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REMEDIAL INVESTIGATION

AT THE

FRONTIER CHEMICAL – PENDLETON SITE

PENDLETON (T), NIAGARA (C), NEW YORK

NYSDEC SITE NO. 9-32-043
WORK ASSIGNMENT NO. D002340-4

Prepared for:

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
50 Wolf Road, Albany, New York

Thomas C. Jorling, Commissioner

DIVISION OF HAZARDOUS WASTE REMEDIATION

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DRAFT FINAL REPORT
& APPENDIX A
JUNE 1991

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1.0 INTRODUCTION

1.1 Purpose of Report

The purpose of the Remedial Investigation Report is to present, summarize, and provide interpretation and conclusions on data gathered during the Remedial Investigation (RI) activities at the Frontier Chemical-Pendelton Site, Town of Pendleton, Niagara County, New York. Activities performed from May 1990 through February 1991 included: preliminary literature reviews; a door-to-door community water well survey; topographic mapping; and soil gas survey. Other activities included geophysical surveys, lake and stream water and sediment sampling, surface and subsurface soil/waste sampling, installation of monitoring wells, two rounds of groundwater sampling, chemical analysis of samples, hydraulic conductivity tests, geotechnical tests on selected soils, stream velocity profiles, benthic survey, and habitat based assessment. The work was phased, with the first round of environmental sampling completed in the Summer of 1990 and the second phase in the Winter of 1990-1991.

The RI provides information for characterization of the physical, geological, hydrogeological, chemical, and environmental factors unique to the Frontier Chemical-Pendleton Site. In it, all necessary data are collected to define the source, nature, and extent of contamination and to provide adequate data for the Feasibility Study.

1.2 Site Background

1.2.1 Site Description

The Frontier Chemical-Pendleton Site is an approximately 75-acre tract of land located on Townline Road in the Township of Pendleton, New York. The site location is shown in Figure 1-1, and a site plan in Figure 1-2. The roughly triangle-shaped site is bounded by Townline Road to the

west, an abandoned railroad right-of-way to the southeast, and Bull Creek to the north. An approximately 15-acre lake (Quarry Lake), site of a former clay quarry operation, occupies the south central portion of the site. There are openly spaced residential developments on the west, northwest, and southwest sides of the site. The nearest residents are located less than 100 feet from the site. The surrounding area is relatively flat and is devoted to both agricultural and residential uses. Ground surface elevations in the site area range from 577 to 582 feet.

The filled portion of the site covers roughly an 8-acre area to the southeast of Quarry lake. Structures on site include two earth berm retention (holding) ponds, one small building, two railroad tank cars, and other small tanks. These and other features are shown on Figure 1-3. Large stockpiles of lake bottom sediments, lime, and mixed debris are found near the shore of Quarry Lake in this area.

1.2.2 Site History

The earliest industrial operation at this site was reportedly a clay brick and tile manufacturing facility. The 1938 aerial photograph shows several buildings and tanks apparently associated with this facility in the area now known as the "process area" (Figure 1-4). The access road from Townline Road was located in its current position at this time. Although much of the area that is now Quarry Lake appears disturbed in this photograph, only a small amount of standing water is visible. The remaining portion of the site and the surrounding area appears cultivated. By 1951, the excavation of the lake had reached roughly its current extent.

Frontier Chemical Waste Process, Inc. obtained the property and operated the site as an industrial waste treatment facility from 1958 to 1974. The 1958 aerial photograph shows that most of the property now owned by Frontier had been vegetated and most of the structures associated

with the clay quarry had been removed (Figure 1-5) prior to the beginning of Frontier's operations. The waste treatment is said to have involved lime neutralization of plating wastes, pickle liquors and other liquid acid wastes from the plating and metal finishing industries. The treatment operation was carried out in the southern part of the site, between Quarry Lake and the abandoned railroad, in the general area shown as cleared and disturbed area in Figure 1-5. Resulting mixtures from the waste treatment process were discharged into Quarry Lake for settling of the neutralization products. Other Frontier operations which were performed at the site included chemical oxidation, chemical product recovery, incineration, and distillation. Various drummed and tanked wastes were stored onsite for transfer. The 1966 aerial photograph indicates that the process area remained relatively constant in size throughout Frontier's period of operation at the site (Figure 1-6).

Much of the process area was filled and graded following termination of the waste processing and treatment operations between 1974 and 1977. The 1978 aerial photograph shows that the area remained relatively unchanged from 1966 with the exception of the appearance of a rectangular (1/2 acre) pond northwest of Quarry Lake and two large ponds within the process area (Figure 1-7).

In 1980, retention ponds were constructed for the rehabilitation of Quarry Lake. This was accomplished by batch treating lake water in the treatment ponds with a 50% caustic solution and discharging the resultant liquid to the Town of Wheatfield Sewage Treatment Plant. The use of the ponds ceased in the mid - 1980s. The ponds were drained in May 1988 by breaching the dikes. This was done as part of an uncompleted effort to build a naturally clay-lined engineered landfill for deposition of metal sludges from Quarry Lake. The lake was drained and sludges stockpiled as excavation progressed until 1988 when an oily, chemical-smelling seepage from the area of the old brick plant began filling the excavation.

Seepage was reduced by construction of a temporary clay cutoff wall in July 1988. Groundwater also entered the excavation at up to 10 gal/min.

The 1985 aerial photograph (Figure 1-8) indicates a larger area of disturbance, encompassing the entire perimeter of Quarry Lake. Two additional rectangular swamps also appear in this photograph in the disturbed area to the northeast of Quarry Lake.

1.2.3 Previous Investigations

The Frontier Chemical Pendleton site has undergone many investigations beginning in 1978 through 1989. Among those who have conducted investigations at the site include the United States Geological Survey, NYSDEC, Frontier Chemical Waste Process, Inc., Golder Associates, R. B. MacMullin Associates, Glynn Geotechnical Engineering, SLC/ Consultants/Contractors, Inc., and A-Cubed, Inc. A chronological summary of previous investigation is presented in Table 1-1.

The United States Geological Survey advanced three borings ranging from 3.0 to 26.5 feet at the site. A single monitoring well was installed in the 3 ft. borehole. Five samples were collected for analytical testing distributed as follows: one water sample from the monitoring well; one substrate sample from each of the other two borings; and two surface water samples from a drainage ditch along Townline Road on the western edge of the property. Testing results showed that soils contained trace levels of cadmium, chromium, copper, iron, nickel, and zinc. Water sample results indicated generally the same. In 1983, the USGS collected two additional substrate samples at the site. Test results of these samples revealed trace levels of trans-1,3,-dichloroethene, trichloroethene, and di-n-butyl phthalate. An excerpt from this report may be found in Appendix Q (Analytical Results from Previous Investigations).

R. B. MacMullin Associates conducted a study of the Frontier Chemical Pendleton site on behalf of Frontier Chemical Waste Process, Inc., in 1980. The purpose of the study was to determine a neutralization procedure which would raise the pH of Quarry Lake water to an acceptable level so that it could be discharged to the Niagara County Sewer System. Two neutralization ponds were built into which Quarry lake water was pumped and subsequently neutralized to a pH of 6-7 with lime or caustic soda. After treatment, the water was pumped into the Niagara County Sewer System.

In November 1984, Earth Dimensions, Inc., advanced six borings near the former plant processing area for SLC Consultants/Contractors, Inc. at the request of Frontier. The purpose of the borings was to determine the level of contamination in the old process area and to delineate the fill thickness which was found to range from 3.5 to 17 feet. One sample was collected in Boring No. 6 from 20-22 feet and submitted for EP Toxicity analysis. Trace levels of barium, chromium, and lead were found. The samples were found contaminated with elevated levels of organic compounds. A sample from 20-22 feet was tested for E.P. Tox and only trace levels of inorganics were found.

