, 13.4
SB-019, 55.6
BUILDING #105 TANK FARM
LAB
12,000 V SUBSTATION
SB-017/PZ-04, 7.1
SB-016, 25.1
SB-015, 118
SB-014, 7.9
SB-081/PZ-12, 30.8
BUILDING #106E TANK FARM
BUILDING #101 OFFICE
BUILDING #106 PRODUCTION
NITROG. SKID
SB-011, 1.5
SB-010, 1.1
SB-009/PZ-02, 66.2
SB-008, 21.7
SB-013, 2.3
BUILDING #108 WAREHOUSE
BUILDING #107 WAREHOUSE
SHIPPING OFFICE
SB-082/PZ-13, 166
SB-003, 1.9
SB-002/PZ-01, 73.3
SB-001, 0.113
SB-007/PZ-11, 1.4
SB-005, 13.1
SB-004, ND
SB-006, 2.2

Legend

- Test Pit Sampling Location
- IRM Excavation Area
- Temporary Soil Staging Area

Mercury Concentrations:

- < 5.7 MG/KG
- 5.7 - 23 MG/KG
- 23 - 260 MG/KG
- > 260 MG/KG

120 0 120 Feet

URS

UNION CARBIDE CORPORATION NIACET SITE
IRM EXCAVATION PLAN

FIGURE 6-1

- SB-074R – No visible mercury was observed in 1-foot deep test pit completed during the 2012 Supplemental SI. However, soil sample SB-074R showed 0.25 mg/L mercury by the TCLP method which exceeds the regulatory criteria of 0.2 mg/L. Located immediately north of the site access road and west of Building 10.

- SB-075R – Visible mercury observed in 1-foot deep test pit completed during the 2012 Supplemental SI. Located north of the site access road near the southeast corner of Building 10.

- Northern Visible Mercury Area – Visible mercury detected during previous investigations as well as in samples VIS-1 and VIS-3 collected from the upper 1-foot of soil during the 2012 supplemental investigation.

- AST Visible Mercury Area – Visible mercury detected during previous investigations. Located immediately north of the waste water storage tank farm.

6.2.1 Permits

The Contractor shall obtain all necessary permits required for the performance of the IRM activities.

6.2.2 Mobilization & Site Preparation

The Contractor will be responsible for mobilization and site setup. The Contractor will procure and transport the necessary resources to accommodate the project requirements (i.e. labor, materials, and equipment). The requirements include, but are not limited to, the information provided in this section. Other requirements not specifically provided herein, but necessary for the successful conduct and completion of the work, will be provided by the UCC or URS to the Contractor.

Site preparation activities include preparation of submittals for UCC/URS review and approval, mobilizing equipment, materials, supplies, and personnel to the project site. These resources will be utilized to perform the following operations:

- Clearing of debris (e.g. metal, tanks, used equipment, etc), as necessary to access the work areas. All materials are to be staged in an area identified by Niacet, unless otherwise approved by URS.

- Installation of five foot high, orange plastic construction safety fencing mounted on driven steel fence posts at 10 foot spacing around active work areas. Signs designating the work area and warning against trespass will be affixed to all sides of the fence during the construction period.
- Construction of temporary soil staging areas consisting of two layers of 6 mil plastic sheeting surrounded with silt fencing.
- Construction of temporary decontamination pad for personnel and equipment.
- Mobilization of excavation and loading equipment, dump trucks and necessary personnel.
- Establishing air monitoring locations.
- Locating and marking underground utilities that may potentially be affected during site work

Anticipated equipment includes air monitoring equipment, excavators, loaders, and dump trucks. Additional equipment will be required for personal safety, equipment decontamination, and field sampling.

6.2.3 Submittals

The contractor shall submit construction materials specifications, construction procedures, and shop drawings for all new features to the owner for review and approval. Three copies of the following submittals shall be provided:

- Construction Schedule
- Site plan indicating the proposed location and dimensions of any area to be used by the Contractor, including any staging areas
- Decon Pad Detail/Sketch
- Any required federal, state, or local permits
- Health and Safety Plan
- OSHA HAZWOPER 40-hour training certificates and most recent 8-hour update for all onsite workers
- Community Air Monitoring Plan

- Traffic Plan for incoming and outgoing trucks
- Source information and materials gradation for proposed backfill material
- Spill and Discharge Control Plan
- Erosion and Sediment Control Plan
- Radiation Management Plan for any potential radioactive materials that might be encountered (See Section 6.12)

6.2.4 Temporary Facilities

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be used by the Contractor, including any staging areas. Contractor shall provide portable office trailer(s) and restroom facilities for their onsite workers. Additionally, Contractor shall make space available within one of the portable trailers for a small Site Office/Work Area to be used by Project Management and NYSDEC personnel during work on site. Alternatively, the Contractor may have the option of utilizing available facilities at the Site with the approval of Niacet.

6.2.5 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by Niacet.

6.2.6 Availability and Use of Utility Services

The Contractor is responsible for providing all temporary utility services required during construction. The Contractor may have the option of utilizing utilities at the Site with the approval of Niacet.

6.2.7 Protection and Maintenance of Traffic

During construction the Contractor shall maintain and protect traffic on 47th Street. Measures for the protection and diversion of traffic, if necessary, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and directional signs, shall be in accordance with applicable State and local laws. The traveling public shall be protected from damage to person and property. The Contractor shall investigate the adequacy and allowable load limit on

these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

The Contractor shall discuss with Niacet which access gates can be utilized for entering/exiting the site by equipment, dump trucks, employees, etc. so as to minimize disruptions to plant operations.

6.2.8 Contractor's Temporary Facilities

The Contractor's temporary facilities shall be established to facilitate safe work habits and efficient execution of the IRM Work Plan. The minimum requirements for the Contractor's facilities follow.

Storage Areas

The Contractor shall designate a storage area in a portion of the Site, as approved by Niacet. Materials shall not be stockpiled outside the designated area in preparation for the next day's work. Mobile equipment, such as excavators, loaders, and trucks, shall be parked within the designated area at the end of each work day, unless otherwise approved by URS.

Maintenance of Storage Area

The storage area will be kept in good repair. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas that are not established roadways, such areas shall be protected as necessary to prevent rutting and the tracking of mud onto paved or established roadways.

6.2.9 Security Provisions

The Contractor shall be responsible for the security of its own equipment. If the Site is used for staging or storage of equipment and supplies, the Contractor shall be responsible for securing all vehicle gates and man gates utilized solely by the Contractor, at the end of each work day.

A daily visitor's log will be maintained to document all visitor's to the site.

6.2.10 Refueling

The Contractor shall provide for onsite equipment refueling capabilities. Spill control equipment including shovels, brooms, absorbent materials, and waste containers shall be provided at the location of refueling. If the total capacity of the equipment and any containers with capacities over 55-gallons at the site exceeds 1,320 gallons, the Contractor shall prepare a SPCC plan in accordance with 40 CFR Part 112.

6.2.11 Cleanup

Construction debris, waste materials, packaging material and the like shall be removed from the work site on a daily basis. Any dirt or mud that is tracked onto paved or surfaced roadways shall be cleaned daily. Stored material shall be neatly stacked when stored.

6.2.12 Restoration of Storage Area

Upon completion of the project and after removal of materials and equipment, the areas used by the Contractor for storage of equipment or materials, and transporting equipment and/or materials between work areas, shall be restored to original or better condition.

6.3 Task 3 - Erosion and Sediment Control

The Contractor shall prepare an erosion and sediment control plan in accordance with *New York Guidelines for Urban Erosion and Sediment Control* (New York 1997).

During construction activities, erosion and sediment controls will be incorporated to minimize storm water contacting disturbed areas and to control runoff. Silt fences shall be installed around excavation areas and around the soil staging area. In addition to the silt fence, active soil stockpiles shall also be covered with tarps.

6.4 Task 4 - Health and Safety Plan/Community Air Monitoring Plan

Residences within one-half mile of the Site will be notified, in writing, at least one week prior to performance of any intrusive site work. Based on the Site's size, location, and setting, no impact to nearby residents is expected as a result of the planned IRM. Notification, continuous downwind air monitoring for mercury vapors and particulates during intrusive (excavation) Site

work, and fugitive emissions control measures described below will assure that there will be no impact to residents.

All onsite contractors will be required to prepare a Health and Safety Plan (HASP) to protect his employees and onsite personnel in, and around, the proposed work areas. Requirements for a typical HASP are included in Appendix B. The HASP sets out personnel protection and action levels and establishes procedures and specifies H&S controls such as exclusion and decontamination zones. Compliance with the HASP will be maintained throughout the planned IRM. It is expected that all intrusive Site work (i.e. soil excavation and potentially impacted soils handling operations) will be conducted under Level D, but PPE levels will be adjusted as per the HASP, based on air monitoring results.

Air monitoring will be conducted in accordance with the requirements of the HASP, the NYSDOH Community Air Monitoring Program (CAMP), which is included as Attachment A to the HASP requirements, and the NYSDEC DER-10 Guidance. Dust control measures will be implemented by the Contractor as required to meet the requirements of the HASP and CAMP.

A hospital route map for the Niacet site is included as Attachment B to the HASP requirements located in Appendix B.

6.5 Task 5 -Equipment Decontamination

Vehicles and equipment that come into contact with affected media shall be decontaminated prior to leaving the site. The Contractor shall utilize procedures for decontamination of vehicles and equipment as outlined in the HASP.

6.6 Task 6 - Spill and Discharge Control

The Contractor shall prepare a Spill and Discharge Control Plan. The Spill and Discharge Control Plan is to be implemented in the event of an accidental release of potentially hazardous materials and shall contain the following elements:

- **Preventive Measures** – the Contractor shall provide methods, means, and facilities required to prevent contamination of soil, water, atmosphere, uncontaminated structures, equipment, or material by the discharge of wastes from spills due to the Contractor's

operations. Shovels, brooms, non-combustible sorbent materials, polyethylene sheeting, and PPE shall be maintained in accessible locations.

- **Emergency Measures** – the Contractor shall provide equipment and personnel to perform emergency measures required to contain any spillage and to remove spilled materials, soil, or liquids that become contaminated due to spillage. The collected spill materials shall be properly disposed of at the Contractor's expense.
- **Decontamination Measures** – the Contractor shall provide the equipment and personnel to perform decontamination measures that may be required to remove spillage from previously uncontaminated structures, equipment, or material. Disposal of decontamination residues and confirmation samples shall be performed at the Contractor's expense.
- **Notification Procedure** – the Contractor shall notify the Volunteer or URS immediately after the release of potentially hazardous materials as well as the National Response Center and NYSDEC Hotline, as required (applicable phone numbers must be listed in the HASP).

The Contractor will be responsible for implementing the site HASP and CAMP. The Contractor will be responsible for conducting air monitoring within his work zones and at the site perimeter and taking appropriate action based on the results. During mobilization and site setup activities, the Contractor shall mobilize and assemble health and safety equipment and materials and air monitoring equipment to the site to satisfy the plan requirements.

6.7 Task 7 - Survey and Work Stake-out

URS will be responsible for staking out the limits of excavation in the field as shown on the drawings. The locations of the excavations will be staked from previously identified sampling locations. The exact limits of excavation will be delineated in the field based on screening and laboratory analysis results. Each excavation area will be numbered for identification purposes and the depth of excavation clearly shown for each area in the field. The final limits of excavation will be staked and subsequently surveyed by URS and plotted on the site drawings for record purposes.

6.8 Task 8 - Excavation

For this IRM, it is assumed that only those soils identified on site as containing visible mercury and/or exceeding TCLP criteria will be remediated. This will include the following areas (Figure 6-1):

Location	Area (sf)	Depth of Excavation (ft)	Volume (cf)	Estimated Unit Weight (pcf)	Total Weight (lbs)	Tons
N Vis Hg	13,500	2	27,000	140	3,780,000	1890
AST Vis Hg	70' X 80' = 5,600	9	50,400	140	7,056,000	3528
SB-70R	50’ X 50’= 2,500	1	2,500	140	350,000	175
SB-72R	100' X 100' = 10,000	1	10,000	140	1,400,000	700
SB-74R	50' X 50' = 2,500	1	2,500	140	350,000	175
SB-75R	20' X 20' = 400	1	400	140	56,000	28
Totals	**34,500**		**92,800**		**12,992,000**	**6,496**

In general, the Contractor shall excavate and place soil into segregated stockpiles based upon field screening performed by URS field personnel. URS will screen soils during excavation using a combination of methods including: 1) visual observation for the presence of visible mercury; 2) screening of soil using XRF monitoring instrumentation; and 3) monitoring soil using a Jerome mercury vapor meter. Based on screening results, the Contractor will be directed to place soil into three possible segregated stockpiles: 1) soil containing visible mercury; 2) soil with no visible mercury but with XRF readings of greater than 3,000 mg/kg mercury; and 3) soil with no visible mercury and XRF readings below 3,000 mg/kg mercury.

At the northern visible mercury area, a demarcation barrier of landscaping fabric was previously installed over the area. The fabric is covered by approximately 6 inches of gravel. The Contractor shall excavate and stockpile the gravel to expose the barrier material, and remove and dispose of the fabric as non-hazardous waste. The Contractor shall then excavate mercury impacted soil from the area as described above.

If bedrock is encountered during excavation, the Contractor shall fully expose the bedrock surface within the excavation area. The Contractor shall then inspect the bedrock surface for visible mercury and perform screening of the bedrock surface using the XRF field instrument at a frequency of approximately 1 reading for every 25 square feet of exposed bedrock. If visible mercury is observed or XRF readings of greater than 3,000 mg/kg mercury are recorded, the Contractor shall then clean the bedrock surface using a shop vacuum to collect visible mercury in combination with sweeping/brushing to loosen mercury contamination for vacuuming. This procedure will be repeated until no visible mercury remains and XRF readings are below 3,000 mg/kg mercury. Under no circumstances will personnel enter any excavation that is greater than 4 feet deep. If bedrock is encountered in an excavation deeper than 4 feet, screening of the bedrock surface using XRF will not be performed. Vacuuming of visible mercury from the bedrock surface will be performed, to the extent practicable, from outside of the excavation using vacuum hose with extensions.

Once excavation is complete to the approximate dimensions described in the above table, URS field personnel will collect a representative number of soil samples from stockpiles that do not exhibit visible mercury. Soil samples will be submitted for analysis of total mercury and leachable mercury by the TCLP method. Decisions regarding disposition of these soils will be based on results of laboratory analytical testing. URS will request rush sample analysis turn-around times for these analyses. However, the fastest turn-around time for the TCLP procedure is 5 days minimum.

Excavating will proceed at any given area until no visible mercury is observed in excavation bottoms and sidewalls and XRF screening results show all areas below 3,000 mg/kg mercury. Once the excavations are completed, the Contractor shall assist URS with the collection of confirmation soil samples from the excavation sidewalls and bottoms. URS will submit confirmation soil samples for laboratory analysis of total mercury and leachable mercury by the TCLP method. URS will request rush sample analysis turn-around times for these analyses. However, excavations will be required to remain open for a minimum of 5 days before the decision to backfill can be made.

It is also to be noted that there is a potential to encounter radiologically contaminated materials during excavation that may have radioactivity levels above normal background levels on site. The management of these materials, if encountered, is detailed in Section 6.12 of this Work Plan.

6.8.1 Deep Excavation Procedures

It is anticipated that some excavations (e.g. former AST Area) may extend to greater than 4 feet in depth. No personnel will be allowed or required to enter these excavations. It is intended that soil samples be collected remotely by use of the trackhoe bucket and/or other hand sampling tools equipped with an extendable pole/handle. However, if the sidewalls are unstable and will not allow remote sampling, then the excavation walls may need to be sloped and/or benched in accordance with OSHA requirements 29 CFR 1926.650 through 29 CFR 1926.653, and all other applicable local, state, and Federal regulations and requirements to maintain stable sidewalls to safely record visual observations, and collect soil samples. The Contractor shall maintain stable sides and slopes and/or benches of the excavations in safe condition until the excavation is backfilled with accepted backfill material. Additionally, excavations may require dewatering in accordance with local, state, and Federal regulations and requirements. Furthermore, personnel shall stand upwind of the excavation area to the extent practicable.

Each excavation will be surveyed by URS for location, boundaries, dimensions, and elevations at the time of excavation.

While excavating, URS's field geologist will log soil type and location of visible mercury. Without entering the excavation, URS will visually inspect and scan soils removed from the excavation sidewalls and bottom using the XRF detector. URS will collect soil samples directly from the trackhoe bucket or from the sidewalls/bottom of the excavation using a hand-held drive sampler attached to an extended handle. If groundwater is encountered, URS will collect a groundwater sample from each trench, as applicable.

6.9 Task 9 – Backfilling

Those areas of the site that have been excavated will be backfilled with 'clean' soil/stone material similar to the materials excavated at that location. The future use of this site will be restricted to industrial uses through the imposition of an environmental easement. Therefore any soil

imported to the site for backfill must meet the chemical concentration requirements found in DER-10 Appendix 5, Allowaable Constituent Levels for Imported Fill or Soil. Crushed stone imported from a commercial stone quarry is exempt from this requirement if less than 10% by volume will pass the #100 sieve.

. The materials will be placed in lifts with maximum thickness of 12 inches and be compacted with suitable vibratory compactors (i.e. granular materials) or heavy construction equipment (i.e. cohesive materials), as appropriate.

The Contractor shall restore the site to a condition equal to or better than that existing prior to remediation. Concrete, asphalt, concrete curbs, grass, or landscaping shall be replaced in kind to match preconstruction elevations, unless otherwise approved by the Engineer and current site owner. Any damage to areas outside the project area resulting from negligence, excess excavation (except where sloping is necessary for excavation stability), etc., shall be repaired at the Contractor's expense and at no additional cost to the UCC.

6.10 Task 10 Transportation and Disposal

Transportation shall comply with all transportation regulations promulgated by the United States Department of Transportation (USDOT), United States Customs and Border Protection, as well as all applicable Canadian transportation and customs regulations. A Hazardous Waste Manifest that documents shipping information, including transporter and disposal facility names and locations, will accompany all waste shipments. The Contractor shall ship wastes only to facilities that are properly permitted to accept such wastes and are approved by the Engineer (i.e. Stablex).

6.11 Task 11 - Demobilization

Following completion of the IRM activities and acceptance of the work by the NYSDEC and UCC, the Contractor will remove all equipment, materials, supplies, debris/waste generated by Contractor's activities, temporary utilities and facilities, and manpower from the Site.

The areas of the Site utilized and/or disturbed by the Contractor during the project are to be left in a condition equal to, or better, than when the Contractor mobilized to the Site.