The NYSDEC conducted a metal detector survey of the former plant processing area at the Frontier Chemical Pendleton site in the fall of 1984. The survey discovered 20 to 50 drums of pyridene tars which were partially covered with dirt and left at the site since 1975.

In September 1984, Frontier Chemical Waste Process, Inc., removed ten badly crushed and damaged barrels of pyridene tars from the ground near the northeast corner of the neutralizing ponds.

In December 1984, seven samples of Quarry Lake sediment/sludge were collected at four locations by SLC Consultants/Contractors, Inc. The samples were tested for EP Toxicity by Frontier Chemical Waste Process,

Inc. Only trace amounts of a few heavy metals were found. Refer to Section 4 for a more detailed discussion.

From May 1, 1985 to May 8, 1985 an additional 47 barrels of pyridene tars were excavated by Frontier Chemical Waste Process, Inc., most of the barrels were in crushed and damaged condition. The barrels were removed along with 200 cu. yds. of soil/waste and transported to the Wayne Disposal site (Belleville, Michigan).

In July 1985, Earth Dimensions, Inc., installed eleven monitoring wells at the Frontier Chemical Pendleton site. Well depths ranged from 10 to 39 feet. Water samples were collected from these wells by Frontier Chemical personnel in the fall of 1985. The samples were split with the NYSDEC. The NYSDEC submitted 4 samples to RECRA Environmental Laboratories (Wells 2R, 5R, 7R, and 3S). Frontier Chemical Waste Process, Inc., submitted eleven samples to Zenon Environmental, Inc. Results of the analyses showed that the water contained dissolved chlorinated solvents, and that heavy metals were present in the former processing area. Perimeter wells did not show any significant contamination. Refer to Appendix Q for results of these analyses and Section 4 for more detailed discussions.

Golder Associates conducted a hydrogeological investigation of the Frontier Chemical Pendleton site in 1988. The investigation included the installation of 22 monitoring wells and 5 test pit excavations. Groundwater samples were collected from the 22 monitoring wells installed in 1988 and 10 additional samples from the monitoring wells installed by Earth Dimensions, Inc., in 1985. Results of testing showed moderate concentrations of chlorinated solvents, traces of heavy metals, and relatively high concentrations of phenols. Section 4 of this report discusses in detail the results of the Golder Associates report of 1988. Analytical results appear in Appendix Q.

Included in the hydrogeological investigation conducted by Golder Associates (1986) was a geophysical survey performed by A-Cubed, Inc. Both magnetometer and conductivity surveys were conducted on a 10 ft. grid within the former plant processing area. The survey anomalies indicate that the highest probability of buried ferrous material is located just west of the neutralization ponds. Test pits conducted in this general area by Golder Associates in 1988 did encounter crushed and damaged 55 gal. drums. Analytical results appear in Appendix Q.

A report finalized in August 1986 by Glynn Geotechnical Engineering presents specifications for the closure of Quarry Lake and design and installation of a leachate collection system.

A 1989 report prepared by the United States Environmental Protection Agency and the New York State Department of Environmental Conservation entitled, "Reduction of Toxic Loadings to the Niagara River from Hazardous Waste Sites in the United States" places the Frontier Chemical Pendleton Site as a Category II site. Estimates from this report indicate that the Frontier Chemical Pendleton site contributes 2.6 pounds of toxic contaminants to the Niagara River (via Bull Creek) per day. However, data generated by the RI/FS field investigation do not support this estimate and indicate that water/sediment quality in Bull Creek is not being significantly affected by the site. Three Niagara River Toxics Management Plan priority toxics have been found at the site including PCBs, mercury, and tetrachloroethylene.

1.3 Report Organization

This RI Report has been organized in a format consistent with Chapter 3 of USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA Interim Final, October 1988). Appendices are bound separately. The following summarizes each section of the report:

- Section 2.0: Description of the investigation field activities.

- Section 3.0: Descriptions of site features, climate, demography, hydrology, regional and site-specific hydrogeology, and ecology.

- Section 4.0: Nature and extent of contamination based on the results of the investigation.

- Section 5.0: Fate and transport of contaminants, including potential routes of contaminant migration and persistence.

- Section 6.0: Applicable or relevant and appropriate requirements.

- Section 7.0: Baseline risk assessment, including both environmental and public health evaluations.

- Section 8.0: Summary and conclusions.

2.0 REMEDIAL INVESTIGATION FIELD ACTIVITIES

In carrying out field activities at the Frontier Chemical - Pendelton Site, all applicable project plans were followed except where deviations from these documents are noted. Applicable documents include Work Plan (URS - 1990), Field Sampling Plan (FSP - URS, 1990), Quality Assurance Project Plan (QAPP - URS, 1990), and Site-Specific Health and Safety Plan (HASP - URS, 1990). The field work was phased, the first phase having been performed from May through August 1990, and the second phase from December 1990 through February 1991. A chronology of the RI/FS field investigation is presented as Table 2-1.

2.1 Surveying and Mapping

A topographic map of the Frontier Chemical - Pendelton Site was prepared in June 1990 for use during the site investigation, data analysis phase, and subsequent evaluations of remedial alternatives. The map was drawn to a scale of 1 inch equals 100 feet, at a contour interval of 1 foot. Mapping was performed using aerial photography with surveyed ground control. Sub-lake level topography depicted on the base map (Plate 1) was developed from over 100 depth soundings in the lake that were subsequently tied to the site vertical and horizontal control. Field surveys were conducted to create a grid system for locational control during site investigation activities (particularly surface geophysical studies and air/soil screening), and to establish locations of field data points. Vertical control was set using the National Geodetic Vertical Datum of 1929, and horizontal control was referenced to a local and site specific coordinate system. Actual horizontal closure for the primary control traverse was 1: 36,000 unadjusted, and primary vertical control network was -0.12 and was adjusted throughout the primary level run. All surveying was performed by URS under the supervision of a New York State Licensed Surveyor.

2.2 Community Well Survey

Prior to initiation of the field investigation, a house to house survey was conducted to determine water use along Beach Ridge, Townline and Loveland Roads nearby the site. On June 7, and again on June 13, 1990 a URS representative attempted to interview homeowners in the site vicinity regarding the existence and use of private wells. In cases where the resident was not available, a questionnaire, a letter of explanation, and a URS-addressed, stammped envelope was left at the home requesting that the questionnaire be filled out and returned to URS. Results of this survey indicate the majority of local residents rely on the municipal water system for domestic supply. A summary of the well survey, the questionnaire, and the letter are presented in Appendix B.

Forty-four (44) of fifty-nine (59) residences responded to the survey questionnaire. Seventeen (17) residences were found to have water wells on their property including thirteen (13) along Beach Ridge Road and four (4) along Townline Road. Of these seventeen (17) wells, eleven (11) were not in use or abandoned, five (5) were used exclusively for outdoor watering and one (1) was used for drinking. The single well used for drinking purposes is located more than 900 feet away from the former process area of concern. The closest well used for watering purposes is more than 400 feet from the process area.

The single well used for drinking was sampled by NYSDOH on 12/11/90. The results of the analysis are also given in Appendix B and discussed in Section 4.5.2.1.

2.3 Air/Soil Gas Survey

Prior to intrusive activities at the Frontier Chemical - Pendelton Site, air and soil gas screening was performed to determine the level of

personal protection necessary for these activities and to aid in determining the extent of subsurface contamination.

The air/soil gas monitoring was performed at the nodes of a 40-by 40-foot grid. The area of survey covered roughly the area of disturbance from Frontier Chemical's activities as indicated by the 1985 aerial photograph (Figure 1-8). The air and soil gas screening was performed using a HNu photoionization organic vapor detector. The soil gas was sampled to a depth of 18 inches using a soil probe. Although this screening method is not quantitative, it yields general qualitative data on the total volatiles and some semivolatile content within soils in a relatively non-intrusive manner.