6.12 Task 12 - Management of Potentially Radioactive Materials

As indicated by NYSDEC, radioactive slag was discovered during excavation activities at the adjacent Norampac Facility. The source of the radioactive slag was undetermined, however, it is thought to have originated from historical operations at plant facilities located in the vicinity of the site (possibly Oldbury Chemical formerly located on Buffalo Ave. that produced phosphorous for > 100 yrs).

Based on the age of the buildings and operational history of the Niacet site, it was not anticipated that any similar materials would exist on the Niacet property. However, Niacet, expressed some concerns that these materials, if present on the Niacet site, could pose a potential hazard to workers. Consequently, Niacet retained Los Alamos Technical Associates, Inc. (LATA) to conduct a Cursory Radiation Survey of the property.

- The cursory survey was conducted on February 2, 2012. "High traffic" areas used by employees during daily site operations and a few additional selected areas were surveyed. This also included the pails of soil collected by URS from the 19 test pits during the Supplemental Investigation program.
- Findings of the cursory survey indicated that radiation levels in the majority of the areas surveyed were consistent with background levels (i.e. 6 – 7,000 cpm). The pails of soil also were consistent with background levels. Four relatively small areas were identified that had elevated gamma radiation readings. For the most part, these areas were located in the southern portion of the site, or along the railroad tracks in the western portion of the site. Only one area, described as "the open field area closest to Niagara Falls Blvd north of access road" was located in areas proposed for mercury remediation.
- Based on the results of the cursory survey, LATA conducted a Detailed Radiation Survey on February 15, 2012. This survey was intended to compliment the initial survey and further delineate the areas previously identified with elevated gamma readings.
- Findings of this detailed survey indicated five small localized areas in the southern portion of the site and three small localized areas in the northern portion of the site. These areas are shown approximately on Figure 6-1. As noted, there is one small area located just east of the

proposed excavation limits for SB-074R. As such, this area may require selective management during remediation.

Whereas the potential for encountering radioactive materials during excavation of the IRM areas is minimal, the following procedures will be implemented to ensure the safety of all onsite personnel and proper detection, handling, and disposal of any radioactive materials.

6.12.1 Radiation Surveys

Excavation and removal of the mercury impacted soils will be performed by sequentially removing soil using excavation equipment. Prior to initiation of excavation activities, a gamma field survey of the proposed excavation areas will be conducted by a qualified radiological technician.

The primary objective of this survey will be to delineate any materials located within the proposed limits of excavation that exhibit radioactivity at levels above site established guidance criteria. For the purpose of this plan the guidance value is established as 10,000 cpm (approximately one and one half times area background) using a Ludlum model 2221 meter with 44-10 probe. Continued screening will be performed as each new layer is exposed. Field surveys and on-site screening will be used to characterize and segregate excavated material for disposition.

If material is identified as radioactive slag or material scanned in excess of 10,000 cpm that is determined through the professional judgment of the radiological technician to be impacted, the material will be excavated and transported to an on-site temporary waste staging area for future loading and transport to the disposal facility.

The radioactive materials also will be examined for the presence of visible mercury and will be screened with the XRF to determine the total mercury concentration. Based on the results, the materials will be segregated as follows:

- > 10,000 cpm with visible mercury and/or XRF readings > 3,000 ppm
- > 10,000 cpm with no visible mercury and XRF readings < 3,000 ppm

Minimization of the quantity of radioactive waste will be a high priority during the project. As noted, the objective of this IRM is to remove soils containing visible mercury and/or mercury at concentrations that result in exceedances of allowable TCLP criteria, and not radioactive soils, per se. Consequently, only radioactive soil/slag containing visible mercury or exhibiting XRF readings > 3,000 ppm will be addressed during this IRM.

Radioactive waste generated during this project will be temporarily staged within a designated area on site (Figure 6-1) until approved for disposition. These materials will be managed in accordance with federal, state, local, and site permitting requirements, consistent with project procedures and license requirements for handling, storage, and transportation.

The excavated radioactive waste will be sampled and analyzed as necessary to provide the basis for disposal facility selection. No mixing of clean soils with waste streams will be used to achieve non-impacted status. Radioactive waste will be appropriately characterized to identify radiological contaminant concentrations to address the requirements in Title 10 Code of Federal Regulations (10 CFR) Part 61, as well as non-radiological hazardous waste characteristics as required by the U.S. Environmental Protection Agency (EPA) and in Title 40 CFR, Parts 260 and 265 and for disposal characterization. Characterization of waste for radiological and non-radiological constituents will assure waste is in compliance for acceptance and disposal off-site.

Any radioactive waste temporarily staged on site shall be covered at the end of each work day. Contaminated materials will be completely covered with a minimum of 1 layer of 0.15 millimeter (6-mil) polyethylene sheeting, or an equivalent material. Additional erosion and sediment control measures are to be implemented, as applicable.

6.12.2 Transport and Disposal

Radioactive waste that is generated during this project will be transported out of state to an approved disposal facility. It is anticipated that one (1) radioactive waste profile will be created to handle specific wastes that will be generated as a result of this operation. Waste streams will

follow the respective approval process of the TSDF, which includes the document generation, review and approval of characterization determinations, and final disposal site determination. The TSDF will be contacted in advance of intended shipments to insure that administrative requirements are met prior to transportation.

It is anticipated that radioactive waste shipments will be transported by truck to the approved disposal facility. Each waste shipment will be accompanied by properly completed shipping documents in accordance with applicable federal, state, and local regulations, as well as disposal site requirements. Required documents will meet the requirements in 49 CFR 10 CFR 20, in addition to the receiving facility requirements.

UCC will be listed as the generator for any mercury-containing radioactive waste that is shipped for disposal from this remedial action project. No radioactive waste will be transported off-site until a Notice to Transport (NTT) has been received from the TSDF. Radioactive waste will be transported to a licensed and approved TSDF in accordance with state and federal guidelines. Completed manifests requiring shipper's certifications will be signed by a designated UCC representative prior to release of each shipment.

Radioactive waste movement will be tracked from generation to disposal. A Certificate of Destruction, Disposal, or Placement is required for radioactive wastes disposed of off-site as part of this project. These certificates will provide a complete record of the final disposition of the radioactive wastes. The certificates will identify the individual quantities of material received at the disposal facility, the disposal method, and location where the material is finally placed after disposal.

6.12.3 Health and Safety

All work associated with radioactive materials encountered during this IRM will be conducted in accordance with the URS Radiation Protection Program - Safety Management Standard 052 included as Attachment C of Appendix B. The objectives of the Radiation Protection Program are to:

- Implement sound radiological practices during activities at the Site where the potential for exposure to ionizing radiation exists;,
- Ensure Radiological exposure to the public, site personnel, and the environment that are maintained As Low as Reasonably Achievable (ALARA), and
- Ensure activities at the Site are performed in a manner consistent with applicable local, state, and federal regulations.

A qualified Radiological Technician will be utilized on site during the IRM and will be responsible for implementation of radiological controls, as necessary. Specific responsibilities will include:

- Performing radiological surveys.
- Collecting samples.
- Assessing radiological hazards during the work and making adjustments to ensure that worker radiological exposures and potential releases to the environment are maintained ALARA.

All work with radioactive materials will be conducted in accordance with established good practices in radiation protection, and in all cases, incorporate radiological criteria to ensure safety and maintain radiation exposures ALARA. The primary method to maintain exposure ALARA will focus on the use of established work practices and engineering controls following the use of administrative and procedural requirements. Engineering controls will principally involve mitigation of dust generation.

Only appropriately trained, authorized, and qualified personnel will be permitted access to radiological controlled areas. The degree of control will be commensurate with the existing and potential radiological hazards within the area. PPE will be selected based on the contamination levels in the work area and the anticipated work activity, ALARA and safety considerations, and consideration of non-radiological hazardous materials (i.e. mercury) that may be present. Protective clothing and equipment selected for project tasks will be in accordance with the HASP.

Equipment decontamination, if necessary, will be performed using techniques that are appropriate based on site-specific conditions. Generally, dry decontamination methods such as high-efficiency particulate air (HEPA) vacuuming or wipe-downs are preferred when facilities for the collection of radiological contaminated wastewater are not in place. If adequate facilities exist for the collection of such fluids, it may be appropriate to use a wet decontamination technique. Additional decontamination methods in extreme conditions include sand or other abrasive blasting.

Training will be provided to general employees who are not radiological workers but may be involved in an occasional or indirect manner with radioactive material or activities supporting decontamination and decommissioning (D&D) efforts at the Site. Additional training requirements will be determined on a site-specific basis and will be commensurate with the radiological hazards present on each site.

7.0 QUALITY CONTROL AND ASSURANCE

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system monitored by URS. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the contract requirements. The system shall cover all construction operations and shall be keyed to the proposed construction schedule. The work shall conform to the documents approved for construction including all work plans and drawings.

The Contractor and its subcontractors shall comply with the construction documents prepared by URS and the HASP prepared by the Contractor, including the CAMP requirements. The Contractor is responsible for providing quality control during all phases of work. URS is responsible for quality assurance.

Changes significantly affecting the approved construction documents or project schedule shall be brought promptly to the attention of URS. Work found to be out of compliance with approved construction documents will be reviewed and halted, if necessary, until satisfactory resolution.

7.1 Responsibilities

The principal organizations involved in implementing the remediation at the site include NYSDEC, UCC, URS, Niacet and the Contractor. Specific responsibilities and authorities are delineated below to establish the lines of communications required to produce an effective decision-making process during execution of the work.

7.1.1 Regulatory Agency

The lead regulatory agency involved with this project is the NYSDEC. In this capacity, the NYSDEC will review construction documents for conformance with applicable requirements. The NYSDEC has the authority to review and accept design revisions or requests for variances that are submitted after the construction documents have been approved.

7.1.2 Union Carbide Corporation

UCC as Volunteer will be responsible for the proper permitting, design, and construction of the project. UCC has retained URS as the project engineer and to confirm quality assurance. The Contractor will be placed under contract with URS following approval of the construction documents. UCC has the authority to dismiss all non-regulatory organizations involved in the design, quality control and assurance, and construction.

7.1.3 URS

URS will function as Project Engineer and will provide construction quality assurance personnel. URS' responsibilities under these separate functions are defined below.

Project Engineer

As the Project Engineer, URS' primary responsibility will be to provide engineering technical support during construction. In this capacity, URS will be responsible for the monitoring of construction work and providing the Contractor with feedback from questions regarding the IRM Work Plan. In addition, URS will be responsible for identifying, documenting and correcting any deviations, as necessary, and to request and receive NYSDEC approvals as may be required.

URS has the responsibility to review proposed design revisions associated with field changes that deviate from the IRM Work Plan, and the authority to approve the revisions, and submit the proposed revisions to UCC and the NYSDEC for approval. All field changes will be processed in accordance with established procedures (Section 7.3).

Construction Quality Assurance Inspector

URS will provide Construction Quality Assurance (CQA) during implementation of the IRM activities. The CQA inspector has the responsibility and authority to halt work that is not in conformance with the NYSDEC-approved IRM Work Plan. The CQA inspector's responsibilities include:

- Review IRM Work Plan for clarity and completeness so that the work can be implemented correctly in a timely fashion.
- Perform on-site inspections to ensure compliance with IRM Work Plan.

- Verify that air monitoring activities have been properly documented.
- Document the results of all inspection, test, and monitoring activities.
- Report non-conforming conditions in accordance with the procedures explained in Section 7.4 as well as other deviations from the IRM Work Plan to the UCC and NYSDEC.
- Verify the implementation of any corrective action measures.

Contractor

The Contractor's responsibility is to perform the work in accordance with the IRM Work Plan. Construction personnel will coordinate their work with the URS CQA inspector.

7.2 Site Meetings

Periodic CQA meetings will be held on site during implementation and construction. It is anticipated that one meeting will be held each week for the duration of the project, unless otherwise approved by the Engineer. Additional meetings will be held, if warranted during the project. As availability allows, meeting attendees will include the URS Project Manager, the CQA inspector, and the Contractor. Representatives of the NYSDEC, UCC and Niacet may also attend, as necessary, and timely notice of any meetings shall be distributed by URS.

7.2.1 Initial Construction Quality Assurance Meeting

The initial CQA meeting will be conducted on-site prior to initiating work. Subjects proposed to be covered during this meeting include:

- Providing appropriate parties with the NYSDEC-approved IRM Work Plan and HASP.
- Resolving identified conflicts within the IRM Work Plan.
- Reviewing the procedures and requirements for the tests and inspections to be performed.
- Reviewing methods for documenting and reporting inspection data (e.g. field book entries).
- Reviewing procedures for identifying and correcting deviations.

- Reviewing the HASP as needed.
- Conducting a site walkover to review and discuss work issues.
- Discussing the overall project schedule.

7.2.2 Daily Construction Quality Assurance

On a daily basis the CQA inspector will communicate with the Engineer to discuss project activities. Discussion topics will include:

- Previous activities and progress.
- Planned activities.
- Anticipated or potential construction issues.
- Review of testing procedures, submittals, or inspection activities.
- Coordination of CQA monitoring and inspection activities with the Contractor.

The CQA inspector will document the daily progress and activities. The documentation will be utilized in preparation of the IRM Report at completion of the project.

7.3 Field Change Request Process

The purpose of this procedure is to describe the method for requesting acceptance for the implementation of field changes to the Work Plan and procedures applicable to the remedial action.

A Field Change Request (FCR) is a document used to request and acquire the necessary reviews and acceptance for implementing a field change involving design, process, or method. During the course of field activities, conditions may be encountered that necessitate a change in requirements affecting design, processes, or methods.

These changes may be necessary to correct or revise a design, institute an additional requirement, or request approval for relief from an existing requirement with suitable justification. Field changes may also be requested to address and acquire guidance for unforeseen or unanticipated conditions, or to acquire acceptance for alternate methods or processes to be employed. A field change request (FCR) form (Appendix C) that includes a complete description of the requested

change, seeks the necessary acceptance, and provides for disposition of the request and identifies affected documents is to be used for each proposed change.

7.4 Nonconformance Reporting

The purpose of this procedure is to establish and provide a system for identifying, reporting, evaluating, and dispositioning nonconforming items and procedures to prevent their inadvertent use, implementation, or installation. This procedure applies to permanent installations and items of hardware or materials, which are procured, constructed, installed, or used in conjunction with remedial activities. This procedure does *not* apply to expendable tools, supplies, or temporary equipment, items or materials. A nonconformance is a deficiency in characteristic, documentation, or procedure that renders the quality of an item or material unacceptable or indeterminate. A disposition is a written order to correct or place a nonconforming condition into a conclusive form. Acceptable dispositions may require nonconforming conditions to be either required, reworked, scrapped, or used-as-is with suitable justification.

The CQA inspector initiating the Nonconformance Report (NCR; Appendix D) will provide a detailed description of the nonconforming condition(s), including any reference(s) to drawings, work plans, specifications, or procedures which may provide acceptance criteria for the item or material being reported. The CQA inspector, will maintain a log of NCRs.

If the NCR prompts any change to the intent of the construction documents, NYSDEC must approve of the change prior to implementation.

8.0 DEED RESTRICTIONS/ENVIRONMENTAL EASEMENTS

UCC and Niacet Corporation will work together to identify and properly file any necessary easements or deed restrictions as required under the VCA. Evidence of the filing will be provided to the NYSDEC.

This will be performed following completion of the Phase II Remediation.

9.0 SCHEDULE

The schedule associated with implementation of the IRM Work Plan for the UCC Niacet Site is presented below. Major milestones that must be satisfied to accommodate the overall project schedule include the following:

- Submit Draft IRM Work Plan to NYSDEC — September 25, 2012
- Receive NYSDEC approval — November 9, 2012
- Initiate Phase I IRM — November 19, 2012
- Complete IRM — December 2012
- Revise and Submit RAS Report — Spring 2013
- Revise and Submit RAWP — Spring 2013
- Receive NYSDEC Approval — Summer 2013
- Initiate Phase II Site Remediation — 2013
- Site Management Plan — TBD
- Final Engineering Report — TBD

10.0 PROJECT CLOSEOUT

As field work comes to an end, URS will schedule a Site walk through with NYSDEC, UCC and Niacet personnel. Any remaining work necessary to satisfy the intent of the IRM will be identified and documented for follow-up action.

A draft Final Engineering Report will be prepared to include a description of activities conducted to comply with the requirements of this Work Plan. The report will include a certification by a Professional Engineer that the work was conducted in accordance with the approved RAWP. Based on input from the NYSDEC, the report will be made final.

URS also will prepare a Site Management Plan (SMP) for the Site, and assist UCC with preparation of the necessary environmental easement.

The FER and SMP will be prepared following completion of the Phase II Remediation.

11.0 REFERENCES

New York State. 2006. Title 6NYCRR – Subpart 375. December

NYSDEC. 1994. Revised TAGM 4046 – Determination of Soil Cleanup Objectives and Cleanup Levels. Memo from Michael J. O'Toole. HWR-94-4046. January.

NYSDEC. 2000. Ambient Water Quality Standards and Guidance Values, Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. October.

NYSDEC. 2002. Draft DER-10 Technical Guidance for Site Investigation and Remediation. December 25.

NYSDEC. 2002. Draft Voluntary Cleanup Program Guide. May.

URS Corporation. 2002. Site Investigation Summary Report. October.

URS Corporation. 2006. Final Supplemental Site Investigation Report. March

URS Corporation. 2006 (Revised 2010). Remedial Action Selection Report. November.

APPENDIX A

CORRESPONDENCE

"William Yeman"
<wxyeman@gw.dec.state.ny.us>

01/27/2010 09:40 AM

To"Timothy (TA) King"
<kingta@dow.com>

cc"Margaret L (L) Bazany"
<MBazany@dow.com>, "Edwin Dassatti"
<eedassat@gw.dec.state.ny.us>, "Gregory Sutton"
<gpsutton@gw.dec.state.ny.us>, "Michael Hinton"
<mjhinton@gw.dec.state.ny.us>, "Paul Counterman"
<prcounte@gw.dec.state.ny.us>, "Thomas Corbett"
<tacorbet@gw.dec.state.ny.us>, <Bob_Henschel@URSCorp.com>

SubjectRE: Niacet Waste Characterization

Tim,

In response to your 1/25 email, I'm not finding the "state letter of concurrence" at the link you provided, but there is a very high probability that this letter of concurrence was sent by DEC's Division of Remediation (DER) and not our division (ie, the Division of Solid and Hazardous Materials, or DSHM). So even if the state letter of concurrence had accepted EPA's classification of the soil at Mercury Refining as non-U151, that letter would very likely not have come from DSHM. Hence, you would need to appeal to a higher management level than DSHM (e.g., the DEC Commissioner's office, which of oversees all DEC's divisions) if you wish to make the argument that DEC is being inconsistent with the assignment of the U151 waste code at the two sites (ie, at the Mercury Refining site and at the Niacet site).

Also, according to DSHM regional staff the Mercury Refining site had a number of potentially major non-U151 sources of elemental mercury in addition to a mercury retort (e.g., manometers etc), whereas there had been none identified (to my knowledge) for the Niacet site, including in Union Carbide's July 2008 report (entitled "Classification of Mercury-Contaminated Soils") nor in our 4/23/09 conference call (in which Bob, Tom, and Greg also participated).

But your email Friday (finally) offered a very reasonable explanation of where "much" of the elemental mercury in the soil came from, namely the reduction of mercury salts to elemental mercury during side reactions involving the mercury-salt catalyst during production. (The "much" quotation above is taken from the fifth paragraph of your 1/22 (Friday) email.)

However, spills of the retorted mercury would still cause the soil to be U151. Although the occurrence of such spills may appear as speculation, absent any other known major source of elemental mercury, reclaimed mercury from the on-site retort was identified by us as the only possible source. (We repeatedly asked ourselves "where could the elemental mercury have possibly come from if not the retorted mercury?") However, since your 1/22 email now provides a very reasonable explanation of where the elemental mercury in the soil originated from - - and since your email also made a convincing argument that any spilled mercury would have likely been picked up and routed back to

the retort for recovery due to its value and readily available means of on-site recovery - - DSHM is willing to apply EPA's 10/14/98 guidance to dismiss this U151 possibility. (I understand from Mike and Tom that Union Carbide's work plans for the project will need to detail a satisfactory way of managing the soil, and that they will be working with UC on those. Hence, there is the important assurance that the soil will be managed properly even without carrying the U151 code, plus your 1/22 email gave added assurances in paragraph 13.)

We trust this satisfies your concerns regarding the U151 classification (and note that the January 31, 2010 deadline for resolving this classification issue given in your 12/7/09 letter is met).

[SIDE ISSUE: With this dismissal of the U151 classification (for the reasons explained above) the following issue appears to be moot, but for the record please note one statement in your 1/22 email (11th paragraph) that is inaccurate regarding soil classified as U151, namely: "if the soil were characterized as U151, the treatment standard would be retorting or roasting in a thermal process unit to recover mercury." As Tom and I explained in the 4/23/09 conference call, the 376.4(k) alternative treatment standards would be available (even in instances where the total mercury concentration is 260 mg/kg or higher). See also my 1/21/09 (5:04) email to Bob. This means that the scenario in your 1/22 email of needing to retort the soil over a 3-4 year period would not have applied even if the soil were classified as U151.]

Please send us any questions your team may have on the above, and thank you for your comprehensive emails (copied below)

Bill Yeman
Division of Solid & Hazardous Materials (DSHM)
NYSDEC
Albany
wxyeman@gw.dec.state.ny.us

>>> "King, Timothy (TA)" <kingta@dow.com> 1/25/2010 2:34 PM >>>
Bill,

Thank you for your quick response. We look forward to hearing back from you about when a meeting or conference call could be arranged to discuss the full range of issues that were only briefly summarized in my prior e-mail.

In the meantime, in response to your question, we have not done an exhaustive search of sites within New York with reported mercury-contamination in soils. However, we believe the Mercury Refining Site in Colonie, New York makes our point that NYDEC is not compelled to classify mercury-contaminated soil as U151.

While EPA may have been the lead agency for the Mercury Refining Site at the time that the soil was characterized as not being U151 (but potentially being D009, depending upon TCLP results), NYDEC has long been active at that site. NYDEC was the lead agency for the site from the time it was placed on the NPL in 1983 to late 1999. Even after EPA took the lead, NYDEC had ample opportunity to comment on and otherwise influence the remedy selected, including the characterization of the contaminated soils. In the end, NYDEC explicitly concurred with the EPA

remedy, which was certified as complying with "Federal and State requirements that are legally applicable or relevant and appropriate." See, e.g., Record of Decision for the Mercury Refining Site (September 2008), Declaration for the Record of Decision, available at http://www.epa.gov/region2/superfund/npl/mercuryrefining

As you know, we have a short window of opportunity to meet this week before you leave. I would like to schedule a meeting or conference call this week, if possible.

Tim

-----Original Message-----
From: William Yeman [mailto:wxyeman@gw.dec.state.ny.us]
Sent: Friday, January 22, 2010 12:15 PM
To: King, Timothy (TA)
Cc: Bazany, Margaret L (L); Edwin Dassatti; Gregory Sutton; Michael Hinton; Paul Counterman; Thomas Corbett; Bob_Henschel@URSCorp.com
Subject: Re: Niacet Waste Characterization

Tim,

Thank you for the very extensive submittal. We are in the process of reviewing it carefully but one early question that surfaced is whether you are aware of any other retort sites in the state where the soil was not classified as U151. We checked with our regional people covering the region where the Mercury Refining site is located and they indicated that this is a site where EPA had the cleanup oversight responsibility, and that it was remediation staff at EPA (ie, not DEC staff, including DEC's "RCRA" staff) that made the determination that the soils there were not U151.

Thanks a lot

Bill Yeman
NYSDEC
Albany NY
wxyeman@gw.dec.state.ny.us

>>> "King, Timothy (TA)" <kingta@dow.com> 1/22/2010 9:14 AM >>>
Bill,

We hope to schedule a meeting with you and Mr. Dassatti representing the waste characterization branch, Robert Knizek representing the remediation group, and including by telephone the NYDEC project managers for the Niacet Site (Greg Sutton and Mike Hinton), Maura Desmond, and other interested parties from the NYDEC Regional office. The purpose of the meeting is to discuss what we know about operations at this site over time, review the rules regarding waste characterization of remediation wastes, and seek an environmentally protective and flexible solution to our remediation issues. We do have some new information to present, and provide a brief outline of our proposed presentation below. Please let us know what meeting dates might work for you, and let us know if there is anything you would like to add to the issues for discussion. I understand that you need to meet in January, and we will be as flexible as possible in scheduling this meeting, or, if a meeting

is not possible, teleconference.

Our argument is not simply that there is no evidence of a spill of pure liquid elemental mercury having occurred at the site -- although there is, in fact, no such evidence. Rather, our argument is that there is evidence showing that such a spill is an extremely unlikely source of the mercury contamination at the site and that there are other, far more plausible explanations for the elemental mercury present in the soil (which would not result in a U151 listing). Although one could always speculate and hypothesize that some small amount of the mercury could have come from a listed source (which could potentially result in a U151 listing), EPA guidance and case law from the courts provide that classifying soils on the basis of such conjecture is inappropriate. As recently as 2008, regulators declined to classify mercury-contaminated soils at another mercury retort site in New York as U151, but rather relied upon classification of the soils as hazardous (D009) or not based on the TCLP. The same approach is warranted here, especially because U151 classification would dramatically increase remediation costs, without providing any corresponding benefit to human health or the environment.

Although we cannot fully present our arguments in an e-mail, in response to your request, we provide below an outline of some of the highlights:
* The Niacet Corporation facility manufactured vinyl acetate and related precursor chemicals (e.g., acetaldehyde and acetic acid) using a mercury-based catalyst approximately from 1925 through 1959. Production of related acetate salts continued until approximately 1978. Niacet records indicate that the catalysts used were mercury salts, not elemental mercury. This is consistent with chemical literature we have found (some from the early 1920s when the Niacet facility first started operating) discussing the use of mercury salts in these types of processes. Since the catalyst used was not metallic mercury, it would not have been characterized as U151 if spilled before, during, or after use.
* The sludges resulting from the production processes contained mercury from the catalyst. The chemical literature makes clear that a significant amount of this mercury would have been in the form of elemental mercury. For example, one early article stated that "[a]s a side reaction in all of these catalytic processes we are likely to have the continual reduction of mercury compounds to the metallic state." See 43 Journal of the American Chemical Society 2071, 2075 (1921). The article noted, in fact, that efforts to prevent this side reaction had not proved of any value in practice. Id. Even though the sludges contained elemental mercury, they would not properly be classified as U151. See, e.g., 40 C.F.R. 261.33(d), Comment (stating that the U-listings "do[ ] not refer to a material, such as a manufacturing process waste, that contains any of the substances listed"); 6 NYCRR 371.4(d)(4), Note (same).
* Based on conversations with Niacet personnel, sludges from the process were collected in pits and periodically removed to the retort area for recovery of mercury. (In later years, some of the sludges apparently were drummed up and shipped off-site to an independent mercury reclaimer.) We understand that, at least sometimes, the sludges were scooped up and moved across the site using the bucket of a front-end loader. In light of these antiquated management practices and the presence of elemental mercury in the sludges (as noted above), it seems almost certain that these sludges account for much of the

elemental mercury contamination across the site.
* Retort processes use heat to convert mercury compounds to elemental mercury, and to recover that metal (together with any elemental mercury present before processing) by condensing the vapors. The waste remaining in a retort after recovery of mercury is an ash or slag. Even modern retorts are unable to recover all of the mercury, and the old retort at Niacet was likely far less efficient. As a result the ash/slag at the Niacet Site almost certainly contained significant amounts of elemental mercury (e.g., from vapors that condensed in the unit before reaching the collection system). Nevertheless, the ash/slag would not qualify as a U151 waste, because it was a process residue containing a variety of other constituents (e.g., ash, carbon, slag), rather than a commercial chemical product. Only if the material fails the TCLP would it be deemed a hazardous waste, and then only a D009 waste, rather than a U151 waste.
* Because all of the mercury in the ash/slag that could practicably be recovered had been recovered, the ash/slag was of no value to the facility. Thus, the facility had no economic incentive to manage the material carefully. Without such an incentive (and without regulatory controls), the facility may well have spilled the material, mismanaged it, or used it as fill. Because the ash/slag probably contained significant amounts of elemental mercury (albeit unrecoverable elemental mercury) and was likely not managed in a way to prevent loss or spillage, it almost certainly was responsible for much of the elemental mercury contamination at the site.
* During the approximately 50 years that that the retort was operated at the Niacet facility (roughly 1925 to 1975), mercury was an extremely valuable metal, often rivaling silver in price per pound or volume. Indeed, this is why the facility went to the time, expense, and trouble of installing and operating the recycling unit at a time when recycling was almost unheard of. The facility had a strong economic incentive to handle the mercury it recovered in a highly protective manner, in order to avoid loss. It simply makes no sense to imagine that the facility went to great lengths to recover a semi-precious material and then handled the product haphazardly. Therefore, the fact that mercury was used or stored at the site in metallic form, without more, is not evidence that the metallic mercury in the soils came from a listed source. Although it may be conceivable that a spill could have occurred at some point in time (despite the absence of any evidence of such a spill having occurred), the facility undoubtedly would have responded to any such spill by picking up the valuable material and re-processing it in the retort (if necessary). Similarly, facility employees are extremely unlikely to have released mercury through "horseplay," as you suggest, but would have been far more likely to have tried stealing every drop of the valuable material that they could (something that we understand was a major problem at some mercury retort facilities at the time).
* In sum, there is no evidence showing that a spill of product-grade metallic mercury occurred at the Niacet site, and there is strong evidence that such a spill (at a time when mercury was highly valuable) is an extremely unlikely source of the mercury contamination at the site. Instead, there are far more plausible explanations for the elemental mercury present in the soil, none of which would result in a U151 listing. In particular, it seems almost certain that historical spills of process sludge or retort ash/sludge, and/or use of these materials as fill, accounted for elemental mercury contamination at the site. These materials contained significant amounts of elemental

mercury, yet were of little or no economic value and/or were known to have been poorly managed.

* EPA guidance clearly states that for remediation wastes where the source of contamination is not known, but could potentially come from non-listed as well as listed sources, the appropriate course is to characterize the material as non-listed. See, e.g., 53 Fed. Reg. 51,394, 51,444 (December 21, 1988); 55 Fed. Reg. 8666, 8758 (March 8, 1990); 61, Fed. Reg. 18,780, 18,805 (April 29, 1996); Memorandum from Timothy Fields, Jr, EPA Acting Assistant Administrator for Solid Waste and Emergency Response, and Steven A. Herman, EPA Assistant Administrator for Enforcement and Compliance Assistance, to EPA RCRA/CERCLA Senior Policy Managers and Regional Counsels (October 14, 1998). Courts have similarly refused to characterize historically disposed wastes as listed commercial chemical products, without clear supporting evidence. See, e.g., O'Leary v. Moyer's Landfill, Inc., 523 F. Supp. 642, 657 (1981) ("Plaintiffs adduced no evidence that the discarded chemicals were materials disposed of in their commercial form [i.e., as P- or U-listed products], rather than, for example, materials which were the residue of other waste. Accordingly, I cannot conclude that the landfill is a . . . hazardous waste site"). In the present case, there is no evidence that the mercury in the soils at the Niacet Site came from listed sources, and in fact all available evidence points strongly in the opposite direction. Accordingly, the soils should not be classified U151, but rather should instead be characterized based on any characteristics they may exhibit. In particular, if the soils contain sufficient mercury to fail TCLP, they should be classified as D009 hazardous wastes.

* EPA's guidance on characterization of remediation wastes was based in large part on a recognition that reflexive application of the RCRA regulations to such wastes can often be unnecessary, unreasonable, unworkable, or even counterproductive. This policy basis for the guidance is particularly relevant in the present case. For example, if the soil were characterized as U151, the treatment standard would be retorting or roasting in a thermal process unit to recover mercury. While this may be appropriate for small volume, concentrated process waste streams, it is ill-suited for large volumes of soil with low mercury concentrations. Based on some preliminary discussions with commercial retorters (including one with a portable retort unit), it could take as long as 3 - 4 years based on 24 hr/day operation to process 16,000 cubic yards (i.e. ~28,000 tons) of contaminated soils from the Niacet Site, at a cost of over $5,000,000 (not counting the time and cost of obtaining any necessary permits, excavating the material, gas and electricity costs, etc.). In contrast, the plan for handling the soils without the U151 listing (i.e., excavating, treating, and off-site disposal in non-haz landfill) has already been determined to be protective of human health and the environment, and can be accomplished in a far more timely and cost-effective manner. This is precisely the type of situation where automatic application of the hazardous waste listings is unwarranted.

* In your e-mail, you state that when elemental mercury is present in soil at a site where mercury retorting had historically taken place, DEC is "compelled" to classify the soil as U151 and cannot "in good conscience" come to a contrary conclusion. However, at other mercury-contaminated sites in New York State, regulatory authorities have followed the EPA guidance discussed above and have not characterized the soil as U151 -- despite the existence of elemental mercury in the soils and despite the existence of an on-site retort. For example, the Mercury Refining Company Superfund Site in Colonie, NY had

a retort for processing various mercury-containing materials, such as sludges, dental amalgams, and batteries. At that site, the soils were not classified as U151. Rather, they were characterized as either D009 or non-hazardous, based solely on the TCLP results for mercury. The mercury-contaminated soils at the Niacet Site should be characterized in the same manner. In fact, this approach is even more appropriate here, given the fact that at the Niacet Site -- unlike retort-only sites -- there are other far more plausible explanations for the presence of elemental mercury in the soil.

* We would like to discuss with you this new information regarding the management of mercury-containing wastes on site. We would also like to discuss the type of facility and type of treatment that may be appropriate for any non-hazardous mercury-contaminated soils. UCC fully understands that there will be stringent requirements for the acceptance of mercury-contaminated soils by a landfill, and we are willing to work with the facility and NYDEC to identify an appropriate disposal location and process.

Thank you for your time and consideration. I have attached the references listed below for your use. Please contact me via email or by phone at 304-747-3763 regarding a meeting or call.

Tim King

List of References Attached

(1) The article we cite to from the 1921 Journal of the American Chemical Society (PDF file "UCC 004").

(2) The cover to the 1921 Journal from which #1 came (Word file jacs 005).

(3) The O'Leary v. Moyer's Landfill case.

(4) The EPA guidance on remediation waste

<<epa 001 remediation waste.pdf>> <<o_leary et al v moyer_s landfill et al.PDF>> <<jacs 005.doc>> <<UCC 004 hydration of acetylene.pdf>>

APPENDIX B

HEALTH AND SAFETY PLAN

PART 1 - GENERAL

1.1 SUMMARY

A. This section describes the minimum health and safety requirements for this project including the requirements for the development of a written Health and Safety Plan (HASP). All on-site workers must comply with the requirements of the HASP. The Contractor's HASP must comply with all applicable federal and state regulations protecting human health and the environment from the hazards posed by activities during this site remediation.

1.2 BASIS

A. The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (20 CFR 1910 and 1926) and subsequent additions and/or modifications, the New York State Labor Law Section 876 (Right-to-Know Law), the Standard Operating Safety Guidelines by the United States Environmental Protection Agency (EPA), Office of Emergency and Remedial Response and the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH, OSHA, USCG, and EPA) provide the basis for the safety and health program. Additional specifications within this section are in addition to OSHA regulations and reflect the positions of both the EPA and the National Institute for Occupation Safety and Health (NIOSH) regarding procedures required to ensure safe operations at abandoned hazardous waste disposal sites.

B. The safety and health of the public and project personnel and the protection of the environment will take precedence over cost and schedule considerations for all project work. Any additional costs will be considered only after the cause for suspension of operations is addressed and work is resumed. The Engineer and the Contractor's Superintendent will be kept appraised, by the Contractor's Safety Officer, of conditions which may adversely affect the safety and health of project personnel and the community. The Engineer may stop work for health and safety reasons. If work is suspended for health and/or safety reasons, it shall not resume until approval is obtained from the Engineer. The cost of work stoppage due to health and safety is the responsibility of the Contractor under this Contract.

1.3 HEALTH AND SAFETY DEFINITIONS

The following definitions shall apply to the work of this Contract:

A. Project Personnel: Project personnel may include the Engineer, Contractor, Subcontractors, and Federal and State Representatives, working or having official business at the Project Site.

B. Authorized Visitor: Authorized visitors who work for the State of New York shall receive approval to enter the site from the Contractor. The Safety Officer has primary responsibility for determining who is qualified and may enter the site. The Site Safety Officer will only allow authorized visitors with written proof that they have been medically certified and trained in accordance with 29 CFR 1910.120.

C. Health and Safety Coordinator (HSC): The HSC shall be a Certified Industrial Hygienist (CIH) or Certified Safety Professional (CSP) retained by the Contractor. The HSC will be responsible for the development and implementation of the HASP.

D. Safety Officer (SO): The SO will be the Contractor's on-site person who will be responsible for the day-to-day implementation and enforcement of the HASP.

E. Health and Safety Technicians (HST): The HST(s) will be the Contractor's on-site personnel who will assist the SO in the implementations of the HASP, in particular, with air monitoring in active work areas and maintenance of safety equipment.

F. Medical Consultant (MC): The MC is a physician retained by the Contractor who will be responsible for conducting physical exams as specified under the Medical Monitoring Programs in this section.

G. Project Site: The area designated on the Site Sketch, which includes the Contractor Work Area.

H. Contractor Work Area: An area of the project site including the Support Zone, access road, staging area, and Exclusion Zone.