The survey was begun on June 11, 1990 and completed on June 18, 1990. A total of 526 air and soil gas monitoring points were screened. Section 4.2.2 discusses the survey's results.

2.4 Geophysical Surveys

Three geophysical techniques were used in conducting the surface geophysical surveys including seismic refraction, ground penetrating radar (GPR), and terrain conductivity (EM-31).

The purpose of the surveys were to: (1) help establish the extent of fill at the site; (2) determine the locations of buried metallic objects (such as drums); and (3) obtain information on the subbottom conditions of Quarry Lake.

The geophysical surveys were performed by ECCO Inc. of Buffalo, New York in July, August and September of 1990.

The results of the surveys are given in Section 3.7.2 and 4.2.2. The entire ECCO Inc. Geophysical Survey Report is given in Appendix D.

2.5 Subsurface Drilling Program/Monitoring Well Installation

Soil borings and monitoring wells were completed at the site to directly evaluate subsurface conditions. Drilling proceeded in two phases, the first in June/July 1990 and the second in February 1991. Conditions evaluated included: stratigraphy, physical and chemical soil properties, aquifer parameters, and groundwater flow and quality. Twenty-three (23) borings were made at 20 locations; stainless-steel monitoring wells were installed in 11 of these borings (Plate 1). Three (3) wells were screened in the upper water bearing zone, three (3) wells were screened at the bedrock/overburden interface, and five (5) wells were screened within bedrock. All borings were advanced in accordance with the procedures specified in the FSP (URS, 1990) and QAPP (URS, 1990). Coring procedures were modified slightly to include the use of 6-inch temporary steel casing, spun 6 inches to 1 foot into bedrock, to prevent overburden collapse near the bedrock/overburden interface during coring.

Continuous split-spoon samples were taken to the maximum depth of augering at each location. Continuous core records were obtained throughout all drilled bedrock intervals. Soil samples and rock cores were examined and classified by the supervising geologist in accordance with the procedures found in the FSP and QAPP. After their installation, each of the monitoring wells was developed by pumping or bailing, depending upon the depth of the well. The wells were considered developed when the groundwater indicator parameters including pH, specific conductance, and temperature had stabilized and turbidity readings of less than 50 (NTUs) were achieved. Field data produced during drilling operations are included as Appendix E (soil boring logs) and Appendix F (monitoring well installation reports). Appendix G contains the well development reports. Appendix I includes well locations and elevations.

2.6 Trenching Program

A total of 8 test trenches (approximately 12 feet by 6 feet) were excavated in and around the former process area of the site with a backhoe in August 1990. This was completed to: (1) obtain analytical samples from the subsurface; (2) determine the depth and type of fill; and (3) locate and examine the condition of buried drums. Since drums were not found in an intact condition, there was no need to overpack and remove any drums from the trenches. All material removed from each trench was stockpiled next to the trench on a large polyethylene liner and returned to the trench upon its completion.

Trench excavations were logged by a supervising geologist. Test trenching reports are given in Appendix J. Trenching locations are shown on Plate 1.

2.7 Hydrogeological Testing

Hydrogeological testing of the water-bearing formations at the Frontier Chemical - Pendelton site consisted of hydraulic conductivity tests and physical soil testing. Slug testing for determining hydraulic conductivity was performed by first raising the water level in a well with a stainless-steel slug and electronically monitoring return of the water level to a static level over time and further by removing the slug and monitoring return of the water level to a static level. The slug tests were performed in August 1990 and February 1991. Tests for physical properties on selected soil samples included triaxial permeability (11 Shelby Tubes), grain size (32 samples), Atterberg limits (29 samples) and moisture content (30 samples). Results are discussed in Section 3.7. Laboratory reports may be found in Appendix K.

2.8 Surface Water Hydrology Studies

Surface water hydrology was investigated to aid in the assessment of the effect of the Frontier Site on Quarry Lake and Bull Creek. This study included the installation of three stream staff gauges and three well points. Two stream cross sections were also determined and stream velocity and discharge calculated on two separate dates.

The three staff gauges were respectively 1) bolted to the Townline Road bridge over Bull Creek, 2) attached upon a pole extending from the bottom of Quarry Lake, and 3) embedded in the bottom of the 1/2-acre pond northeast of Quarry Lake. These gauges were installed such that a portion of the staff was immersed in the water body at all times. The gauges were referenced to the USGS Vertical Geodetic Datum of 1929.

Cross-section and stream velocity were determined on Bull Creek at two locations. These data were then used to calculate stream discharge.

Well points were installed at three locations on the site. A well point was installed in the Bull Creek bed to determine the hydraulic gradient of the stream with respect to local groundwater (i.e., to determine whether the stream was influent or effluent in nature). Two well points were installed in the swampy area between Quarry Lake and the rectangular pond northeast of Quarry Lake to further assess the relationship between these two water bodies and the local groundwater flow pattern. Locations of well points are shown on Plate 1.

2.9 Benthic Survey

The purpose of the benthic macroinvertebrate study is to determine the potential effect of leachate from the site upon the Bull Creek benthic community. Changes in the structure of the macroinvertebrate community

over distance can be an indication of site-caused environmental pressures which may go undetected by other methods.

Field work was completed in early June 1990. The results of the benthic survey are presented in Section 4.4.4.

2.10 Habitat Based Assessment

A Phase I Habitat Based Assessment (HBA) was completed at the Frontier Chemical - Pendelton site. The HBA consisted of delineation of the major vegetative communities in and around the site by utilizing aerial photographs in conjunction with field species identifications. In addition, wildlife types were associated with each vegetative community. Field identifications took place throughout the first phase of field work (June - July, 1990). The results of the HBA are presented in Section 3.5.

2.11 Environmental Sampling

The purpose of the environmental sampling program is to produce a data base adequate both to characterize the site chemically and to assess its current impact upon public health and the environment. All laboratory analyses were performed by a laboratory certified in the ELAP program and followed the latest appropriate NYSDEC ASP (Analytical Services Protocol). All quality assurance/quality control (QA/QC) procedures specified in the QAPP (URS, 1990) were followed. All data were subjected to rigorous review by URS before acceptance. The data assessment report for the first round of analysis data may be found in Appendix O. A summary of the samples is given in Appendix C. Environmental samples for two first phase of the RI were collected in June/July/August 1990 and samples for the second phase were collected in December 1990 and February 1991.

(a) **Soils/Wastes:** Continuous split-spoon samples were taken over the depth of all borings or boring pairs. After

classification by the geologist, a representative sample was taken from each split-spoon. Several of these samples were then subjected to chemical or geotechnical analyses. Those not analyzed were held for reference purposes. Analytical samples included ten (10) samples from borings in the process area, two (2) samples from borings north of Quarry Lake and five (5) samples from borings at well locations.

Twelve (12) surface samples were also taken with a hand trowel or bucket auger, some being strictly soil and others containing waste material. Five (5) waste samples were taken with a hand trowel from test trenches. All these samples were sent for chemical analysis. Plate 1 shows the locations where the samples were taken. Results of the soils investigation are presented in Section 4.2.

(b) **Surface Water and Sediments:** Surface water and sediment samples were collected at several locations on Bull Creek, Quarry Lake, the pond northeast of Quarry Lake, and the drainage ditches bordering the site during the two phases of field work. These samples included four (4) sediment and water sample locations on Bull Creek, seventeen (17) lake bottom sediment sample locations and four (4) water sample locations within Quarry Lake, two (2) sediment locations at the northeast pond, and one (1) water sample and two (2) sediment samples from the bordering ditches. Sediment samples were taken from depositional environments on Bull Creek so as to maximize the possibility of finding sediment contamination. The results of these investigations are presented in Section 4.3 and 4.4.