I. Contractor Support Zone: An area of the Contractor Work Area outside the Exclusion Zone, accessible for deliveries and visitors. No persons, vehicles, or equipment may enter these areas from the Exclusion Zone without having gone through specified decontamination procedures in the adjacent Contamination Reduction Zone.

J. Staging Areas: Areas within the Exclusion Zone for the temporary staging of contaminated soil and debris.

K. Exclusion Zone: The innermost area within the Contractor Work Area that encloses the area of contamination. Protective clothing and breathing apparatus as specified in the health and safety requirements and in the Contractor’s approved HASP must be worn.

L. Contamination Reduction Zone: An area at the Exit Point of the Exclusion Zone through which all personnel, vehicles, and equipment must enter and exit. All decontamination of vehicles and equipment and removal of personal protective clothing and breathing

apparatus must take place at the boundary between the Exclusion Zone and the Contamination Reduction Zone.

M. Engineer's on-site representative: The Engineer's representative assigned responsibility and authority by the Engineer for day-to-day field surveillance duties.

N. Work: Work includes all labor, materials, and other items that are shown, described, or implied in the Contract and includes all extra and additional work and material that may be ordered by the Engineer.

O. Monitoring: The use of direct reading field instrumentation to provide information regarding the levels of gases and/or vapor, which are present during remedial action. Monitoring shall be conducted to evaluate employee potential exposures to toxic materials and hazardous conditions.

1.4 RESPONSIBILITIES

The Contractor will be responsible for the following:

The Contractor will perform all work required by the Contract Documents in a safe and environmentally acceptable manner. The Contractor will provide for the safety of all project personnel and the community for the duration of the Contract.

The Contractor shall:

1. Employ a SO who shall be assigned full-time responsibility for all tasks describe herein under this HASP. In the event the SO cannot meet his responsibilities, the Contractor shall be responsible for obtaining the services of an "alternate" SO meeting the minimum requirements and qualifications contained herein. No work will proceed on this project in the absence of an approved SO.

2. Ensure that all project personnel have obtained the required physical examination prior to and at the termination of work covered by the contract.

3. Be responsible for the pre-job indoctrination of all project personnel with regard to the HASP and other safety requirements to be observed during work, including but not limited to (a) potential hazards, (b) personal hygiene principles, (c) personal protection equipment, (d) respiratory protection equipment usage and fit testing, and (e) emergency procedures dealing with fire and medical situations.

4. Be responsible for the implementation of this HASP, and the Emergency Contingency and Response Plan.

5. Provide and ensure that all project personnel are properly clothed and equipped and that all equipment is kept clean and properly maintained in accordance with the manufacturer's recommendations or replaced as necessary.

6. Have sole and complete responsibility of safety conditions for the project, including safety of all persons (including employees).

7. Be responsible for protecting the project personnel and the general public from hazards due to the exposure, handling, and transport of contaminated materials. Barricades, lanterns, roped-off areas, and proper signs shall be furnished in sufficient amounts and locations to safeguard the project personnel and public at all times.

8. Make certain all OSHA health and safety requirements are met.

9. Maintain a chronological log of all persons entering the project site. It will include organization, date, and time of entry and exit. Each person must sign in and out.

1.5 SUBMITTALS

The Contractor shall submit a HASP to the Owner's Engineer for review. The HASP shall govern all work performed for this contract. The HASP shall address, at a minimum, the following items in accordance with 29 CFR 1910.120(I)(2) and other applicable regulations:

A. Health and Safety Organization.

B. Site Description and Hazard Assessment.

C. Training.

D. Medical Surveillance.

E. Work Areas.

F. Standard Operating Safety Procedures and Engineering Controls.

G. Personal Protective Equipment (PPE).

H. Personnel Hygiene and Decontamination.

I. Equipment Decontamination.

J. Air Monitoring.

K. Emergency Equipment/First Aid Requirements.

L. Emergency Response and Contingency Plan.

M. Confined-Space Entry Procedures (N/A)

N. Spill Containment Plan.

O. Heat & Cold Stress.

P. Record Keeping.

Q. Community Protection Plan.

R. Radiation Protection Plan

The Contractor shall not initiate on-site work in contaminated areas until an acceptable HASP addressing all comments has been developed. The following sections will describe the requirements of each of the above-listed elements of the HASP.

1.6 HEALTH AND SAFETY ORGANIZATION

The Contractor shall list in the HASP a safety organization with specific names and responsibilities. At a minimum, the Contractor shall provide the services of a Health and Safety Coordinator, SO, Health and Safety Technician, and a Medical Consultant.

A. Health and Safety Coordinator: The Contractor must retain the services of a Health and Safety Coordinator (HSC). The HSC must be an American Board of Industrial Hygiene (ABIH) Certified Industrial Hygienist (CIH) or a Certified Safety Professional (CSP). The HSC must have a minimum of two years experience in hazardous waste site remediations or related industries and have a working knowledge of federal and state occupational health and safety regulations. The HSC must be familiar with air monitoring techniques and the development of health and safety programs for personnel working in potentially toxic atmospheres.

In addition to meeting the above requirements the HSC will have the following responsibilities:

1. Responsibility for the overall development and implementation of the HASP.

2. Responsibility for the initial training of on-site workers with respect to the contents of the HASP.

3. Availability during normal business hours for consultation by the Safety Officer.

4. Availability to assist the Safety Officer in follow-up training and if changes in site conditions occur.

B. Safety Officer: The designated SO must have, at a minimum, two years of experience in the remediation of hazardous waste sites or related field experience. The SO must have

formal training in health and safety and be conversant with federal and state regulations governing occupational health and safety. The SO must be certified in CPR and first aid and have experience and training in the implementation of personal protection and air monitoring programs. The SO must have "hands-on" experience with the operation and maintenance of real-time air monitoring equipment. The SO must be thoroughly knowledgeable of the operation and maintenance of air-purifying respirators (APR) and supplied-air respirators (SAR) including SCBA and airline respirators.

In addition to meeting the above qualifications, the SO will be responsible for the following minimum requirements:

1. Responsibility for the implementation, enforcement, and monitoring of the health and safety plan.

2. Responsibility for the pre-construction indoctrination and periodic training of all on-site personnel with regard to this safety plan and other safety requirements to be observed during construction, including:

    a. Potential hazards.
    b. Personal hygiene principles.
    c. PPE.
    d. Respiratory protection equipment usage and fit testing.
    e. Emergency procedures dealing with fire and medical situations.
    f. Conduct daily update meetings in regard to health and safety.

3. Responsibility for alerting the Engineer's on-site representative prior to the Contractor starting any particular hazardous work.

4. Responsibility for informing project personnel of the New York State Labor Law Section 876 (Right-to-Know Law).

5. Responsibility for the maintenance of separation of Exclusion Zone (Dirty) from the Support Zone (Clean) areas as described hereafter.

C. Health and Safety Technicians: The Health and Safety Technician (HST) must have one year of hazardous waste site or related experience and be knowledgeable of applicable occupational health and safety regulations. The HST must be certified in CPR and first aid. The HST will be under direct supervision of the SO during on-site work. The HST must be familiar with the operations, maintenance and calibration of monitoring equipment used in this remediation. An HST will be assigned to each work crew or task in potentially hazardous areas.

D. Medical Consultant: The Contractor is required to retain a Medical Consultant (MC) who is a physician, certified in occupational medicine. The physician shall have experience in the occupational health area and shall be familiar with potential site hazards of remedial action projects. The MC will also be available to provide annual physicals and to provide additional medical evaluations of personnel when necessary.

1.7 SITE DESCRIPTION AND HAZARD ASSESSMENT

The Contractor shall perform a hazard assessment to provide information to assist in selection of PPE and establish air-monitoring guidelines to protect on-site personnel, the environment, and the public. The Contractor shall provide a general description of the site, its location, past history, previous environmental sampling results, and general background on the conditions present at the site.

A. Chemical Hazards: A qualitative evaluation of chemical hazards shall be based on the following:
   1. Nature of potential contaminants;
   2. Location of potential contaminants at the project site;
   3. Potential for exposure during site activities; and
   4. Effects of potential contaminants on human health.

B. Biological Hazards: A qualitative evaluation of biological hazards (blood borne pathogens, insects, and other elements.

C. Physical Hazards: The Contractor shall assess the potential for physical hazards affecting personnel during the performance of on-site work.

1.8 TRAINING

A. OSHA Training

   1. The Contractor is responsible to ensure that all project personnel have been trained in accordance with OSHA 1910.120 regulations.

   2. The Contractor shall ensure that all employees are informed of the potential hazards of toxic chemicals to the unborn child and of the risks associated with working at the project site.

   3. The Contractor shall be responsible for, and guarantee that, personnel not successfully completing the required training are not permitted to enter the project site to perform work.

B. Safety Meetings

The SO will conduct daily safety meetings for each working shift that will be mandatory for all project personnel. The meetings will provide refresher courses for existing equipment and protocols, and will examine new site conditions as they are encountered.

Pre-entry briefing. The site specific safety and health plan shall provide for pre-entry briefings to be held prior to initiating any site activity, and at such other times as necessary to ensure that employees are apprised of the site safety and

health plan and that this plan is being followed. The information and data obtained from site characterization and analysis work shall be used to prepare and update the site safety and health plan.

1. Additional safety meetings will be held on an as-required basis.

2. Should any unforeseen or site-specific safety-related factor, hazard, or condition become evident during the performance of work at this site, the Contractor will bring such to the attention of the SO in writing as quickly as possible for resolution. In the interim, the Contractor will take prudent action to establish and maintain safe working conditions and to safeguard employees, the public, and the environment.

1.9 MEDICAL SURVEILLANCE

A. The Contractor shall utilize the services of a Physician to provide the minimum medical examinations and surveillance specified herein. The name of the Physician and evidence of examination of all Contractor and Subcontractor on-site personnel shall be kept by the SO.

B. Contractor and Subcontractor project personnel involved in this project shall be provided with medical surveillance prior to onset of work and in accordance with 29 CFR 1910.120 (f)

Physical examinations are required for:

1. All employees who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;
2. All employees who wear a respirator for 30 days or more a year or as required by 1910.134;
3. All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and
4. Members of HAZMAT teams.

D. Physician's written opinion.

The employer shall obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:

1. The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use.

2. The physician's recommended limitations upon the employees assigned work.
3. The results of the medical examination and tests if requested by the employee.
4. A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposure. Medical examinations required by this section shall include a medical and work history (or updated history if one is in the employee's file) with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site. The ***Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*** presents guidelines for designing a medical program for personnel at hazardous waste sites***.***

1.10 SITE CONTROL

A. Security

1. Security shall be provided and maintained by the Contractor. Security identification, specific to the project site, shall be provided by the Contractor for all project personnel entering the project site. The Contractor shall be responsible for and ensure that such identification shall be worn by each individual, visible at all times, while the individual is on the site. Vehicular access to the site, other than to designated parking areas, shall be restricted to authorized vehicles only.

2. Use of on-site designated parking areas shall be restricted to vehicles of the Engineer, Engineer’s on-site representative, Contractor subcontractor, and service personnel assigned to the site and actually on duty but may also be used on short-term basis for authorized visitors.

3. The Contractor shall be responsible for maintaining a log of security incidents and visitor access granted.

4. The Contractor shall require all personnel having access to the project site to sign-in and sign-out, and shall keep a record of all site access.

5. All approved visitors to the site shall be briefed by the SO on safety and security, provided with temporary identification and safety equipment, and escorted throughout their visit.

6. Project sites shall be posted, "Warning Hazardous Work Area, Do Not Enter Unless Authorized," and access restricted by the use of a snow fence or equal at a minimum. Warning signs shall be posted at a minimum of every 500 feet.

B. Site Control

The Contractor shall provide the following site control procedures as a minimum:

1. A site map;
2. A map showing site work zones;
3. The use of a "buddy system"; and
4. Standard operating procedures or safe work practices.

C. Work Areas

The Contractor will clearly lay out and identify work areas in the field and will limit equipment, operations and personnel in the areas as defined below:

1. Exclusion Zone (EZ) - This will include all areas where potential environmental monitoring has shown or it is suspected that a potential hazard may exist to workers. The level of PPE required in these areas will be determined by the SO after air monitoring and on-site inspection has been conducted. The area will be clearly delineated from the decontamination area. As work within the hazardous zone proceeds, the delineating boundary will be relocated as necessary to prevent the accidental contamination of nearby people and equipment. The Exclusion Zone will be delineated by fencing (e.g., chain link, snow fencing, or orange plastic fencing).
2. Contamination Reduction Zone - This zone will occur at the interface of "Hazardous" and "Clean" areas and will provide for the transfer of equipment and materials from the Support Zone to the Exclusion Zone, the decontamination of personnel and clothing prior to entering the "Clean" area, and for the physical segregation of the "Clean" and "Hazardous" areas. This area will contain all required emergency equipment, etc. This area will be clearly delineated by fencing (e.g., chain link, snow fencing, or orange plastic fencing). It shall also delineate an area that although not contaminated at a particular time may become so at a later date.
3. Support Zone - This area is the remainder of the work site and project site. The Support Zone will be clearly delineated and procedures implemented to prevent active or passive contamination from the work site. The function of the Support Zone includes:

    a. An entry area for personnel, material and equipment to the Exclusion Zone of site operations through the Contamination Reduction Zone;
    b. An exit for decontamination personnel, materials and equipment from the "Decontamination" area of site operations;
    c. The housing of site special services; and
    d. A storage area for clean, safety, and work equipment.

1.11 STANDARD OPERATING SAFETY PROCEDURES, Administrative CONTROLS

A. GENERAL

1. The **Contractor** will ensure that all safety equipment and protective clothing is kept clean and well maintained.

2. All prescription eyeglasses in use on this project will be safety glasses and will be compatible with respirators.

3. The SO will approve all disposable or reusable gloves worn on the site.

4. During periods of prolonged respirator usage in contaminated areas, respirator filters will be changed upon breakthrough (not defined). Respirator filters will always be changed at least daily.

5. Footwear used on site will be covered by chemical resistant overboots or booties when entering or working in the Exclusion Zone area or Contamination Reduction Zone. Boots or booties will be washed with water and detergents to remove dirt and contaminated sediment before leaving the Exclusion Zone or Contamination Reduction Zone.

6. All PPE used on site will be decontaminated or disposed of at the end of the workday. The SO will be responsible for ensuring decontamination of PPE before reuse.

7. All respirators will be individually assigned and not interchanged between workers without cleaning and sanitizing.

8. Contractor, subcontractor and service personnel unable to pass a fit test as a result of facial hair or facial configuration shall not enter or work in an area that requires respiratory protection.

9. (Covered under medical surveillance).

10. On-site personnel found to be disregarding any provision of this plan will, at the request of the SO, be barred from the project.

11. Used disposable outerwear such as coveralls, gloves, and boots shall not be reused. Used disposable outerwear will be removed upon leaving the hazardous work zone and will be placed inside disposable containers provided for that purpose. These containers will be stored at the site at the designated staging area and the Contractor will be responsible for proper disposal of these materials at the completion of the project. This cost shall be borne by the Contractor.

12. Protective coveralls that become torn or badly soiled will be replaced immediately.

13. Eating, drinking, chewing gum or tobacco, smoking, etc., will be prohibited in the hazardous work zones.

14. All personnel will thoroughly cleanse their hands, face, and forearms and other exposed areas prior to eating, smoking or drinking.

15. All personnel will wash their hands, face, and forearms before using toilet facilities.

16. No alcohol, firearms or drugs (without prescriptions) will be allowed on site at any time.

B. Engineering Controls - Air Emissions

The Contractor shall provide all equipment and personnel necessary to monitor and control air emissions.

Engineering controls and work practices shall be instituted to reduce and maintain employee exposure to or below the permissible exposure limits for substances regulated by 29 CFR Part 1910, to the extent required by Subpart Z, except to the extent that such controls and practices are not feasible.

NOTE TO PARAGRAPH (g)(1)(i): Engineering controls which may be feasible include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment. Work practices which may be feasible are removing all non-essential employees from potential exposure during opening of drums, wetting down dusty operations and locating employees upwind of possible hazards.

1.12 PERSONAL PROTECTIVE EQUIPMENT (PPE)

General

The Contractor shall provide all project personnel with the necessary safety equipment and protective clothing, taking into consideration the potential chemical wastes at the site. The Contractor shall supply the Engineer's on-site personnel with PPE as specified.

A. Personal protective equipment selection.

1. Personal protective equipment (PPE) shall be selected and used which will protect employees from the hazards and potential hazards they are likely to encounter as identified during the site characterization and analysis.
2. Personal protective equipment selection shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site.
3. Positive pressure self-contained breathing apparatus, or positive pressure air-line respirators equipped with an escape air supply shall be used when chemical exposure levels present will create a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.
4. Totally-encapsulating chemical protective suits (protection equivalent to Level A protection as recommended in Appendix B) shall be used in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

The level of protection provided by PPE selection shall be increased when additional information or site conditions show that increased protection is necessary to reduce employee exposures below permissible exposure limits and published exposure levels for hazardous substances and health hazards. NOTE:

The level of employee protection provided may be decreased when additional information or site conditions show that decreased protection will not result in hazardous exposures to employees.

5. Personal protective equipment shall be selected and used to meet the requirements of 29 CFR Part 1910, Subpart I, and additional requirements specified in this section.

B. Levels of Protection

Personal protective equipment selection shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site.

The following sections described the requirements of each level of protection.

Personal protective equipment is divided into four categories based on the degree of protection afforded. (See Part B of this appendix for further explanation of Levels A, B, C, and D hazards.)

Level A Protection

To be selected when the greatest level of skin, respiratory, and eye protection is required.

The following constitute Level A equipment; it may be used as appropriate;

1. Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).

2. Totally-encapsulating chemical-protective suit.

3. Coveralls.(1)

4. Long underwear.(1)

5. Gloves, outer, chemical-resistant.

6. Gloves, inner, chemical-resistant.

7. Boots, chemical-resistant, steel toe and shank.

8. Hard hat (under suit).(1)

9. Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit).

Footnote(1) Optional, as applicable.

Level A - Level A protection should be used when:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin,

2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or

3. Operations must be conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

Level B Protection

The highest level of respiratory protection is necessary but a lesser level of skin protection is needed.

The following constitute Level B equipment; it may be used as appropriate.

1. Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved).

2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).

3. Coveralls.(1)

4. Gloves, outer, chemical-resistant.

5. Gloves, inner, chemical-resistant.

6. Boots, outer, chemical-resistant steel toe and shank.

7. Boot-covers, outer, chemical-resistant (disposable).(1)

8. Hard hat.(1)

9. Face shield.(1)

Footnote(1) Optional, as applicable.

Level B protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection.