(c) **Groundwater:** Groundwater samples from 29 wells were collected in accordance with the FSP (URS, 1990) during the first phase

of investigation in August 1990. Samples from 28 wells were collected during the second phase of investigation in February 1991. A total of 36 wells were sampled overall with 21 wells sampled during both phases (sampled twice) and 15 wells sampled during one of the two events. Prior to sampling, at least three well volumes of water were recovered (purged) from each well to ensure the removal of water held in casing storage. Well purging data are found in Appendix H. Each groundwater sample was collected in the appropriate sample container (supplied by York Laboratories, of Monroe, Connecticut). Preservation was completed on the appropriate portion of each sample. Samples were labeled with sample identification codes, analysis to be performed, field preservation method, date and time collected, and field sampler signature. Groundwater sample identification codes were used per the Work Plan (URS, 1990). Samples were sealed and packed in coolers, and shipped to York Laboratories on the day of collection. Groundwater analytical results are discussed in Section 4.5.

2.12 Statement of Compliance with Contract Documents

Methods of construction of soil borings, development and installation of monitoring wells, soil/air screening, and performance of other field activities are presented in the FSP (URS, 1990). Unless otherwise noted above, all field work was conducted in a manner consistent with the FSP.

3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

3.1 Surface Features

The Frontier Chemical-Pendelton Site is located in the drainage basin of the Niagara River at a point approximately 5 miles east-northeast of the river, 15 miles south of Lake Ontario, and 15 miles north of Lake Erie. Relief in the area is very gentle ranging from 593 feet above mean sea level to 573 feet m.s.l. within a one mile radius of the site. The site itself is relatively flat, its only significant relief appearing around Quarry Lake in the form of a berm (0-5 feet) encompassing the lake and in the waste and fill piles of the process area (up to 20 feet).

Cultural features at the site include several pieces of equipment associated with Frontier's onsite operations (Depicted in Figure 1-3) and an abandoned railroad grade to the immediate southeast of the site.

3.2 Climate

The area around the Frontier Chemical - Pendelton Site (Lockport - Niagara County) has a humid, continental climate. Summers are pleasantly warm, but winters are fairly long and cold, and there are frequent spells of cloudy, unsettled weather. Precipitation is generally evenly distributed during the year, though it is slightly less in winter and mid-summer. The climate is greatly influenced by the close proximity of Lake Ontario and Lake Erie. Climatic data for the years 1951-1980 have been compiled by the National Oceanic and Atmospheric Administration (NOAA, 1985). Yearly mean temperature for that period was 47.7°F with extremes rarely exceeding 95°F or falling below -10°F. Precipitation for the 30-year period averaged 35.70 inches per year. Prevailing winds, recorded at the Buffalo weather station 15 miles to the south, came from the southwest and averaged 10-14 mph for the 30-year period.

3.3 Demography and Land Use

The Frontier Chemical site is located in the Town of Pendleton, Niagara County, New York approximately 2 miles northeast of the City of North Tonawanda and 7 miles east of the City of Niagara Falls. The site is bounded generally by Townline Road to the west, an abandoned railroad right-of-way to the southeast, and a wooded area to the north. There are openly spaced residential developments on the west, northwest, and southwest sides of the site. The nearest residents are located approximately 100 feet from the site.

Townline Road is the eastern boundary of the Town of Wheatfield.

The Town of Pendleton has a population of 4,926 according to preliminary results of the 1990 Census. The population of the neighboring Town of Wheatfield is 11,053. Approximately 2,203 people live within a 2 mile radius of the site. Aerial photography shows the surrounding land use to be primarily agricultural with residences located along the main highways. Various wooded pockets are located within a 2 mile radius. The nearest suburban and urban areas are located 2 miles to the southeast in North Tonawanda. There is no industry apparent within a mile of the site.

Bull Creek, a Class C stream, passes through the site on the northern boundary. This tributary of Tonawanda Creek is used for fishing and other human contact. There is a NYSDEC regulated wetland on the site and seven others located within a two-mile radius.

Drinking water is publicly supplied in both Wheatfield and Pendleton, and nearly all residents are connected to public water according to the water departments in each town and information obtained during the community well survey.

3.4 Soils

Soils in and around the site are alkaline, fine grained, silty loams and silty clay loams commonly formed in calcareous lacustrine deposits. The site is dominated by the Lakemont silty clay loam found on flat slopes around Quarry Lake and Bull Creek. This soil is typically difficult to drain. The Odessa silty clay loam is found at several locations onsite in slightly higher, better drained areas than that of the Lakemont. Two other soil types are found along Beach Ridge Road immediately south of the site including the Ovid silt loam and the Schoharie silty clay loam. These two soils are typically found in knolls and other areas of higher elevation within former glacial lake beds. Soils data presented here were taken from the Soil Survey of Niagara County (USDA, 1972).

3.5 Ecology

This assessment follows the guidelines for habitat-based assessments outlined in Division Technical and Administrative Guidance Memorandum: Habitat Based Assessment, Guidance Document for Conducting Environmental Risk Assessments at Hazardous Waste Sites, step 1 (NYSDEC, December 28, 1989).

3.5.1 Covertypes

Vegetative communities on the site, and within one-half mile radius of the site may be divided into five categories. These categories are based, as closely as possible, on the communities listed in "Natural and Cultural Ecological Communities of New York State", preliminary draft #4, October 1988 (NYSDEC, 1988). The categories are described in the paragraphs below, and their ranges are plotted on Figure 3-1.

1) **Open Water:** Bull Creek forms the northern border of the site. This is a Class C water with a markedly seasonal flow. The

creek is 20 to 30 feet wide at its entrance to the site from the east, while much narrower (three to ten feet wide, depending upon the season) as it leaves the site to the west. In this area, it is frequently overgrown by buttonbush (Cephalanthus occidentalis). Throughout its range in the vicinity of the site it is bordered by ash - maple forest similar to that described in paragraph 2 below, though often only for a distance of approximately 50 feet on either bank.

There are five permanent bodies of open water within a one-half mile radius of the site, as well as several that are seasonal. All are on-site. Under normal flow conditions, none of the water bodies are connected via surface water to Bull Creek. However, during wet periods when Quarry Lake is at a high level, lake water apparently overflows northwestward to the ditch along Townline Road and continues northward to Bull Creek. The area used as a clay quarry for brick manufacturing (Quarry Lake) forms the largest water body. There is a water filled, approximately 3 foot deep rectangular excavation (about 1/2-acre in size) to its northeast. Both of these are turbid due to suspended clay particles. They apparently lack significant submergent vegetation, and would appear to be poor habitat for most aquatic species.

Three other small ponds (not more than 1000 sq. ft. each), to the east of Quarry Lake, appear to have been created by impoundment, rather than excavation (all have at least one bank that is higher than the surrounding grade). Two are the remnants of the ponds designed to batch treat lake water during lake dewatering in the late 1980s. These two ponds are quite shallow, and may evaporate entirely in a dry summer. The remaining pond, located closer to Townline Road, is deeper and does not appear related to any former site activity.

These are superior habitats to the lake and rectangular pond described in the above paragraph. These ponds are quite clear and less than five feet deep with bottoms covered by submergent vegetation. These ponds contain the majority of the aquatic and semi-aquatic animal species seen on-site: muskrat, snapping turtle, painted turtle, bull frog and leopard frog.

2) **Site Plant Communities:** The vegetation of the site is dominated by young plant communities developing on the moderately alkaline, fine grained, messic to hydric soils (Section 3.4). The vegetation present reflects the wet, alkaline conditions of the soil. On a 1942 air photo, the site can be seen to be almost entirely cleared for cropland. Only small areas of the banks of Bull Creek support vegetation. In an air photo taken 20 years later, farming seems to have been recently discontinued: tree growth is significant near the banks of the river, and small trees or shrubs are scattered throughout the northern half of the site. Minimal disturbance of the northern portion of the site appears to have occurred since then.

The plant communities are, therefore, in varying stages of development. Significant tree growth occurs only along the northern border of the site, becoming increasingly sparse southward. The vegetation surrounding, and south of, Quarry Lake, where activity had continued until recently, is predominantly herbaceous.