2. The atmosphere contains less than 19.5 percent oxygen; or

3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

Note: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

Level C Protection

Level C - The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met.

The following constitute Level C equipment; it may be used as appropriate.

1. Full-face or half-mask, air purifying respirators (NIOSH approved).

2. Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).

3. Coveralls.(1)

4. Gloves, outer, chemical-resistant.

5. Gloves, inner, chemical-resistant.

6. Boots (outer), chemical-resistant steel toe and shank.(1)

7. Boot-covers, outer, chemical-resistant (disposable).(1)

8. Hard hat.(1)

9. Escape mask.(1)

10. Face shield.(1)

Footnote(1) Optional, as applicable.

Level C - Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;

2. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and

3. All criteria for the use of air-purifying respirators are met.

Level D Protection

Level D - A work uniform affording minimal protection: used for nuisance contamination only.

The following constitute Level D equipment; it may be used as appropriate:

1. Coveralls.

2. Gloves.(1)

3. Boots/shoes, chemical-resistant steel toe and shank.

4. Boots, outer, chemical-resistant (disposable).(1)

5. Safety glasses or chemical splash goggles.(1)

6. Hard hat.(1)

7. Escape mask.(1)

8. Face shield.(1)

_____

Footnote(1) Optional, as applicable.

Level D - Level D protection should be used when:

1. The atmosphere contains no known hazard; and

2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Note: As stated before, combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

As an aid in selecting suitable chemical protective clothing, it should be noted that the National Fire Protection Association (NFPA) has developed standards on chemical protective clothing. The standards that have been adopted by include:

NFPA 1991 - Standard on Vapor-Protective Suits for Hazardous Chemical Emergencies (EPA Level A Protective Clothing)

NFPA 1992 - Standard on Liquid Splash-Protective Suits for Hazardous Chemical Emergencies (EPA Level B Protective Clothing)

NFPA 1993 - Standard on Liquid Splash-Protective Suits for Non-emergency, Non-flammable Hazardous Chemical Situations (EPA Level B Protective Clothing)

These standards apply documentation and performance requirements to the manufacture of chemical protective suits. Chemical protective suits meeting these requirements are labeled as compliant with the appropriate standard. It is recommended that chemical protective suits that meet these standards be used.

1.13 PERSONNEL HYGIENE AND DECONTAMINATION

Portable "Boot Wash" Decontamination Equipment

The Contractor shall provide a portable decontamination station, commonly referred to as a "Boot Wash" facility for each hazardous work zone requiring decontamination for project personnel. These facilities shall be constructed to contain spent wash water, contain a reservoir of clean wash water, a power supply to operate a pump for the wash water, a separate entrance and exit to the decontamination platform, with the equipment being mobile, allowing easy transport from one hazardous work zone to the next. All such wash water shall be containerized for later characterization. An appropriate detergent such as trisodium phosphate shall be used.

Personnel Decontamination

The Contractor shall provide full decontamination facilities at all hazardous zones. Decontamination facilities must be described in detail in the HASP.

Disposal of Spent Clothing and Material

Contaminated clothing, used respirator cartridges and other disposable items will be put into drums/containers for transport and proper disposal in accordance with TSCA and RCRA requirements. Containers/55-gallon capacity drums shall conform to the requirements of 40 CFR Part 178 for Transportation of Hazardous Materials. The containers/drums containing excavated and other hazardous material shall be transported by the Contractor to the staging area.

The Contractor is responsible for the proper container packaging, labeling, transporting, and disposal.

1.14 EQUIPMENT DECONTAMINATION

General

All equipment and material used in this project shall be thoroughly washed down in accordance with established federal and state procedures before it is removed from the project. With the exception of the excavated materials, all other contaminated debris, clothing, etc. that cannot be decontaminated shall be disposed at the Contractor's expense by a method permitted by appropriate regulatory agencies. The cost for this element of work shall be incorporated in the lump sum bid for mobilization/demobilization the unit prices bid for disposal of decontamination liquids or as otherwise directed on this project. All vehicles and equipment used in the "Dirty Area" will be decontaminated to the satisfaction of the SO in the decontamination area on site prior to leaving the project. The Contractor will certify, in writing, that each piece of equipment has been decontaminated prior to removal from the site.

Decontamination shall take place within the designated equipment and materials decontamination area. The decontamination shall consist of degreasing (if required), followed by high-pressure, hot-water cleaning, supplemented by detergents as appropriate. Wash units shall be portable, high-pressure with self-contained water storage tank and pressuring system (as required). Each unit shall be capable of heating wash waters to 180 degrees Fahrenheit and providing a nozzle pressure of 150 psi.

Personnel engaged in vehicle decontamination will wear protective clothing and equipment as determined in the HASP. If the Contractor cannot or does not satisfactorily decontaminate his tools or equipment at the completion of the project, the Contractor will dispose of any equipment that cannot be decontaminated satisfactorily and will bear the cost of such tools and equipment and its disposal without any liability to the ENGINEER. At the completion of the project the Contractor shall completely decontaminate and clean the decontamination area.

Decontamination Station

The Contractor shall construct a decontamination station as described. The decontamination station shall be located in the Contamination Reduction Zone and shall be used to clean all vehicles leaving the Exclusion Zone prior to entering the Support Zone or leaving the site. Each decontamination pad will be equipped with a drain system and holding tank on a properly graded area that has no deleterious material. Shop drawings of the decontamination pad shall be submitted to the ENGINEER for approval.

The Contractor shall be responsible for the provision of an adequately equipped decontamination pad that shall meet the following requirements:

A. Adequate dimensions to contain wash water and debris from the largest sized vehicles to be utilized in this contract. All vehicles and construction equipment leaving a contaminated zone shall be decontaminated.

B. Perimeter to be curbed and provided with splash guards.

C. A 40 mil impervious HDPE membrane is required to prevent seepage into the ground.

D. Sumps, pumping facilities, and temporary storage facilities to be adequate for anticipated use.

E. Temporary storage facility may be mobile tankers or suitable fixed tanks. Fixed tanks shall be located within secondary containment areas capable of containing 100% of the tank capacity, or 110% of the largest tank where the secondary containment area holds more than one tank. The secondary containment area shall have a permeability of not more than 1.0 x 10-7 cm/sec.

F. The decontamination pad is to be located at the exit of each contaminated zone such that previously non-contaminated areas are not contaminated during remedial activities. This may require the construction and use of multiple decontamination pads.

G. The Contractor shall place a minimum of six (6) inches of sand under the decontamination pad.

H. There shall be side wall panels, six (6) feet high minimum on two sides to prevent over spray.

The Contractor shall clean the decontamination pad after daily use. No contamination shall be left behind. The Contractor will be required to dismantle, remove and properly dispose of the pad at their own expense.

1.15 AIR MONITORING PROGRAM

General

The Contractor shall develop, as part of the HASP, an air monitoring program (AMP). The purpose of the AMP is to determine what the proper level of personnel protective equipment is , to document that the level of worker protection is adequate, and to assess the migration of contaminants to off-site receptors as a result of site work. This AMP shall be prepared in accordance with the requirements of the New York State Department of Health (NYSDOH) Community Air Monitoring Plan (CAMP) (Attachment A to these HASP requirements) and the NYSDEC DER-10 guidance documents. The Contractor shall supply all personnel, equipment, facilities, and supplies to develop and implement the air monitoring program described in this section. Equipment shall include at a minimum real-time aerosol monitors, depending on work activities and environmental conditions. The Contractor's AMP shall include both real-time and documentation air monitoring (personal and area sampling as needed). The purpose of real-time monitoring will be to determine if an upgrade (or downgrade) of PPE is required while performing on-site work and to implement engineering controls, protocols, or emergency procedures if Contractor-established action levels are encountered.

The Contractor shall also use documentation monitoring to ensure that adequate PPE is being used and to determine if engineering controls are mitigating the migration of contamination to off-site receptors.

Documentation monitoring shall include the collection and analysis of samples for total nuisance dust. To protect the public in the neighboring residential neighborhood, the Contractor must include in the AMP provisions for suspending work and implementing engineering controls based upon detectable odors, as well as upon instrument monitoring results.

During the progress of active work, the Contractor will monitor the quality of the air in and around each active operation with real-time instrumentation prior to personnel entering these areas. Sampling at the work site will be conducted on a continuous basis. Any departures from general background will be reported to the SO prior to entering the area. The SO will determine when and if operations should be shut down.

Air monitoring (both real time and documentation monitoring) shall be conducted by a minimum of one dedicated person with communication to the foreman whenever intrusive activities (such as excavation) are performed in an exclusion zone. After completion of intrusive activities involving contaminated materials and removal of the exclusion zone, air monitoring may be discontinued. Air monitoring equipment will be operated by personnel trained in the use of the specific equipment provided and will be under the control of the SO. A log of the location, time, type and value of each reading and/or sampling will be maintained. Copies of log sheets will be provided on a daily basis to the Engineer's on-site representative.

A. Personal Monitoring

1. In addition to perimeter monitoring, personnel documentation samples will be collected on site once a week. On-site samples will be collected by choosing "high risk" workers to wear appropriate collection media for volatiles, metals and particulates. "High risk" workers are those who are most likely to encounter contamination on a particular task. At a minimum, two high risk workers will be chosen to wear collection media for a particular day each week and the media will be analyzed with the documentation air monitoring samples.

2. The documentation sampling submitted shall also identify the "high risk" workers chosen to wear appropriate collection media for contaminants; date media was worn; task involved; analytical results and applicable standards.

B. Community Air Monitoring

1. Real-time air monitoring, for particulate levels at the perimeter of the work area is necessary. Particulates should be continuously monitored upwind, downwind and within the work area at temporary particulate monitoring stations. If the downwind particulate level is 150 ug/m3 greater than the upwind particulate level, then dust suppression techniques must be employed. All readings must be recorded and be available for Engineer's review.

2. The Contractor shall install a meteorological station on site that will be capable of recording, at a minimum, wind velocity and direction.

3. Action Levels

The Contractor is responsible for developing level of protection site action levels for organic vapors, particulates, and/or inorganic species. In addition to these on-site action levels, the following action levels will be established for work area and perimeter monitoring of particulates. If the following levels are attained at the perimeter of the exclusion zone, then work will cease until engineering controls bring levels down to acceptable limits. These levels are general and shall be used as minimum action levels. The Contractor shall develop site specific

work area and perimeter monitoring action levels based on contaminants found in the work areas.

Parameter	Action Level	Action
Total particulates	2.5 times background and/or greater than 150 µg/kg	Work ceases until mitigated
Visible Dust	Visible dust as determined by ENGINEER	Work ceases until mitigated
Total Organic Vapors	5 ppm at project perimeter 25 ppm in work zone	Work ceases until mitigated
Odors	Noticeable odors outside the exclusion zone as determined by the ENGINEER	

4. Real-Time Monitoring

The Contractor shall submit a written copy of the real time air monitoring results for each Workday, by 10:00 a.m. the following Workday, which shall include an appropriately scaled map of the Work area depicting sample locations, wind direction and other pertinent meteorological data: date; time; analytical results; applicable standards and engineering controls implemented (necessary).

Real-time monitoring shall be conducted using the following equipment:

Organic vapor photoionizers shall be Photovac TIP, total organic vapor analyzer as manufactured by Photovac International, 739B Park Avenue, Huntington, New York 11743 or equal. The Contractor shall provide one Photovac TIP for each and every hazardous work zone operation. Particulate monitoring must be performed using real-time particulate monitors (MiniRam Model MIEPDM-3, or equal) and shall monitor particulate matter in the range of 0-10 microns diameter (PM10) with the following minimum performance standards:

Object to be measured: Dust, Mists, Aerosols

Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 µg/m3)

Logged Data:
Each Data Point: average concentration, time/date, and data point number

Run Summary:
overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number.

Alarm Averaging Time (user selectable):
real-time (1-60 seconds) or STEL (15 minutes)

Operating Time: 48 hours (fully charged NiMH battery);

continuously with Charger

Operating Temperature: -10 to 50EC (14 to 122EF)
Automatic alarms are suggested.

Particulate levels will be monitored and integrated over a period not to exceed 15 minutes. Consequently, instrumentation shall require necessary averaging hardware to accomplish this task. A monitor such as the personal DataRAM, manufactured by Monitoring Instruments for the Environment, Inc., or equivalent, can be used as a real time particulate screening tool. Although the instrument's design does not allow it to make a sharp differentiation of particulates at the PM10 standard, the instrument could be used in the passive mode without a pump to provide readings in the 0.1 to 10µ range in the immediate vicinity of construction activities.

Monitor the air, using the same equipment, for 10-15 minutes upwind of the work site to establish background level. The background level shall be established before the start of each shift every day. In the event that downwind particulates are detected at levels in excess of 150 ug/m3 or 2.5 times the established background level at the work site, re-measure the background concentrations upwind of the work zone using the same equipment. If the measured particulate level at the work zone is 100 ug/m3 above background, monitor the downwind site perimeter and implement additional dust controls in the work zone. Continue to take hourly measurements of the upwind background concentrations and compare such concentrations with the particulate level at the work zone, until the downwind level at the work zone is less than 100 ug/m3 above the upwind level. If at any time the measured particulate level at the work zone is more than 150 ug/m3 over background concentration, the Contractor shall immediately suspend work at the site, promptly notify the Safety Officer, and implement suitable corrective action or engineering controls before work resumes.

Real-time monitoring will be conducted at any excavation of contaminated soil or sediments. Real-time monitoring will also be conducted at perimeter locations including an upwind (background) and three downwind locations. A background reading will be established daily at the beginning of the work shift. If the wind direction changes during the course of the day, a new background reading will be made. Downwind readings at the perimeter will be made when Contractor action levels have been exceeded at the excavation face or at a minimum of twice a day.

If action levels are exceeded at the perimeter location for fugitive dust, work must be suspended and engineering controls must be implemented to bring concentrations back down to acceptable levels.

Construction activities generate dust that could potentially transport contaminants off site. There may be situations when visible dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Therefore, if dust is observed leaving the working site, the Contractor must employ additional dust suppression techniques.

5. Documentation Monitoring

Documentation monitoring will be conducted at the perimeter at a minimum of four locations (one upwind and three downwind) for total dust. Documentation monitoring will be

conducted only during excavation, consolidation, staging, removal, or decontamination activities (i.e., intrusive activities).

a. Collect total nuisance dust using PVC collection filter and personnel sampling pump and analyze gravimetrically according to NIOSH 89-127 Method 0500.

b. Documentation samples will be collected at established perimeter locations. The four locations will be chosen according to site activities and expected wind direction.

c. The perimeter locations will be established and marked with high visibility paint or flagging at approximately equidistant points around the site. Samples will be collected at a height of 6 feet above ground surface.

d. Documentation samples will be collected continuously, during the normal work hours when activities are occurring on site. At the end of the week two samples will be selected by the ENGINEER for analysis.

e. The Contractor shall submit a written copy of the documentation air monitoring results within 7 days of sampling to the NYSDEC, which shall include an appropriately scaled map of the Work area depicting sample locations, wind direction and other pertinent meteorological data: date; time; analytical results; applicable standards and engineering controls implemented (if necessary).

The documentation samples will be collected over an eight (8) hour work period.

1.16 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

Communications

The Contractor shall provide telephone communication at the site field office. Emergency numbers, such as police, sheriff, fire, ambulance, hospital, poison control, NYSDEC, EPA, NYSDOH, and utilities, applicable to this site shall be prominently posted near the telephone. The Contractor shall establish a signaling system for emergency purposes.

Emergency Shower and Emergency Eye Wash

The Contractor shall supply and maintain one portable eyewash/body wash facility per active hazardous work zone. The facility shall have a minimum water capacity of 10 gallons and shall conform to OSHA regulations 29 CFR 1910.151.

Fire Extinguishers

The Contractor shall supply and maintain at least one fire extinguisher in the Contractor's office and one at each hazardous work zone. The fire extinguisher shall meet OSHA Safety and Health Training Standards 29 CFR 1910.157.

First Aid Kit

The Contractor shall supply and locate in his project office and at each and every hazardous work zone one 24-unit (minimum size) "industrial" or "Contractor" first aid kit, required by OSHA requirements 29 CFR 1910.151.

Emergency Inventory

In addition to those items specified elsewhere, the SO will maintain the following inventory of equipment and protective clothing for use at the site in the event of emergencies.

a. Washable coveralls;
b. Gloves (outer);
c. Gloves (inner);
d. SCBA;
e. Escape SCBA (authorized visitor use);
f. Face shields;
g. Safety glasses;
h. Respirators and appropriate cartridges;
i. Disposable coveralls;
j. Chemical-resistant boots and latex boot covers;
k. Hard hats;
l. Bottled breathing air; and
m. Rain suits.

1.17 EMERGENCY RESPONSES/CONTINGENCY PLAN AND PROCEDURES

Daily Work

During the progress of work, the Contractor will monitor the quality of the air in and around each active hazardous operation prior to personnel entering these areas. Sampling shall be conducted on a continuous basis. Based on the air monitoring data, the proper level of protection will be chosen by the SO.

Emergency Vehicle Access

In the event that emergency services vehicles (police, fire, ambulance) need access to a location that is blocked by the working crew operations, those operations (equipment, materials, etc.) will be immediately moved to allow those vehicles access. The SO will brief emergency crews as to site conditions and hazards. All vehicles and personnel will be decontaminated prior to leaving the site.

Personal Injury Response Plan

The Contractor shall provide an “Injury Response Plan” as part of the HASP. In cases of personal injuries, the injured person or the crew personnel in charge will notify the SO. The SO will assess the seriousness of the injury, give first aid treatment if advisable, consult by telephone with a physician if necessary, and arrange for hospitalization if required.

Route to the Hospital

The Contractor shall post in conspicuous places in the Support Zone a map with written directions to the nearest hospital or emergency medical treatment facility (Attachment B).

Fire Service

The Contractor will make arrangements to take immediate fire fighting and fire protection measures with the local Fire Chief. If there is a fire, the crewmen or their person in charge will immediately call the SO. The SO will immediately call the fire personnel. The air downwind from any fire or explosion will be monitored immediately in order to protect workers and the nearby community. If personal injuries result from any fire or explosion, the procedures outlined in the Personal Injury Response Plan are to be followed.

Master Telephone List

The attached master telephone list will be completed and prominently posted at the field office. The list will have telephone numbers of all project personnel, emergency services including hospital, fire, police, and utilities.