The forest along the banks of Bull Creek is well developed, with canopy cover. It is dominated (approximately 80%) by green and white ash (Fraxinus Pennsylvania, F. Americana), with occasional red oak (Quercus rubra) and red maple (Acer rubrum) individuals, as well as isolated stands of hawthorn

(Crataegus spp.) and black willow (Salix nigra). The understory is mostly open and dominated by grasses. There are signs that the understory is kept open in some areas for hunting purposes as evidenced by a tree stand, a deer lick, many shotgun shells and several trees felled but not removed.

South of the banks of Bull Creek undergrowth becomes dense, dominantly arrowwood (Viburnum recognitum) and shrub dogwood (Cornus spp.). The canopy is similar to that described above.

Further south, the canopy and then the shrub layer thin and gradually disappear until, surrounding Quarry Lake, the vegetation is dominantly sedge meadow. Wild iris (Iris spp.), water plantain (Alisma triviale), and grasses occur with the sedges (Carex spp.). There is also a large quantity of green ash seedlings. Much of the soil in this area is seasonally flooded, and exhibits desiccation cracks during the summer.

The remainder of the site is covered by herbaceous growth typical of mesic soil conditions: sweet clover (Melilotus spp.), cow vetch (Vicia cracca) and ox-eye daisy (Chrysanthemum leucanthemum) are typical. Isolated stands of phragmites (Phragmites australis), etc. identify areas of poorer drainage.

An area of stressed vegetation encompassing a small (500 sq. ft.), seasonal impoundment of water in the southern portion of the site, (east of Quarry Lake) was evident during the field activities. This area contained water plantain with numerous circular black necrotic lesions not seen elsewhere on-site on their leaves. Also noted were phragmites on the impoundment banks with a higher than usual amount of browning at their leaf tips and brown lesions along the leaf midribs. A larger

than normal quantity of snails was seen. Shallow point sample SPS-7 was taken at this location.

The dominance of ash species in the forest along the banks of Bull Creek is unusual. Red and silver maple (Acer rubrum, A. saccharinum) and eastern cottonwood (Populus deltoides) usually occur as co-dominant species in this type of community, but none were noted in any significant quantities in this area. No reason for this variation is apparent. During the time that this survey was being conducted, it should also be noted that the growth of the majority of the trees in the forest along the banks of Bull Creek was sparse and diseased: leaves grew only at the upper tips of branches, and had irregular black necrotic areas on them. However, ash species in similar environments off-site exhibited similar symptoms. The uniformity of the symptoms across the region suggests an environmental cause not associated with the site, such as a late frost or abnormally wet spring.

3) **Cattail Marsh:** In two adjacent rectangular excavations immediately northeast of the Quarry Lake, a pure stand of cattails (Typha spp.) has developed. The total area of both excavations (which appear as one marsh) is approximately one-half to one acre. This is the largest stand of cattails on-site; there are many smaller areas of cattails, as well as phragmites. Only a few small clumps of purple loosestrife (Lythrum salicaria) are present.

4) **Culture:** Cultural development is concentrated along Townline Road, Beach Ridge Road and the smaller roads in the area. It is almost exclusively residential, with the corresponding lawns, trees and gardens.

5) **Farmland:** The remaining land (not described in one of the sections above) within one-half mile radius of the site is farmland. It appears that the land is used principally for field crops.

3.5.2 Protected Wetlands

The site covers the majority of NYSDEC protected wetland TE-6, as shown in Figure 3-2.

TE-6 is considered a Class II wetland by NYSDEC based upon the fact that the wetland contains two basic wetland structural types: deciduous and herbaceous (as illustrated by Section 3.5.1 above). The classification was made in June 1979, after cessation of Frontier Chemical activities, and revised to include more land to the south of Bull Creek in October, 1981.

Seven other protected wetlands, all class II, occur within a two mile radius of the site; these are also shown in Figure 3-2. None of these are downstream of the site. One additional wetland, TE-26, not shown in Figure 3-2, occurs near Tonawanda Creek just prior to its junction with the Niagara River, approximately five miles downstream of the site. This is also a class II wetland.

In addition, all areas where Lakemont soil predominates are likely to be considered wetlands according to the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (U.S. Army Corp of Engineers, 1989).

3.5.3 Special Resources

According to the Natural Heritage Program of New York State, no federal or NYS endangered, threatened, or special concern species are

known to exist within a two mile radius, or nine miles downstream, of the site. No critical habitats are known to occur within this range.

None of the plant communities described in section 3.5.1 appears to be of limited range or threatened within New York State or the world.

3.5.4 Wildlife Species Present

A wide variety of animal species has been noted by URS personnel on-site during the field investigation. The areas of greatest concentration of animal species were the clear shallow ponds described in section 3.5.1, paragraph 1, above. Deer and raccoon tracks were present along the banks of all bodies of water on-site. The banks of one of the smaller impoundment ponds contain numerous muskrat dens. Mammals seen or noted by tracks include muskrat, raccoon, and deer as well as domesticated cats and dogs. Reptiles and amphibians sighted include painted turtle, snapping turtle, bull frog, and large quantities of leopard frog. Fish have been sighted by local residents in both Quarry Lake and Bull Creek (including northern pike, bass, and carp). Birds seen include great blue heron, killdeer, red-wing blackbird, woodcock, mallard, swallow, and american goldfinch. A great quantity of insect life occurs throughout the site.

3.5.5 Resource Characterization

As evidenced by the range of species, including the predator species, the varied covertypes and habitats, and the strong evidence of significant hunting activity there, the site is a valuable resource to both humans and fauna of the surrounding area.

3.6 Surface Water Hydrology

The two dominant surface water features in the vicinity of the Frontier Chemical - Pendelton Site are Bull Creek and Quarry Lake. Bull

Creek, originating six miles to the northeast near Lockport, New York, forms the northern border of the site and flows westward before bending southward and entering Tonawanda Creek approximately two miles south of the site. Quarry Lake is a man-made water-filled excavation approximately 15-acres in size and over 20-feet deep at its deepest point. The lake is divided into an eastern and western basin separated by the peninsular remnants of a berm that was used to separate the basins during lake dewatering by Frontier Chemical in the mid-1980's. Other surface water features include several wetland areas to the north of Quarry Lake and four 1/2 acre or less sized ponds including one northeast of Quarry Lake and three in the process area south of the lake. Standing water is common after heavy rains. The site is part of the Niagara River drainage basin.

3.6.1 Site Drainage

The surface drainage at the site is typically poor, with many pools of standing water evident throughout the site following heavy rains. The slope of the site is gentle with typical surface gradients of less than 2 percent except in the vicinity of berms surrounding Quarry lake and near the large waste piles in the process area. All areas are eventually drained to Bull Creek, Quarry Lake, or one of several small ponds surrounding the lake. To the north of Quarry Lake, drainage is northward to Bull Creek. To the west and south, drainage is generally to Quarry Lake. Drainage ditches are found along the former railroad bed along the southeastern edge of the site (flows toward Townline Road) and along Townline Road to the west of the site. These ditches eventually discharge surface runoff into Bull Creek at the Townline Road bridge. During periods of intense rain when the water level in Quarry Lake is high, lake water overflows northwestward through a breach in the berm and eventually to the Townline Road ditch. Residents have reported occasions when the Townline Road ditch has exceeded its capacity and water has flowed across the road to Bull Creek on the opposite side. This has reportedly occurred

two or three times per rainy year for the past several decades. Surface runoff patterns are indicated on Figure 3-3.

3.6.2 Stream Hydrology

The Frontier Site is located adjacent to Bull Creek, approximately two linear miles upstream from its confluence with Tonawanda Creek. In the vicinity of the Frontier Site, Bull Creek is classified by NYSDEC (6NYCRR part 701.19) as a Class C stream (suitable for fishing and fish propagation, and for primary and secondary contact recreation).

The drainage basin area of Bull Creek at the downstream corporate limits (Town of Pendelton - Townline Road) is 20.65 sq. miles (FEMA, 1981). This location is approximately 3.5 miles downstream (stream distance) from the Frontier Site. Discharge values for 10-year, 50-year, 100-year, and 500-year floods at this location are 840 ft^3/sec, 1,153 ft^3/sec, 1,287 ft^3/sec, and 1,600 ft^3/sec, respectively (FEMA, 1981). Flooding has been known to occur along Bull Creek, generally caused by heavy rainfall or rapid thaws. The Town of Pendelton has completed cleaning operations and drainage improvements of the Bull Creek watershed.

As part of this study, discharge was measured in Bull Creek on two occasions at two nearby locations close to the Townline Road bridge. At these locations, the stream was subdivided into transverse sections. Velocity measurements were taken at each section using dye, rod and timer and discharge was calculated as the cumulative sum of average velocity times cross-sectional area for each of these sections.

The two sections were located in the same reach of the stream partially as a test of the method of measurement. These profiles are depicted in Figures 3-4 and 3-5. Location No. 1 is downstream relative to location No. 2. On 7/16/90, the average discharge for the two locations was 0.7 ft^3/sec. On 7/20/90, discharge had increased by 8 times to an

average of 5.7 ft^3/sec with a 0.5 ft increase in water level. These two dates represent roughly the high and low flow levels recorded for Bull Creek for the period of 7/10/90 to 10/6/90.

The highest recorded level of Bull Creek measured during this investigation occurred in March, 1991 when the creek reached a level of 3 feet higher than average mid summer flow (base flow). The highest observed level noted during the study occurred on 12/19/90, when the water level in Bull Creek rose over the top of the stream gauge to one foot below the Townline Road bridge girder. At this time the maximum estimated depth of the creek at this point was approximately 8 feet. Estimated discharge for that period is greater than 500 ft^3/sec based on a reported 10-year flood discharge of 840 ft^3/sec (based on a downstream location - FEMA, 1981).

A well point installed in the stream bed of Bull Creek during this study showed a consistent upward gradient from July to October, indicating effluent (gaining) conditions during this period. During periods of heavy rain and associated increased runoff to Bull Creek, the stream may become temporarily influent (losing). Influent conditions were confirmed by measurements taken on 3/6/91, a high flow period.

3.6.3 Lake Hydrology

Quarry Lake is a water filled man-made excavation covering approximately 15 acres of the Frontier Site. Although the water depth is typically 9 to 14 feet, the depth may range to over 20 feet in the western basin. Lake bottom contours are shown on Plate 1. From a comparison of the lake level to the surrounding water table observed in monitoring wells and well points, it is apparent that the lake, at its current level, has an influent (losing) relationship with the groundwater except in the vicinity of the process area. This situation is discussed further in

Section 3.7.4. The lake is primarily underlain by clay deposits. The water cycle balance of Quarry Lake is described in Section 3.8.

The lake volume, assuming a lake water level of 577 m.s.l., is 40 million gallons (i.e. 200,000 cu yds.).

Quarry Lake is considered a Class D surface water body by NYSDEC. Therefore, the lake should be suitable for fishing and primary and secondary contact recreation. The waters will not necessarily support fish propagation.

3.7 Geology and Hydrogeology

This section discusses the geology and groundwater conditions at the Frontier Chemical - Pendelton Site. Information presented in this section was obtained from a review of available geologic reports, geologic maps, and data gathered from this and previous investigations at the site. Field investigations included surface geophysical surveys, a soil investigative program that characterized soil and fill material at 20 boring locations and 8 trenching locations, installation of 11 monitoring wells and 3 well points, and hydraulic testing of water-bearing formations. Geotechnical laboratory analyses were conducted on selected soil samples. Table 3-2 summarizes the results of the geotechnical testing. The complete geotechnical report is given in Appendix K. Results of the geophysical investigation are presented in detail in Appendix D. Detailed logs of all sampled soil borings appear in Appendix E. Boring logs from previous investigations appear in Appendix L.

3.7.1 Regional Geology

The site is located within the extreme western portion of the Erie-Ontario lowlands physiographic province (University of the State of New York, 1966). This province forms a band across the western half of New

York State, lying east of Lake Erie and largely south of Lake Ontario. The Erie-Ontario Lowlands are characterized by relatively flat-lying, low relief topographic features. The major physiographic feature of the area is the east-west trending Niagara Escarpment which extends westward into Ontario, Canada and becomes discontinuous towards Rochester, New York to the east. The Middle Silurian Lockport Dolomite forms the Escarpment's resistant caprock. The Niagara Escarpment is located approximately 5 miles north of the Frontier Site.

Glacial erosion and deposition has significantly modified the topography of the Erie-Ontario Lowlands. The area has experienced repeated southward advance and northward retreat of the glacial ice margin, resulting in the deposition of a variety of glacial sediments. Glacial deposits in the immediate vicinity of the site include lacustrine sediments and ground moraine (Muller, 1977).

Much of the site's clay deposits are fine grained sediments that settled into the basin of glacial lake Tonawanda during Pleistocene and Holocene time. These sediments were laid into a depressional trough shaped by glacial erosion of the underlying bedrock with subsequent deposition of ground moraine (crushed rock material transported by and lodged beneath actively flowing ice).

The bedrock in the vicinity is a nearly flat lying sequence of Silurian aged limestone, dolomite, shale, and sandstone deposits. This sequence, exposed along the Niagara Escarpment and in the Niagara River Gorge, is dipping gently southward at a grade of approximately 30 feet per mile. The Frontier Site is underlain by the Oak Orchard (Guelph) Dolomite Member of the Lockport Formation.

3.7.2 Site Stratigraphy

A sequence of unconsolidated sediments ranging in thickness from 28 to 44 feet was encountered over bedrock in boreholes drilled at the Frontier Chemical -Pendelton Site. Geologic sections interpreted from the borings logged in this study confirm the stratigraphic sequence identified in previous investigations (Earth Dimensions, 1985; Golder Associates, 1988). Figure 3-6 is a generalized geologic/hydrologic column for the site. Principal units of the section include an upper water bearing zone consisting of fill and weathered clay, a clay confining unit, and a lower aquifer consisting of till and fractured bedrock. Geologic cross-sections are depicted in Figures 3-8 and 3-9. Cross section locations are shown on Figure 3-7.

The units described below were defined on the basis of composition, with emphasis given to hydrologic properties. The units are described from youngest to oldest (i.e., shallowest to deepest).

(a) Upper Water Bearing Zone:

Fill: The fill material at the Frontier Site typically includes brick and brick fragments in a silty clay to a sandy gravel matrix. It also includes various types of C&D debris, crushed drums and other metal objects, dredged lake bottom clay and pickle liquor sludge, and black sludge-like substances.

Fill is commonly from 3 to 6 feet thick but may range to over 20 feet thick in the dredged sludge piles and other waste piles in the process area. The thickness of fill is controlled by the topographic expression of the waste piles except at the far eastern end of the process area. In this vicinity, metal sludges and lake bottom sediments exceeding 14 feet in thickness were encountered (Boring B-6) in an area of low topographic expression. It is apparent from a 1985 topographic map that

this area was formerly part of Quarry Lake and that lake bottom sediments and metal sludges were used to fill this part of the lake to above shoreline grade.

The areal extent and thickness of fill is shown in Figure 3-10. The fill is subdivided into: 1) lake bottom dredge spoils, 2) general fill, 3) metals-contaminated sludges still remaining on the lake bottom, and 4) clay and fill associated with the clay berm that formerly separated the lake basins. The total estimated volume of fill at the Frontier Site is 105,000 cu. yds.