Emergency Service	Telephone Number
Fire Department	911
Police Department	911
Ambulance	911
Hospital/Emergency Care Facility	_____
Poison Control Center	(800) _____
Chemical Emergency Advice (CHEMTREC)	(800) 424-9300
NYSDEC Albany Office Work Hours	(518) 457-7878
After Hours	888) 459-8667 (leave message)
NYSDEC Buffalo Office Work Hours	(716) 857-7200
New York State Dept. of Health - Albany	(518) 402-7890
New York State Dept. of Health - Buffalo	(716) 847-4302

1.18 HEAT STRESS MONITORING

Site personnel who wear protective clothing allow body heat to be accumulated with an elevation of the body temperature. Heat cramps, heat exhaustion, and heat stroke can be experienced, which, if not remedied, can threaten life or health. Therefore, an American Red Cross Standard First Aid book or equivalent will be maintained on site at all times so that the SO and site personnel will be able to recognize symptoms of heat emergencies and be capable of controlling the problem.

In addition, heat stress should be monitored and work limited accordingly. Monitoring and work limitation should follow the *American Conference of Industrial Hygienist 2005 or later Threshold Limit Values* for limiting heat strain and managing heat stress.

This liquid refreshment will be stored in a cooler at the edge of the decontamination zone in plastic squeeze bottles. The plastic bottles will be marked with individual's names. Disposable cups with lids and straws may be used in place of the squeeze bottles. Prior to drinking within the decontamination zone, the project personnel shall follow the following decontamination procedures:

A. Personnel shall wash and rinse their outer gloves and remove them.
B. Personnel shall remove their hard hats and respirators and place them on table.
C. Personnel shall remove their inner gloves and place them on table.
D. Personnel shall wash and rinse their face and hands.
E. Personnel shall carefully remove their personal bottle or cup from the cooler to ensure that their outer clothes do not touch any bottles, cups, etc.
F. The used bottle or cups will not be returned to the cooler, but will be placed in a receptacle or container to be cleaned or disposed of.
G. Personnel shall replace their respirators, hard hats, gloves and tape gloves prior to re-entering the hazardous zone.

When personnel are working in situations where the ambient temperatures and humidity are especially in situations where protection Levels A, B, and C are required--the SO must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent);
- Assure that frequent breaks are scheduled so overheating does not occur; and
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 1:00 p.m., and 6:00 p.m. to nightfall).

Cold Stress

Whole-body protection shall be provided to all site personnel that have prolonged exposure to cold air. The right kind of protective clothing shall be provided to site personnel to prevent cold stress. The following dry clothing shall be provided by the Contractor as deemed necessary by the SO:

- Appropriate underclothing (wool or other);
- Outer coats that repel wind and moisture;
- Face, head, and ear coverings;
- Extra pair of socks;
- Insulated safety boots; and
- Glove liners (wool) or wind- and water-repellant gloves.

The SO will use the equivalent chill temperature when determining the combined cooling effect of wind and low temperatures on exposed skin or when determining clothing insulation requirements. Site personnel working continuously in the cold are required to warm themselves on a regular basis in the on-site hygiene facility. Warm, sweet drinks will also be provided to site personnel to prevent dehydration. The SO shall follow the work practices and recommendations for cold stress threshold limit values as stated by the 2005 or later Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices by the American Conference of Governmental Industrial Hygienists or equivalent cold stress prevention methods.

1.19 LOGS, REPORTS AND RECORD KEEPING

The Contractor shall keep a daily log of security incidents and visitors granted access to the site will be maintained, as well as a log of all personnel entering and exiting the site. All approved visitors to the site will be briefed by the SO on safety and security, provided with temporary identification and safety equipment, and escorted throughout their visit. Site visitors

will not be permitted to enter a hazardous work zone. Project site shall be posted, "Warning: Hazardous Work Area, Do Not Enter Unless Authorized," and access restricted by the use of a snow fence.

Safety Log

The Contractor's SO will maintain a bound safety logbook. The log will include all health and safety matters on site and include, but not be limited to, the following information:

- Date and weather conditions on site;
- A description of the proposed work for the day;
- Times when site personnel arrive and depart;
- Air monitoring data;
- Heat and/or cold stress monitoring;
- Decontamination procedures;
- Type and calibration of air sampling/monitoring equipment used;
- Safety meeting summaries; and
- Accidents.

Emergency Or Accident Report

Any emergency or accident will be reported immediately to the SO. The ENGINEER will also be notified. The Contractor will submit a written report immediately, but no later than 24 hours of its concurrence. The report will include, but not be limited to, the nature of the problem, time, location, areas affected, manner and methods used to control the emergency, sampling and/or monitoring data, impact, if any, to the surrounding community, and corrective actions the Contractor will institute to minimize future occurrences. All spills will be treated as emergencies.

Daily Work Report

The Contractor shall maintain a daily work report that summarizes the following:

- Work performed,
- Level of protection,
- Air monitoring results,
- Safety-related problems, and
- Corrective actions implemented.

1.20 POSTING REGULATIONS

The Contractor will post signs at the perimeter of the Exclusion Zone that state "Warning, Hazardous Work Area, Do Not Enter Unless Authorized." In addition, a notice directing visitors to sign in will be posted at the project site. Also, the Contractor will post a sign stating that any questions about the site should be directed to the New York State Department if Environmental Conservation. Safety regulations and safety reminders will be posted at conspicuous locations throughout the project area. The following safety regulations and safety reminders are at a minimum to be posted around the job site.

SAFETY REGULATIONS

(To be Posted for Project Personnel)

The main safety emphasis is on preventing personal contact with gases, soils, sludge and water. Towards that end, the following rules have been established.

A. Eating, drinking and smoking on the site is PROHIBITED except in specifically designated areas.
B. All project personnel on the site must wear clean or new gloves daily.
C. If you get wet to the skin, you must wash the affected area with soap and water immediately. If clothes in touch with the skin are wet, these must be changed.
D. You must wash your hands and face before eating, drinking or smoking.
E. Observe regulations on washing and removing boots before entering the dressing room or a clean area.

1.21 COMMUNITY PROTECTION PLAN

A. General

Develop, as part of a HASP, a Community Protection Plan (CPP). The CPP shall outline those steps to be implemented to protect the health and safety of surrounding human population and the environment.

B. Air Monitoring

As part of the Air Monitoring Program, use real-time monitoring and documentation sampling as described in the Subpart “Air Monitoring Program” of this section to determine if off-site emission, as a result of site work, poses a threat to the surrounding community.

Provide real-time air monitoring for volatile compounds and particulate levels as the perimeter of the work area as necessary. Include the following:

1. Volatile organic compounds must be monitored at the downwind perimeter of the work area on a continuous basis. If total organic vapor levels exceed 5 ppm above background, work activities shall be halted and monitoring continued under the provisions of a Vapor Emission Response Plan. All readings shall be recorded and be available for State (DEC & DOH) personnel to review.

2. Particulates shall be continuously monitored at the 4 documentation sampling stations for a total of 4 dust monitors. If the downwind particulate level is 150 ug/m3 greater than the upwind particulate level, dust suppression techniques shall be employed. All readings shall be recorded and be available for State (DEC & DOH) personnel to review.

B. Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities shall be halted and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities may

resume. If the organic vapor levels are greater than 5 ppm over background but less than 225 ppm over background at the perimeter of the work area, activities may resume provided the organic vapor level 200 feet downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities shall be shutdown. When work shutdown occurs, downwind air monitoring as directed by the SO shall be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

C. Major Vapor Emission

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, all work activities shall be halted. If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, the air quality shall be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone). If efforts to abate the emission source are unsuccessful and if organic vapor levels are approaching 5 ppm above background and persist for more than 30 minutes in the 20 Foot Zone, the Major Vapor Emission Response Plan shall automatically be placed into effect. However, the Major Vapor Emission Response Plan shall be immediately placed into effect if organic vapor levels are greater than 10 ppm above background levels.

D. Major Vapor Emission Response Plan

Upon activation, the following shall be undertaken:

All Emergency Response Contracts as listed in the Subpart titled “Emergency Response and Contingency Plan” paragraph titled “Telephone List.”

The local police authorities shall immediately be contacted by the SO and advised of the situation. Coordinate with local officials to arrange for notification and evacuation of the surrounding community.

Frequent air monitoring shall be conducted at 30 minutes intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring say be halted or modified by the SO.

The Air Monitoring Program shall include real-time air monitoring and shall be conducted at the perimeter of the site. Particulates should be continuously monitored upwind, downwind and within the Exclusion Zone at temporary particulate monitoring stations. If the downwind particulate level is more than 2.5 times greater than the upwind particulate level and greater than 150 ug/m3, then dust suppression techniques shall be employed. This is a general action level. A site-specific action level shall be developed based on available analytical data. All readings shall be recorded and be available for ENGINEER, NYSDEC, and NYSDOH personnel to review.

Coordinate with local officials to arrange for notification and evacuation of the surrounding community in the event that off-site emissions pose a threat.

E. Odor Response Plan

As a contingency, the Contractor shall arrange the appropriate materials and equipment to foam active work areas to reduce odors if odor complaints are received from nearby businesses during site activities. Odor masking agents or other odor control methods may be used subject to Engineer's review. Continue odor suppression during each day that odor complaints are received or as directed by ENGINEER or the NYSDEC.

F. On and Off-Site Spill Response

Produce as part of the HASP a Spill Response Plan also coordinated with local officials, (including US Coast Guard) in case of an off-site spill of either liquid or solid wastes. The plan shall include transportation routes and times, as well as the minimum requirements set forth in the Subpart titled "On-Site Spill Containment Plan."

1.22 RADIATION PROTECTION PROGRAM

The Radiation Protection Program is detailed in the URS Safety Management Standard 052 included as Attachment C to these HASP requirements.

ATTACHMENT A

NYSDOH COMMUNITY AIR MONITORING PLAN

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see Paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

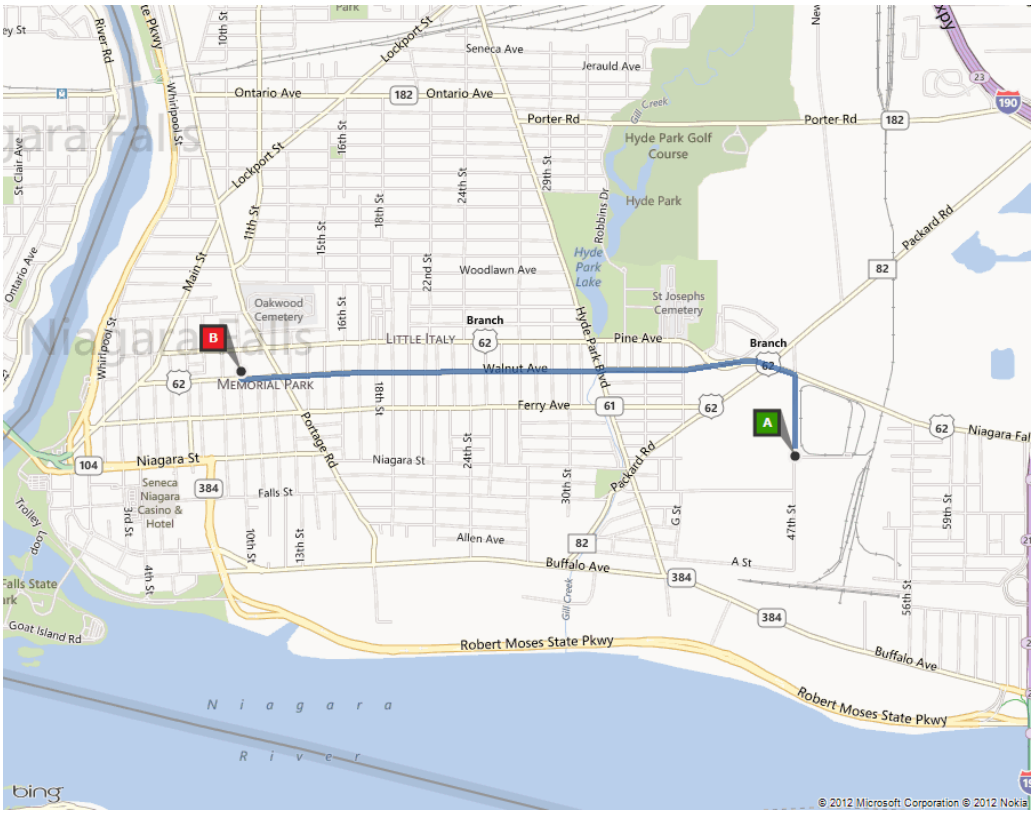
8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

ATTACHMENT B

HOSPITAL ROUTE MAP

Figure 3 - Route to Hospital:

Niagara Falls Memorial Medical Center
621 10th Street
Niagara Falls, New York 14302-0708
(716) 278-4000



Route: **2.5 mi, 8 min**

A	**400 47th St, Niagara Falls, NY 14304**	**A–B: 2.5 mi** 8 min
	1. Depart **47th St** toward US-62 / Niagara Falls Blvd	0.3 mi
↰	2. Turn **left** onto **US-62 / Niagara Falls Blvd**	0.1 mi
↑	3. Keep **straight** onto **US-62 N Branch / Niagara Falls Blvd**	0.2 mi
↰	4. Keep **left** onto **US-62 N / Walnut Ave** *Pass Coastal on the right in 1.3 mi*	1.8 mi
↱	5. Turn **right** onto **10th St**	148 ft
B	6. Arrive at **621 10th St, Niagara Falls, NY 14301** *The last intersection is US-62 N / Walnut Ave* *If you reach US-62 Branch / Pine Ave, you've gone too far*	

ATTACHMENT C

URS RADIATION PROTECTION PROGRAM
(SMS 052)

1.0 PURPOSE AND SCOPE

This Radiation Protection Program was prepared for use on URS field projects with known radioactive contamination that may result in the exposure of employees to ionizing radiation, particularly projects at Formerly Utilized Sites Remedial Action Program (FUSRAP) sites. This document was developed to ensure that

- Activities at these sites are conducted in a manner consistent with sound radiological practices,
- Radiological exposure to site personnel and the environment are maintained As Low as Reasonably Achievable (ALARA), and
- Activities at these sites are performed in a manner consistent with applicable federal, state, and local regulations.

This Radiation Protection Program was prepared pursuant to the requirements of U.S. Army Corps of Engineers (USACE) EM-385-1-1, Section 6E (*Radiation Safety Program*) and is consistent with the requirements for a Radiation Protection Program presented at 10 CFR 20.1101 (commensurate with the types of activities that URS will perform at FUSRAP sites). Note: None of these sites are licensed by the Nuclear Regulatory Commission (NRC), and as such, URS is not considered a licensee of the Nuclear Regulatory Commission (or any other Agreement State program) in regard to activities on these sites. Use or possession of licensable quantities of radioactive materials requires the issuance of a radioactive materials license from the NRC or an Agreement State.

An annual review of this Radiation Protection Program's content and implementation will be conducted by URS' Corporate Radiation Safety Officer, in accordance with 10 CFR 20.1101(c) and EM-385-1-1, Section 6E.

2.0 APPLICABILITY

The work practices specified in this Radiation Protection Program apply to work conducted by URS personnel involved in contracts that may result in the exposure of employees to ionizing radiation. Each URS employee working in a radiation area or a restricted area is responsible for following this Program. The URS Project Manager is responsible for ensuring that the Program is implemented at a particular site.

The majority of URS' contracts under the purview of this Program are expected to be at construction and environmental investigation/restoration projects involving materials containing low levels of radiation and radioactivity. Although this Program has been tailored for these types of activities, implementation of Program elements will be commensurate with the nature of each site-specific project. Implementation of this Program will be performed through the applicable site-specific health and safety plan (HASP) and associated standard operating procedures.

3.0 GENERAL

3.1 References

- Department of Transportation (DOT) – Transportation: Hazardous Materials Regulations – 49 CFR 171-177
- NRC – Standards for Protection Against Radiation – 10 CFR 20

- U.S. Occupational Safety and Health Administration (OSHA) – Ionizing Radiation – 29 CFR 1910.96
- U.S. OSHA – Ionizing Radiation – 29 CFR 1926.53
- USACE – Ionizing Radiation – EM-385-1-1, Section 6E

3.2 Definitions

Airborne Radioactivity Area - Area where the measured concentration of airborne radioactivity above natural background exceeds a peak concentration of 1 DAC or 12 DAC-hours during a work week.

As Low As Reasonably Achievable (ALARA) - An approach to radiological control or a process to manage and control exposures to the work force and to the general public at levels as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations.

Bioassay - Measurement of radioactive material deposited within or excreted from the body. This process includes whole body, urine and organ counting and others.

Contaminated Area - An area in which radioactive contamination is present that exceeds removable levels presented in Table 7.1.

Controlled Area - An area in which access is controlled in order to protect personnel from exposure to radiation and radioactive materials. An area in which the existing or potential radiation and radioactivity levels are above normal background but are less than that designating a Radiological Area or a restricted area.

Derived Air Concentration (DAC) - The concentration of a radionuclide in air that, if breathed over the period of a work year, would result in the annual limit on intake being reached.

Disintegration per Minute (dpm) - The rate of emission by radioactive material as determined by correcting the counts per minute observed by a detector for background, efficiency, and window size associated with the instrument.

Dose - A generic term for the amount of energy deposited in body tissue due to radiation exposure. Technical definitions for dose terms necessary for various exposure calculations and recordkeeping purposes include the following:

> absorbed dose (D): Energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest in that material. The units of absorbed dose are the rad and the gray (Gy).
>
> dose equivalent (HT): The product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert (Sv).
>
> effective dose equivalent (HE): The sum of the products of the dose equivalent to the organ or tissue (HT) and the weighting factors (WT) applicable to each of the body organs or tissues that are irradiated (HE = SWT x HT)
>
> committed dose equivalent (HT,50): The dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by a person during the 50-year period following the intake.

committed effective dose equivalent (HE,50): The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues (HE,50 = SWT x HT,50)

total effective dose equivalent (TEDE): The sum of the deep dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

total organ dose equivalent (TODE): The sum of the deep dose equivalent (for external exposures) and the committed dose equivalent to an individual organ or tissue (for internal exposures).

Fixed Contamination - Radioactive material that cannot readily be removed from surfaces by nondestructive means such as causal contact, wiping, brushing, or washing.

Frisking - Process of monitoring personnel for contamination.

Hazardous Work Permit (HWP) - Permit that identifies radiological conditions and health and safety hazards, establishes worker protection and monitoring requirements, and contains specific approvals for radiological work activities. The HWP serves as an administrative process for planning and controlling radiological work and informing the worker of the radiological, health, and safety issues.

High Radiation Area - An area, accessible to personnel, in which radiation levels could result in a person receiving a dose equivalent to or in excess of 100 mrem in 1 hour at 30 cm from the radiation source or from any surface that the radiation penetrates.

Internal Dose - The portion of the dose equivalent to that received from radioactive material taken into the body.

Lifetime Dose - Total occupational exposure over a worker's lifetime, including external and committed internal dose.

Low Level Radioactive Waste - Waste that contains radioactivity and is not classified as high level waste, transuranic waste, spent nuclear fuel, or by-product material as defined in Section 11e(2) of the Atomic Energy Act.