Based upon the results of the soil gas survey and electromagnetic survey of the site, there appears to be no fill at the Frontier Site outside the limits of fill indicated on Figure 3-10. These surveys are further explained in Section 4.2.2.

Desiccated Surface Soil: This unit is comprised of a weathered clay and clayey silt and is incorporated with the fill zone (where present) to form the upper water bearing zone. These materials are typically moderately plastic with a very stiff to medium stiff consistency. Vertical fractures are common especially near the top of the unit. Smoky quartz crystals were observed within the fractures indicating alternate cycles of wetting and drying. This unit contains seasonally perched water.

(b) Clay Confining Unit:

This unit is a brown clay or silty clay that is soft to very soft, wet, plastic, and sticky. Gray horizontal silty seams increase in size and number with depth and contribute to an overall coarsening of the unit with depth. This unit is highly impermeable, and serves to confine the lower unit from the upper water bearing zone.

The thickness of this unit varies from less than 5 feet in the western basin of Quarry Lake to greater than 20 feet beneath the fill of the process area. The thickness of clayey sediments, including the soft confining clay and the weathered clay of the upper water bearing zone, is shown in Figure 3-11. Since the base of clay was calculated based upon only eight deep borings, variations from the thicknesses shown in Figure 3-11 are likely, especially beneath Quarry Lake. The amount of clay present on the lake bottom will be determined during the remedial design remedial action phase of this project, when the lake is dewatered.

(c) Local Impervious Unit:

This unit is found in significant thickness (19 feet) at only one offsite well location. The unit consists of dense silt, with some clay and trace sand and gravel and is dry to moist. It is local to the elongated ridge that underlies Beach Ridge Road and is likely at least the partial cause of this topographic feature. This silt may interfinger into the silty sand unit of the lower aquifer at the southern portion of the site. The unit may cause locally semi-confining conditions.

(d) Lower Aquifer:

This unit contains three types of materials including 1) relatively permeable mixtures of silt, sand, and gravel, 2) dolostone bedrock, and 3) weathered bedrock.

Silty Sand: The unit shown as silty sand on the cross sections (Figures 3-8 and 3-9) is predominantly silty sand with some clay and gravel but may range to sandy silt with trace gravel and to gravelly sand with some silt. The top of this unit continues the gradational coarsening with depth exhibited by the unit above. Although loose at the top of the unit, the materials are typically dense to very dense.

Although the unit is saturated, isolated lenses give the appearance of being moist to dry.

Thickness of this unit ranges from greater than 17 feet at the southeast end of the site to less than 5 feet at the northeast end of the site. The thickness of the silty sand is depicted on Figure 3-12.

Dolostone: Dark gray very hard dolostone was encountered at all deep boring locations. The rock was fractured, faintly and thinly laminated and contained occasional crystals in small non-connected voids. A faint white residue appeared on many of the fracture surfaces. Based on stratigraphic position this unit is consistent with classification as the Oak Orchard Dolomite Member of the Lockport Formation (Zenger, 1965). More recent publications have reclassified this unit as the Guelph Formation of the Lockport Group (Brett et al., 1988). The elevations of the top of competent bedrock are given in Figure 3-13.

Weathered Bedrock: This unit was interpreted to include the interval between sample spoon and auger refusal. This zone contains weathered dolostone, which has formed at the soil/rock interface, and consists of a mixture of dolostone fragments in a silty and sandy matrix.

3.7.3 Hydraulic Conductivity

Variable head hydraulic conductivity tests (slug tests) were performed on 22 monitoring wells including 10 of 11 installed in this study. The tests consisted of raising the water level in the casing by means of a stainless-steel slug, and electronically monitoring the water level over time as it returned to static level. Field data was used to calculate hydraulic conductivity by using methods developed by Bouwer and Rice (1976) and cross checked by Hvorslev (1951). The results of this analysis are presented in Table 3-3. Hydraulic conductivity calculations are given in Appendix M.

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Vertical hydraulic conductivity of the clay confining unit were determined in laboratory tests performed on undisturbed Shelby tube samples. The test samples were extruded from the tube and tested in a triaxial chamber using differential heads. The values derived as summarized on Table 3-2. The geotechnical testing report is given in Appendix K.

The ranges of hydraulic conductivities measured were generally similar within the individual units defined. The hydraulic conductivity of the clay confining unit is one to three orders of magnitude less than that of the upper water bearing zone and three to four orders of magnitude less than that of the lower aquifer. There appears to be a great variation in hydraulic conductivity values within the fill unit.

Specific properties of each unit are described below:

(1) Fill - Slug tests from four wells screened in fill reveal hydraulic conductivity values that range from 9.2×10^{-3} to 1.8×10^{-4}. Golder Associates (1988) slug tested eleven wells screened in fill. Their results indicate a range of hydraulic conductivity values from 3.5×10^{-4} to 7.3×10^{-7} cm/sec. These values likely vary with changes in the nature of the fill material (i.e. loose C&D type debris and brick mixtures will have a significantly higher hydraulic conductivity when compared to sludge/clay mixtures). The Golder results must be compared with caution, as their results tend to yield hydraulic conductivity values an order of magnitude or more lower than the values derived in this study, when comparing data from the same wells.

(2) Weathered Clay - Four of five wells tested that were screened in the weathered clay yielded hydraulic conductivity values between 9.0×10^{-5} and 7.2×10^{-6} cm/sec. The single anomalous value was 2.0×10^{-3} cm/sec. Flow through this unit is likely controlled by secondary porosity (i.e. flow through fractures). The primary conductivity of the weathered

clay is likely on the order of 10^{-7} or 10^{-8} cm/sec, similar to the underlying unfractured clay.

(3) Confining Clay - Golder (1988) reports hydraulic conductivity values from slug tests from two wells screened in this unit as on the order of magnitude of 1 x 10^{-7} cm/sec. One of these wells, sampled during this investigation (88-11B), did not recover fully from purging to dryness until after a one month time period. Laboratory permeability tests from samples taken within this unit yield values on the order of 1 x 10^{-8} cm/sec. These samples reveal a small increase in k with depth in all cases. This correlates with the observed coarsening with depth of this unit observed in borings.

(4) Silty Sand - Slug tests from wells screened in this interval for the most part reveal hydraulic conductivity values of 8.7 x 10^{-3} to 9.8 x 10^{-4} cm/sec. An anomalous value of 9.2 x 10^{-6} was observed at one location. A single laboratory permeability run on a test sample taken in a tight compact till layer within this unit revealed a value of 7.2 x 10^{-7} cm/sec. Compact layers of till were only encountered in two of five deep borings.

(5) Dense Silt (Local Impervious Unit) - Although no hydraulic conductivity testing of this unit was completed, values on the order of 10^{-6} or 10^{-7} are likely based upon the slow rate of recovery observed in the single well screened in this interval.

(6) Dolostone - The primary porosity of unfractured limestones and dolomites can be extremely low (as little as 1%; Fetter, 1980). Secondary porosity in these rocks, in the form of fractures, increases porosity and may increase hydraulic conductivity many orders of magnitude (Davis, 1969). Hydraulic conductivity values for the bedrock unit obtained from slug test data ranged from 1.1 x 10^{-3} to 1.6 x 10^{-4} cm/sec. The measured

hydraulic conductivity is likely attributable to secondary porosity (fractures).