Mixed Waste - Waste containing low level radioactive waste as well as Resource Conservation and Recovery Act (RCRA) or Toxic Substances Control Act (TSCA) waste.

Naturally Occurring Radioactive Material (NORM) - Includes radioactive elements found in the environment. Long-lived radioactive elements of interest include uranium, thorium and potassium, and any of their radioactive decay products, such as radium and radon. These elements have always been present in the earth's crust and within the tissues of all living beings.

Occupational Dose - The dose received by a person during employment in which the person's assigned duties involve exposure to radiation and to radioactive material. Occupational dose does not include dose received from background radiation, as a patient from medical practices, from voluntary participation in medical research programs, or as a member of the public.

Personnel Dosimetry - Devices designed to be worn by a single person for the assessment of dose equivalent such as film badges, thermoluminescent dosimeters (TLDs), and pocket ionization chambers.

Personnel Monitoring - Systematic and periodic estimate of radiation dose received by personnel during work hours.

Radiation - Ionizing radiation includes alpha particulate, beta particulate, X-rays, gamma rays, neutrons, and other particulates capable of producing ions.

Radiation Area - An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent to or in excess of 0.005 rem in 1 hour at 30 cm from the source of radiation or from any surface that the radiation penetrates.

Radiation Work Permit (RWP) - Permit that identifies radiological conditions, establishes worker protection and monitoring requirements, and contains specific approvals for radiological work activities. The RWP serves as an administrative process for planning and controlling radiological work and informing the worker of the radiological, health, and safety issues.

Radioactive Material Area - A controlled area or structure where radioactive material is used, handled, or stored.

Radiological Worker - Worker whose job assignment requires work on, with, or in the proximity of radiation production machines or radioactive materials. A radiological worker has the potential to be exposed to more than 100 mrem per year, which is the sum of the dose equivalent to external irradiation and the committed effective dose equivalent to internal irradiation.

Removable Contamination - Radioactive material that can be removed from surfaces by nondestructive means, such as casual contact, wiping, brushing, or washing.

Survey - An evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other source of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.

Technologically Enhanced Naturally Occurring Radioactive Material (TENORM) - Any naturally occurring radioactive materials not subject to regulation under the Atomic Energy Act whose radionuclide concentrations or potential for human exposure have been increased above levels encountered in the natural state by human activities.

Thermoluminescent Dosimeter (TLD) - Radiation detection and measuring device used to record the radiological exposure of personnel or area to certain types of radiation.

Unrestricted Area - An area designated by the NRC as being an area to which access is neither limited nor controlled by a NRC licensee.

3.3 Organization

3.3.1 Vice President/Director of Health, Safety, and Environment (HSE)

URS' Vice President/Director of Health, Safety, and Environment (HSE) is responsible for overall administration of the environmental health and safety program, including the Radiation Protection Program.

3.3.2 Business Radiation Safety Officer

URS' Business Radiation Safety Officer is responsible for:

- Continuing to develop and implement the Radiation Protection Program;

- Reviewing the qualifications of site radiation safety personnel (Site Radiation Safety Officer and Health Physics Technicians);
- Reviewing and approving the standard operating procedures that implement specific elements of the Radiation Protection Program;
- Conducting audits of site radiation safety programs; and
- Periodic reviewing of personnel radiation monitoring results.

3.3.3 Site Radiation Safety Officer

The Site Radiation Safety Officer (SRSO) will develop and coordinate implementation of the Radiation Protection Program. The SRSO will evaluate potential site/employee radiation exposure and recommend workplace and administrative controls, as necessary. The SRSO will be responsible for the development and administration of the Radiation Protection Program that will be incorporated in the HASP and associated standard operating procedures. The SRSO will be responsible for implementing and managing the site-specific Radiation Protection Program, as well as ensuring that all employees under the SRSO's control are knowledgeable of applicable radiological safety requirements for their work area and comply with these requirements.

The SRSO will be technically qualified and will meet the following experience, training, and education minimal requirements:

- Formal training in radiation protection that covers the following topics: physics of radiation, radiation interaction with matter, mathematics necessary for the subject matter, biological effects of radiation, and type and use of instruments for detection, monitoring, and surveying radiation;
- Hands-on training in the theory and uses of radiation monitoring equipment, and procedures; and
- Knowledge of regulations (NRC, Environmental Protection Agency, DOT, and Department of Defense) to include all applicable components pertaining to radioactive materials, radiation-generating devices, and radioactive and mixed waste.

Operations involving radiation hazards or use of radioactive material or radiation-generating devices will be performed under the direct supervision of a person, designated in writing by the SRSO, who is qualified and responsible for radiation safety. This person will conduct surveys and evaluate and secure any specialized assistance to assure compliance with radiation protection standards.

3.3.4 Health Physics Technicians

Health Physics Technicians will be responsible for assisting the SRSO in the implementation of radiological controls on each site. Specific responsibilities will include

- Performing radiological surveys;
- Collecting effluent samples (air and water); and
- In conjunction with the SRSO, assessing radiological hazards during work changes and making adjustments to ensure that worker radiological exposures and releases to the environment are maintained ALARA.

Qualifications of Health Physics Technician personnel will be reviewed by the SRSO to ensure that the level of expertise is commensurate with the assigned duties. Minimally,

Health Physics Technicians will meet the experience and training requirements contained in American National Standards Institute (ANSI) 18.1, 1969. Personnel who do not yet meet these minimal requirements may be allowed to perform limited radiological monitoring tasks, under the supervision of a qualified Health Physics Technician.

3.3.5 URS Project Manager

The URS Project Manager will be responsible for

- Reviewing each scope of work to identify potential radiation hazards;
- Designating a SRSO;
- Arranging for employees on the project to receive appropriate radiation safety training;
- Ensuring that employees working on the project are monitored for radiation exposures; and
- Arranging for employee monitoring results to be sent to the URS Occupational Health Specialist.

The URS Project Manager ensures that all employees under his or her control are knowledgeable of applicable radiological safety requirements for their work area and compliance with these requirements. Project Managers emphasize the need for high standards for radiological control through direct communication, support of radiation control goals, and a presence in the workplace.

3.3.6 Employees

Employees are responsible for knowing radiological protection requirements for their work areas and complying with these requirements.

4.0 ALARA PROGRAM

4.1 Policy Statement

It is URS' policy to conduct all work with ionizing radiation in accordance with established good practices in radiation protection, and in all cases, to incorporate radiological criteria to ensure safety and maintain radiation exposures ALARA. To this end, URS business management holds its Project Managers responsible for implementing all plans and procedures prepared in accordance with regulatory and contract documents. Project Managers will be responsible for demonstrating URS' commitment through direct communication, instruction, and inspections of the workplace. Project Managers will use facility and equipment design features as the primary method to maintain exposures ALARA. In most cases, decontamination operations represent an uncommon activity in facilities designed for specific purposes. Design features of temporary facilities and special equipment will be in general augmented by administrative and procedural requirements.

4.2 Administrative Implementation Procedures

Implementation of specific steps aimed at maintaining radiation exposures ALARA will be determined on a site-specific basis and will be commensurate with the nature of both the radiological work being performed and the radiation hazards present. Minimally, the following steps will be implemented on all sites:

- Radiation exposure estimates will be made and used to set project ALARA dose goals;

- Periodic review of actual radiation exposures against projected dose values will be conducted; if necessary, adjustments will be made to the administrative and engineering controls that are in place; and
- An ALARA Committee will be formed, consisting of the SRSO, Site Manager, Health Physics Supervisor (if applicable), and representatives of the workforce. This committee will meet periodically (at least every quarter); the frequency will be dependent on the nature of the radiological work being conducted and radiation levels present. Activities of the ALARA Committee are detailed in Section 4.3, ALARA Committee.

Commensurate with the nature of the work being performed and radiation levels present, the following additional measures will be considered (specific implementation of these additional program measures will be documented in the HASP):

- Inclusion of Radiation Control Hold Points in Work Documents;
- Work Processes and Special Tools to Reduce Exposures;
- Engineering Controls to Minimize the Spread of Activity;
- Special Radiological Training or Monitoring Requirements;
- Mockups for High Exposure or Complex Tasks;
- Engineering, Design, and Use of Temporary Shielding;
- Walkdown or Dry-run of the Activity Using Applicable Procedures;
- Staging and Preparation of Necessary Materials/Special Tools; and
- Maximization of Prefabrication and Shop Work.

4.3 ALARA Committee

An ALARA Committee will be formed for each site at which there is a potential for exposure to radiation at levels that significantly exceed natural background. This Committee will be minimally composed of the SRSO, Project Manager, Health Physics Supervisor (if applicable), and one representative of the site labor force.

The ALARA Committee will meet periodically (at a minimum of once each quarter) and will review previous site radiation exposure, air monitoring, effluent monitoring, and contamination level data to assess the presence of unacceptable trends. Additionally, this Committee will periodically assess the success of the radiological controls and serve as a forum for recommendations for improvements. A written record (minutes) of the Committee's activities will be maintained. The ALARA Committee will serve the function of the Ionizing Radiation Safety Committee (ISRC), referenced in EM-385-1-1, Section 6E.

5.0 EXPOSURE LIMITS

5.1 Administrative Goals

Administrative goals for radiological protection performance will be established for each site. These limits are more conservative than regulatory limits, commensurate with the work plan and level of hazard, and in accordance with the ALARA principle. Annual radiological goals (not to be exceeded) are as follows:

- Maximum individual total effective dose equivalent: 500 mrem

- Maximum embryo/fetus total organ dose equivalent for a declared pregnancy:100 mrem
- Maximum total effective dose equivalent to a member of the public, or visitor (excluding radon and thoron): 10 mrem.

5.2 Occupational Exposure Limits

The occupational exposure to employees performing the duties of radiation workers will be controlled so that the limits in Table 5.1 are not exceeded in one year. Furthermore, measures will be taken to maintain doses as far below these limits as reasonably achievable through the use of administrative goals, engineering controls, and application of the ALARA process. All of the occupational exposure received during the year, including exposures while employed elsewhere, will be included in the determination of occupational exposure. Radiation exposures from normal background, therapeutic and diagnostic medical radiation, and voluntary participation in medical research programs will not be included in the determination of occupational exposure. Planned special exposures will not be used.

Table 5.1 Occupational Radiation Exposure Limits

Part of the Body	Annual Dose Equivalent Limit[1]
Stochastic Effects	
Whole body, head, trunk, arm, and leg, including elbow and knee	5 rem total effective dose equivalent - sum of deep dose equivalent and the committed effective dose equivalent
Non-Stochastic (Deterministic) Effects	
Arms and legs (includes hands and feet) below knee	50 rem total dose equivalent from shallow and/or deep dose equivalent
Skin of whole body	50 rem shallow dose equivalent
Individual organ or tissue	50 rem sum of deep dose equivalent and the committed dose equivalent
Lens of eye	15 rem dose equivalent
Embryo/fetus during entire gestation period - declared pregnancy	0.5 rem dose equivalent - sum of deep dose equivalent and dose equivalent from internal radionuclides

[1]In addition to the annual dose limits, soluble uranium intake will be limited to 10 milligrams per week in consideration of chemical toxicity.

5.3 Embryo/Fetus Exposure Limits

The occupational dose equivalent limits applicable to the embryo/fetus are detailed in Table 5.1 and apply to a "declared pregnancy." In such a case, a woman elects to declare the pregnancy and limit the dose received by the embryo/fetus as provided in regulatory requirements. In this case, the dose equivalent goal for the embryo/fetus, from the period of conception to birth, from occupational exposure will be no more than 100 mrem.

Efforts will be made to maintain exposures ALARA and to avoid significant variations above a uniform monthly exposure during the pregnancy. If the dose equivalent has exceeded 500 mrem by the time the pregnancy is declared, steps will be taken to ensure that additional occupational exposure is unlikely. Declaration of Pregnancy Form – Attachment 052-4 NA

will be used to document this decision. Embryo/Fetus Initial Dose Calculation – Attachment 052-5 NA will be used to assess the radiation exposure to the embryo/fetus at the time of declaration. Withdrawal of Declaration of Pregnancy – Attachment 052-6 NA will be used to withdraw a pregnancy declaration.

5.4 Minor Exposure Limits

URS' policy is that no worker under 18 years of age will be allowed to work on site where there is the potential for exposure to radiation. This requirement is consistent with EM-385-1-1, Section 6E, which does not allow the occupational radiation exposure of minors.

5.5 Members of the Public Exposure Limits

The annual exposure limit for any member of the public will be limited to 100 mrem total effective dose equivalent, regardless of whether the individual is inside or outside of a controlled area. The dose equivalent in any unrestricted area from external sources will not exceed 2 mrem in any one hour or 50 mrem per year, regardless of occupancy by a member of the public.

5.6 Air and Liquid Effluents

The release of radioactivity in air or liquid effluents to unrestricted areas will be monitored and controlled in accordance with the requirements of 10 CFR 20.1302. Projects subject to state or local regulatory requirements will comply with the effluent limitations in those requirements. For projects at low hazard sites, workplace monitoring and/or conservative modeling can be used to determine compliance with effluent limitations. Records of radioactive effluent monitoring and/or modeling will be generated and maintained to demonstrate compliance with effluent limitation requirements.

6.0 CONDUCT OF RADIOLOGICAL WORK

6.1 Planning

Incorporation of radiological protection requirements such as engineering controls and dose and contamination reduction considerations is the key to the successful execution of work activities in areas where there is a potential for exposure to radiation or radioactive materials. Review and incorporation of such controls and considerations will be made on a site-by-site basis and will be commensurate with the quantity and type of radioactive materials present. Appropriate requirements will be documented in applicable work plans and procedures, and in the HASP.

Projected radiation dose (internal and external) estimates will be made for all jobs involving potential exposure to radiation or radioactive materials. The complexity of these exposure estimates will be commensurate with the levels of radiation and radioactive materials present and the types of activities involved. At a minimum, documentation of these exposure estimates will be placed in the site-specific project file.

Trigger levels for the development and execution of formal ALARA reviews will be adopted on a site-specific basis and documented in the HASP or associated standard operating procedures (SOPs). At a minimum, formal ALARA reviews will be conducted any time a projected individual dose exceeds 200 mrem or collective dose estimates exceed 2,000 person-mrem.

6.2 Work Permits

Radiation Work Permits (RWP; see Radiation Work Permit – Attachment 052-2 NA) will be used to inform workers of area radiological conditions and entry requirements, and to provide a mechanism to relate worker exposure to specific work activities. They will be used at all sites that have a potential for exposure to radiation or radioactive materials. If appropriate, radiological requirements will be combined with other, nonradiological requirements, onto a single Hazardous Work Permit (HWP; see Hazardous Work Permit – Attachment 052-3 NA). Implementation of a work permit program will be made on a site-specific basis, as specified in the HASP and any associated SMSs. However, the following minimum requirements will be met:

- RWP/HWPs will be written based on radiological survey data that are appropriate to characterize the expected work conditions;
- RWP/HWPs will detail the work area and activity that are within their scope and will contain detailed specifications required for protective measures, including dosimetry, air sampling, PPE, respiratory protection, work area preparation, and health physics oversight;
- RWP/HWPs will be reviewed and approved by the SRSO. Modifications to existing RWP/HWPs require the concurrence of the SRSO or designee;
- RWP/HWPS will be posted in a conspicuous area (if possible, they will be posted at the access point to the applicable radiological work area);
- Workers will acknowledge by signature that they have read, understand, and will comply with the RWP/HWPs prior to initial entry to the area and after any revisions to the RWP/HWPs; and
- RWP/HWPs will be updated if radiological conditions change to the extent that protective requirements need modification.

6.3 Control Zones

6.3.1 Access/Egress Procedures

Only appropriately trained, authorized, and qualified personnel are permitted access to radiological controlled areas. The degree of control will be commensurate with the existing and potential radiological hazards within the area and may include, for example, signs and barricades, entranceways locked against ingress, control devices or alarms, or administrative controls. Additional access control measures for High and Very High Radiation Areas will be established in accordance with NRC-specific requirements, as appropriate. The controls will be established so that rapid egress from the controlled area in an emergency is not prevented.

Control measures and established procedures will incorporate a hazardous work permit (HWP) system to ensure appropriate planning, control, hazard communication, and documentation of work activities in Radiological Controlled Areas (RCA) that include Radiation Areas, Contamination Areas, or Airborne Radioactivity Areas. Task-specific HWPs will be used for short-term work in these RCAs with the potential for changing radiological conditions. General HWPs may be used for longer-term activities in RCAs with known, stable radiological conditions.

Personnel frisking and/or monitoring will be conducted before exiting radiological contaminationed areas and other areas where contamination is suspect. If the instruments

indicate greater than 100 cpm over background, a Health Physics Technician will be contacted for decontamination of personnel.

6.3.2 Posting and Labeling

The standard radiation symbol (ANSI N2.1/12.1) in magenta or black on a yellow background (or alternate as provided by regulations) will be used to warn individuals of the presence of radiation and/or radioactive material. Each access point to a controlled or restricted area will be posted with the appropriate identification and instructions. For controlled or restricted areas, each area will be posted as detailed in Table 6.1.

Table 6.1 Posting Requirements

Posting	Definition
Caution Radiation Area	5 mrem in 1 hr at 30 cm
Danger High Radiation Area	100 mrem in 1 hr at 30 cm
Grave Danger, Very High Radiation Area	500 rads in 1 hr at 1 m
Caution Airborne Radiation Area	>1 DAC or 12 DAC hr/week
Caution Radioactive Materials	Radioactive material handled, used, or stored
Contamination Area	Removable radioactive contamination in excess of values listed in Table 7.1

Additionally, NRC Form 3, "Notices to Employees," will be posted in a location visible to all employees who work with or around radioactive materials.

7.0 MONITORING

7.1 Personnel Monitoring

7.1.1 Internal Dosimetry

All personnel who have the potential to receive intakes of radioactive materials that may result in a committed effective dose equivalent of 500 mrem will participate in an appropriate bioassay program. This program will be reviewed and approved by a qualified Health Physicist and will be capable of detecting internal radioactive materials at a level below 10% of the Annual Limit of Intake listed in Appendix B of 10 CFR 20 for each radionuclide for which exposure at this level is likely.

Prior to beginning work in restricted or controlled areas with the potential for internal exposure in excess of the levels stated previously, each radiation worker will have an appropriate baseline bioassay performed. These individuals will also have an appropriate exit bioassay performed when they leave the project.

All personnel who perform routine field activities where the potential for removable surface or airborne radioactive contamination exists will participate in an appropriate routine bioassay program. Special follow-up bioassay procedures will be implemented whenever a suspected intake has occurred or routine bioassay results are above a derived investigation level.

7.1.2 External Dosimetry

Monitoring applies to any individual likely to receive an annual external whole body exposure in excess of 10% of the occupational limit. In addition, personnel monitoring is required for any individual who enters a High or Very High Radiation Area. All personnel dosimetry used will be processed and evaluated by a processor holding a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology (NIST). The work-related radiation exposure history will be acquired from past employers where radiation monitoring was required.

7.1.3 Summation of Internal and External Exposures

Internal committed effective dose equivalents and external effective dose equivalents during the year will be combined to determine the annual total effective dose equivalent in accordance with the requirements of federal and state regulations. Generally, summation will be required when intakes exceed 10% of the annual limit on intake, may result in a total effective dose equivalent of 50 mrem for minors or visitors, or may result in a dose equivalent of 50 mrem to the embryo/fetus for declared pregnant women. The deep dose equivalent to the whole body may be used as the effective dose equivalent for external exposures. The quality factors (Q) prescribed by the applicable regulatory jurisdiction will be used to calculate the dose equivalent in rem from the absorbed dose.

7.2 Medical Surveillance

No specific medical surveillance requirements exist for exposure to radiation levels at occupational levels. General medical surveillance requirements for all hazardous waste sites are contained in each HASP. URS' medical monitoring program is administered in accordance with the URS SMS 024 – Medical Screening and Surveillance.

All cases of overexposure and suspected ingestion or inhalation of radioactive materials must be reported to the SRSO immediately. The URS Medical Consultant will advise the SRSO on the type(s) of test(s) required to accurately assess exposure effects.

7.3 Workplace Monitoring

7.3.1 Surveys

Radiological monitoring and surveys of radiation exposure levels, contamination, and airborne radioactivity will be conducted to

- Characterize workplace conditions and detect changes in those conditions;
- Verify the effectiveness of physical design features, engineering and process controls, and administrative control procedures;
- Demonstrate regulatory compliance;
- Detect the gradual buildup of radioactive material;
- Identify and control potential sources of personnel exposure; and
- Identify areas requiring postings.

Monitoring will be performed only by trained and qualified personnel and will be conducted as specified in the HASP and associated RWPs.

At a minimum, radiological surveys will be conducted:

- Once per shift at entrance or exit points between contamination areas and clean areas;
- Daily in RCAs;
- Weekly in radiation and/or contamination areas;
- Weekly in clean areas; and
- As specified on RWPs/HWPs.

7.3.2 Air Sampling

General area and personal air sampling will be conducted in accordance with the guidance in NRC Regulatory Guide 8.25. Air sampling will be employed when necessary to determine whether confinement of radioactive material is effective, to determine workplace administrative controls required, to estimate worker intakes, and to determine what PPE is appropriate.

General area air sampling for airborne radioactivity will be conducted with high-volume air samplers where the potential for airborne radioactivity is above background levels. High-volume air samplers are those with sufficient flow rate to achieve a minimum detectable activity (MDA) of 10% of the applicable derived air concentration (DAC) in an 8-hour shift. For small jobs with documented minimal airborne radioactivity potential, general area air sampling for airborne radioactivity will not be required. Air samples will be analyzed in accordance with written procedures**.** In areas with a potential for short-term airborne excursions, representative grab samples will be collected in the immediate vicinity of work being performed to determine whether the area is an airborne radioactivity area requiring additional work controls and whether personal breathing-zone air sampling is necessary to assess the worker's intake of airborne radioactive materials. As with the protocol for personal sampling, high-volume sample results will be compared with the most conservative DAC.

When required to estimate worker intakes, representative personal air sampling from each field team working in radiologically contaminated areas will be conducted for airborne radioactivity in the breathing zone. To gauge employee exposure potential, the data will be compared with the DAC that is the most conservative for the contaminant(s) expected to be present. DACs for radioactive contaminants in Appendix B to 10 CFR 20 will be used to assess exposure potentials, as appropriate.

7.4 Release of Materials from Contamination Areas

Radiological contamination survey, documentation, and labeling requirements will be established for all property/material released from an RCA. All equipment, materials, and property used in an RCA established for contamination control will be considered as potentially contaminated and will not be released to an uncontrolled or unrestricted area until they have been surveyed and meet the unconditional release limits listed in Table 7.1 or site-specific requirements.

If the property/material to be released either cannot be monitored using standard survey techniques or is a volume or bulk material, such as liquids, soils, etc., it will be considered potentially contaminated. A special property/waste release evaluation will be conducted prior to release. The release limits for these materials will be established in accordance with specific guidance from the cognizant regulatory authority. All surveys and evaluations for release of potentially contaminated property/material to uncontrolled or unrestricted areas will be documented.

Table 7.1 Surface Radioactivity Release Limits

Radionuclide	Removable dpm/100 cm^2	Total (Fixed + Removable) dpm/100 cm^2
U-natural, U-235, U-238, and associated decay products	1,000	5,000
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	100
Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (i.e., those with other than alpha emitters or spontaneous fission) except Sr-90 or radionuclides listed in this table	1,000	5,000

7.5 Instrument Calibration

Radiation detection instrumentation will be provided as appropriate for performing necessary surveys and monitoring. The instrumentation will be selected based upon the type of radiation detected, measurement capability, and range in accordance with the radiological hazards present or anticipated for the project.

Calibration of radiological instruments and equipment will be performed by the vendor or a calibration service in accordance with ANSI N323, 1997, using standards traceable to the NIST primary standards. The calibration certificate will be maintained by the SRSO.

Field calibration of counting instrumentation in accordance with approved written procedures is authorized if it meets the previous requirements and the source calibration certificate and if documented detection efficiency determinations are maintained in the site-specific project file. Each instrument or piece of equipment will have a calibration sticker with an expiration date affixed.

At a minimum, performance tests of radiological instruments will be conducted before use. Unless more stringent site-specific criteria have been established (as documented in the HASP), satisfactory performance test results will be within +/- 20% of the expected response. Instruments that do not meet performance test criteria, are found to be out of calibration, or are defective will be removed from service until repaired and/or calibrated. The results of these checks will be recorded in a daily source check log by the performer and will be maintained in the site-specific project file. All performance tests will be conducted in accordance with ANSI N323, 1997, guidance using the manufacturer's recommendations and approved written procedures.

8.0 PERSONNEL PROTECTIVE EQUIPMENT

8.1 Use and Selection of Protective Clothing

Personal protective equipment (PPE) will be selected based on the contamination levels in the work area and the anticipated work activity, ALARA and safety considerations, and consideration of nonradiological hazardous materials that may be present. Surfaces are considered radiologically contaminated if they are above Table 7.1 levels. PPE provided will be in good condition and free of chemical or radioactive contamination.

Full Set

a. Coveralls (Tyvek® or cotton)
b. Cotton glove liners
c. Rubber or chemical resistant gloves
d. Shoe covers
e. Protective overshoes
f. Hood (Tyvek® or cotton)

Double Set

a. Two pairs of coveralls
b. Cotton glove liners
c. Two pairs of gloves
d. Two pairs of shoe covers
e. Protective overshoes
f. Hood (Tyvek® or cotton)

Protective clothing and equipment selected for project tasks will be described in the HASP, together with procedures for donning and removing PPE without spreading contamination or contaminating the worker. For projects using a RWP system, the necessary PPE for a task will be specified by the RWP.

8.2 Use and Selection of Respiratory Protection Devices

URS' Respiratory Protection Program (URS SMS 042 – Respiratory Protection) details specific procedures for respiratory usage, fit, cleaning, etc.

Engineering control measures will be provided to limit the concentrations of radioactivity in air to levels below those that constitute an airborne radioactivity area to the extent feasible. When this level is not feasible, other methods such as administrative controls and respiratory protection will be used to limit the potential for intake of radioactive material.

Only respiratory protection equipment that is tested and certified by the National Institute for Occupational Safety and Health (NIOSH) will be used. Protection factors listed in Appendix A of 10 CFR 20 will be used in the assessment of potential radioactive material intake.

Selection of appropriate respiratory protection devices will be designated within either the HASP or RWP. At a minimum, respiratory protection devices will be selected so that a protection factor greater than the multiple by which peak concentrations or airborne radioactivity exceed the values specified in Appendix B of 10 CFR 20 is not exceeded. Only respiratory protection equipment that has been specifically certified for emergency use by National Institute for Occupational Safety and Health (NIOSH)/ Mine Safety and Health Administration (MSHA) will be used as emergency devices.

Whenever respiratory protection will be used at a site, the following additional minimum requirements will be met:

- Air sampling will be performed to identify the potential hazard, permit proper equipment selection, and estimate exposures;
- Surveys and bioassays as appropriate will be performed to evaluate actual intakes;
- Respirators will be tested for operability immediately prior to each use; and
- Written procedures will be available regarding selection, fitting, issuance, maintenance, and testing of respirators (including testing for operability prior to each use), supervision and training of personnel, monitoring (including air sampling and bioassays), and recordkeeping.

9.0 RADIOACTIVE MATERIAL ACCOUNTABILITY AND CONTROL

All procurement, receipt, and storage of radioactive material will be coordinated with the individual or organization responsible for radiation protection at the project site. A source custodian and documented inventory record will be established and maintained for radioactive sources. All sources brought on site by external organizations will not be allowed into areas under company control without prior notification and approval by the company individual or organization responsible for radiation protection. Radioactive materials licenses will be required for sources that exceed exempt quantities.

Transportation of radioactive material (specific activity >2000 pCi/g) in commerce, generally off site, will be in accordance with DOT requirements in 49 CFR 170 through 180, International Air Transport Association (IATA) regulations, and other federal, state, and local regulations, as applicable.

10.0 DECONTAMINATION

10.1 Personnel

The guideline for determining the presence of skin contamination on personnel is detectable radiological contamination above background.

If necessary, decontamination of personnel will be performed using soap and water, taking care to ensure that loose contamination is prevented from entering body openings. Decontamination fluids will be collected and disposed of as radioactive waste. If contamination has been transferred to the skin with chemical carriers or if repeated decontamination attempts with soap and water are unsuccessful, additional decontamination steps may be required. If possible, sufficient radiological measurements will be collected prior to decontamination so that exposure to the skin may be evaluated.

Prior to attempting any additional methods, medical assistance and direction will be sought. Potential skin decontamination methods that may be used (under direction of medical staff) include titanium dioxide paste followed by rinsing, a saturated solution of potassium permanganate followed by a rinse using a 5% solution of sodium acid sulfate, and complexing agents such as ethlylene diamine tetraceticacid (EDTA) or diethylenetriaminepenta-acetic acid (DTPA).

Specific decontamination procedures and documentation requirements are contained in site-specific SOPs. Nonradiological decontamination procedures are contained within the HASP.

10.2 Equipment

Surface contamination levels presented in Table 7.1 will be used to determine whether a piece of equipment is contaminated with radioactive materials. When decontamination is necessary, decontamination will be performed using techniques that are appropriate based on site-specific conditions. Generally, dry decontamination methods such as high-efficiency particulate air (HEPA) vacuuming or wipe downs are preferred when facilities for the collection of radiological contaminated wastewater are not in place. If adequate facilities exist for the collection of such fluids, it may be appropriate to use a wet decontamination technique. Additional decontamination methods include sand or other abrasive blasting.

Specific decontamination procedures and decontamination requirements are contained in the site-specific SOPs. Nonradiological equipment decontamination procedures are contained within the HASP.

11.0 WASTE MANAGEMENT

The generation, treatment, storage, packaging, and transport of radioactive waste for disposal will be in accordance with the applicable requirements of 10 CFR 20 Subpart K, depending on the cognizant regulatory authority. Materials suspected of being mixed waste (RCRA/TSCA/etc. hazardous substances combined with radioactive materials) will be identified and segregated as soon as practical to avoid combining mixed waste with other waste forms.

Radioactive waste will not be disposed of except through coordination with the designated authority (the USACE Hazardous, Toxic and Radioactive Waste Center of Expertise).

Provisions for the minimization of radioactive waste generation will be implemented on each site, as appropriate. Although the scope of this waste minimization program will be commensurate with the level of radioactive materials present and activities conducted at each site, at a minimum, the following guidelines will be followed:

- Removal of excess/unnecessary packaging material prior to bringing materials into radiological controlled areas;
- Restriction of materials entering controlled areas to those materials necessary for performance of work;
- Restriction of the quantities of hazardous materials, such as paints, solvents, chemicals, cleaners, and fuels, entering radiological areas;
- Substitution of reusable items in place of disposable ones, when practical;
- Selection of consumable materials such as PPE that is compatible with waste processing systems, volume reduction, and waste acceptance criteria;
- Survey of potentially contaminated material leaving controlled areas to separate uncontaminated materials from contaminated materials; and
- Emphasis on waste reduction methodologies in training.

Additional waste minimization procedures and/or requirements will be identified in each site-specific work plan and will be commensurate with the levels of radioactive materials present and activities being performed.

12.0 EMERGENCY PROCEDURES

Site-specific radiological emergency procedures commensurate with the level of hazard will be developed or client procedures will be adopted prior to the initiation of work. The procedures will address, as appropriate, severe weather actions, transportation accidents or spills, medical emergencies, personnel contamination, and onsite emergency response and notification requirements involving radioactive materials. The scope of the procedures will be based on a contractual agreement with the client with respect to the role employees are expected to fulfill in an emergency event.

At a minimum, emergency procedures will take into account client emergency response procedures and the responsibilities of offsite state and local emergency response agencies.

All site personnel will be instructed in their emergency responsibilities and the emergency procedures. For high hazard projects, if the client has not done so, nearby hospitals and fire department(s) will be contacted and briefed on what hazards may be expected from radioactive material or toxic substances during an emergency.

13.0 TRAINING

Training will be provided to general employees, radiation workers, and radiological control staff at a project site under this Radiological Protection Program. Periodic retraining will be conducted whenever a significant change to the Radiation Protection Program or implementing procedures occurs or at a frequency consistent with applicable regulatory or client requirements and commensurate with radiological hazards present on the site. A minimum retraining frequency of two years will be implemented.

All formal training under the program will verify individual knowledge by an appropriate examination. Documentation of training, consisting of the individual's name, date of training, topic(s) covered, pass or fail, and the name of the certifying official, will be generated. No employee will be permitted to independently perform tasks inside of a radiological controlled area until the appropriate training and qualification requirements are met.

Radiological Worker Training. At a minimum, all personnel entering an area where radioactive material or radiation-generating devices are used, and where there is a potential for an individual to receive a Total Effective Dose Equivalent (TEDE) of 100 mrem or more in one year, will receive instruction in:

- The presence of the material or device;
- Health and safety problems associated with exposure to radiation, including the potential effects of radiation on a pregnant female, the fetus, or the embryo;
- Precautions and controls used to control exposure;
- This Radiation Protection Program; and
- Their rights and responsibilities.

Additional training requirements will be determined on a site-specific basis and will be commensurate with the radiological hazards present on each site. These additional requirements will be documented in the applicable HASP.

14.0 AUDITS

An internal audit of the content and field implementation of this Radiation Protection Program will be conducted at least once per year by the Business Radiation Safety Officer, Vice President/Director of Health, Safety, and Environment (HSE), or designee. Audit findings will be reported in writing to the appropriate personnel within URS.

15.0 RECORDS MANAGEMENT

Radiation Protection Program records will be maintained to document compliance with regulatory requirements and the exercise of due diligence in the control of radiological hazards for the protection of employees, members of the public, and the environment. These records will be transferred to the project file at the conclusion of the project.

At the completion of site activities, copies of exposure monitoring records will be sent to URS' Occupational Health Specialist for inclusion into each respective employee's medical file. Exposure monitoring records for subcontract personnel will be transferred to each respective subcontract organization. Copies of radiation monitoring results for all site personnel will be provided to an individual consistent with the requirements of 10 CFR 19.13. Upon completion of work at a site, exposure data pursuant to the 10 CFR 19.13 requirement will be provided for URS employees only. Subcontract personnel will be required to make requests for exposure records directly to their respective employer.

Exposure records that are maintained by URS will be maintained in a manner consistent with applicable Privacy Act requirements. The records will be available for retrieval over a period not less than 75 years after the date of creation of the record. All quantities used in the records will be in special units of curie, rad, or rem, including multiples and subdivisions of these units. Records identified with an individual's name or identifying number will be available upon request from that individual.

Records to be maintained include the following (as available):

- Doses received by individuals, for whom monitoring was required, during previous employment;
- Doses received by individuals for whom monitoring was required;
- Dose assessments and organ burdens for individuals for whom bioassay was performed.
- Doses to the embryo/fetus of a declared pregnant employee;
- Written declarations of pregnancy;
- Written withdrawal of declaration of pregnancy;
- Results of surveys for radiation and radioactive material in the workplace and outside of controlled or unrestricted areas as required by regulatory requirements or the Radiation Protection Program;
- Results of surveys for the release of material or equipment to uncontrolled or unrestricted areas;
- Records of effluents and radioactive waste disposal under control;
- Results of calibrations performed on radiological instruments and quality control checks for radiological instrumentation and personal monitoring devices;
- Records of ALARA evaluations and control actions;
- Records of radiological training completed, including general employee radiological training;
- Records of internal reviews and audits with corrective actions closeout; and
- Records of regulatory agency inspections and audits with corrective actions closeout.

Interim storage of these radiological records will be the responsibility of the SRSO and will be maintained in a readily retrievable, controlled manner. Upon completion of each site project, and upon request, copies of all radiation exposure records will be made available to USACE.

APPENDIX C

FIELD CHANGE REQUEST FORM

URS Corporation

77 Goodell Street
Buffalo, New York 14203
Telephone: (716)-856-5636
Fax: (716)-856-2545

FIELD CHANGE REQUEST

Field Change No.:_____
Project:_____
Contractor:_____ Contract:_____

Gentlemen:

This is a Field Change Request and may involve a change in the Contract price or Contract completion time.
In addition to the items included in the Contract Drawings, Specifications and Bulletins additional work is being added to this project.

DESCRIPTION OF CHANGE IN PROJECT APPROACH/SCOPE:

REASON FOR CHANGE:

DRAWING AND/OR SPECIFICATION REFERENCE:

DISTRIBUTION:

_____
_____
_____

USED BY:_____
Residential Engineer

DATE:_____

APPENDIX D

NON-CONFORMANCE REPORT

URS Corporation

77 Goodell Street
Buffalo, New York 14203
Telephone: (716)-856-5636
Fax: (716)-856-2545

NON-CONFORMANCE REPORT

Non-Conformance Report No.:_____
Project:_____
Contractor:_____ Contract:_____

Project Name:		Date:
Responsible Activity:		
Description of Discrepancy:		
Disposition:		
URS Inspector:	Date:	

Root Cause:		
Corrective/Preventive Action:		
Responsible for C/A:	Title:	Date:
Approved by URS Inspector:	Title:	Date:

DISTRIBUTION:

_____
_____
_____

USED BY:_____
Residential Engineer

DATE:_____