3.7.4 Groundwater Flow Patterns

Groundwater elevations presented in Table 3-4 were used to evaluate horizontal and vertical gradients. Groundwater contours and interpreted flow direction for the water table aquifer on October 16, 1990 (fall conditions) are presented in Figure 3-14 and for the same aquifer on March 6, 1991 (spring conditions) in Figure 3-15. The shallow flow at the site is quite complex. During all dates monitored between June 1990 and April 1991, radial flow occurred away from a groundwater recharge mound in the process area (reflecting the topographic mound and recharge tendency of this area), away from Quarry Lake, and away from the rectangular shallow pond NE of the lake. The steep gradients (as much as .0555 ft/ft) at the perimeter of these features shown on Figure 3-14 are likely caused by the relatively low horizontal hydraulic conductivities of the weathered clay unit of the upper water bearing zone. Although the gradients are steep, actual horizontal flow is of low volume (See Water Balance; Section 3.8). Shallow flow is also apparently away from the elongated ridge that underlies Beach Ridge Road based on the information from the single shallow well installed at the base of the ridge (URS-14S). The water levels in shallow wells exhibited a drop of up to 2 feet between June and September 1990 and recovered from 2 to 3 feet between September 1990 and March 1991.

Table 3-5 summarizes vertical hydraulic gradients, as determined from water level readings at monitoring well pairs. These data indicate a strong downward (discharge) gradient between the upper water bearing zone and the lower aquifer at all locations to the south and west of Quarry Lake and a strong upward (recharge) gradient to the north of the lake. The data also generally indicates a slight downward gradient within

the lower aquifer, between wells screened within the silty sand unit (intermediate wells) and those screened within bedrock (deep wells).

Horizontal groundwater flow in the silty sand unit of the lower aquifer is generally southwestward, away from a consistently high anomaly at URS-8I. The magnitude of the gradient is approximately .0026 ft/ft. The groundwater levels in wells screened in this unit were lowered from 1.5 to 2.5 feet from June to October 1990 and raised by approximately 1.5 feet from October 1990 to March 1991. Irregular fluctuations of level were observed at URS-9I and 85-5R. These fluctuations are currently unexplainable, although interaction with the lower aquifer and Quarry Lake through the lake bottom may provide a hypothesis as the water level database expands.

Horizontal groundwater flow gradients in the bedrock aquifer are extremely low (approximately .0005 ft/ft), although the data indicate a slight flow to the west. Groundwater levels in wells screened in bedrock typically dropped approximately 1 foot from June to October 1990 and rose by approximately 1 foot from October 1990 to March 1991.

3.8 Quarry Lake Water Balance

A water balance for Quarry Lake was performed to determine the relative contributions of all hydrologic components contributing to the lake (including rainfall, runoff, evaporation, and groundwater flow) and to verify estimates of aquifer parameters (thicknesses, hydraulic conductivities, etc.).

A time period of study was selected for which there was a complete set of data including groundwater and surface water elevations and meteorologic information (rainfall and evaporation). Average water levels for the period 7/11/90 to 8/9/90 were used to calculate average flow into and out of the lake. The lake water level at the beginning and at the end

of this period were utilized to calculate the real (observed) change in storage. The sum of the in-flows and out-flows and real change in storage are depicted on Figure 3-16. Detailed assumptions, formula and the calculation process are given in Appendix N.

The following conclusions can be drawn from the results: 1) the lake water level is governed primarily by evaporation and rainfall. Flow via groundwater is relatively insignificant; and 2) the small discrepancy in the difference between the observed and calculated balance (9%) is well within the margin of error of the calculations performed.

4.0 NATURE AND EXTENT OF CONTAMINATION

The data and conclusions presented in this section are based upon previous investigations and upon the results of the first and second rounds of remedial investigation activities at the Frontier Chemical - Pendelton Site. This section describes the nature and extent of contamination encountered at the site, and the possible sources of that contamination.

4.1 Sources of Contamination

The investigation revealed several potential sources of contamination at this site. These sources were discovered during field tasks, literature reviews, and examination of historical aerial photography. Contaminant sources appear to be confined to the filled area south of Quarry Lake depicted in Figure 3-10. The area includes many piles of general C&D refuse, metal sludge spoils, and black, dry or sludge-like material mixed with non-intact drums. Intact drums were not observed during the test pit investigation. The nature and distribution of the contamination is discussed further in Section 4.2.

In addition, several tanks are located onsite that may have formerly contained product. These tanks were individually examined during the investigation, and only one, underground tank "B" depicted on Figure 1-3, was found to contain a liquid. One sample was collected from the tank and included both aqueous and non-aqueous phases. The remainder of the tanks onsite were found to be empty. The tank sample was analyzed for TCLP parameters, the results of which are shown in Table A-9 of Appendix A. The toxicity standard for pyridine (5 ppm) in 40 CFR 261 was exceeded at 92 ppm classifying the tank contents as hazardous. The tank contents were also scanned for petroleum hydrocarbons. Diesel fuel was found to be present.

The results of the soil gas survey, terrain conductivity survey, and analytical sampling away from the filled area indicate that there are no contaminant sources in areas other than in the known filled area and in the sediments of Quarry Lake.

Several samples were analyzed from different matrices to assess the amount of leachable metals and organics in potential source materials. These samples included seven (7) subsurface soils samples, two (2) surface soil samples, and two (2) lake sediment samples that were analyzed by the EP Toxicity Methodology, and two (2) additional surface soil samples that were analyzed by the Toxicity Characteristic Leaching Procedure (TCLP). Although leachable arsenic, barium, cadmium, chromium, lead, selenium, and tetrachloroethene were detected among the samples, no samples were found to exceed 40 CFR 261.

4.2 Surficial and Subsurface Soils/Waste

The evaluation of the soil (solid) matrix at the Frontier Site makes use of data collected from the following sources: soil gas surveys, terrain conductivity surveys, chemical data gathered from surficial and subsurface soil samples, and fill material obtained during past and present site investigations. The following subsections present a summary of the pertinent field data and analytical results, as well as a brief discussion of the nature and extent of soil contamination.

4.2.1 Previous Investigations of Soil Contamination

Subsurface Soil: In June 1982, the United States Geological Survey advanced three test borings on the Frontier Chemical Pendleton site near the former process area. Two borings were shallow (3 ft. and 4 ft.) and a well was installed in the 3 ft. boring. The third boring was advanced to 26.5 ft. Two subsurface soil samples were collected at 3 - 3.5 ft. and 3.6 - 4 ft. from shallow and deep borings, respectively. The samples were

analyzed for select heavy metals. Results of these analyses as summarized on Table 4-1, indicate no abnormally high levels of metals.

Two additional subsurface soil samples were collected by the United States Geological Survey in May 1983 near the process area. The samples were designated 1A and 3A, and were collected from 3.2 ft. and 3.8 ft., respectively. These samples were subjected to organic compound analyses. Results revealed concentrations of trans-1,3-dichloroethene (110 ppb) and trichloroethene (900 ppb) for Sample 1A. These two compounds were not detected in Sample 3A.

In November 1984, Earth Dimensions, Inc., retained by Frontier Chemical Waste Process, Inc., advanced six boreholes on the Frontier Chemical Pendleton site. The purpose of the borings were to determine fill thickness across the former plant process and drum storage areas, to collect subsurface samples, and to collect a sample from the surface of the 'old' drum storage area.

Subsurface boring logs revealed that the fill ranges from 3.5 feet to 17 feet across the former plant process and drum storage areas. Broken drums were encountered at Boring #4 within the fill zone (0-9 feet). A green liquid was encountered in Borehole #2 at a depth of 6 inches. In Borehole #3, a light green solid was encountered in the sample from 2-4'. Subsurface soil samples analyzed by DEC contained elevated levels of organic compounds.

The NYSDEC collected three surficial soil samples in the fall of 1984 near the vicinity of the former plant processing area. The samples were designated 984-027-01 (composite of 'B2 and B3'), 984-027-02 (composite of 'B5 and B3'), and 984-027-03 (from 'B4'). The sampled area corresponds to the area where 55-gal. drums were reported to have been buried. The samples were analyzed by Versar, Inc., and were tested for semivolatiles, volatiles, metals, and phenol. Results of detected

parameters are shown in Table 4-5. Significant levels of a few metals, chlorinated solvents, and phenol were detected.

The sample collected from the spoil pile (20-22 feet depth) was tested for EP toxicity including endrin, lindane, methoxychlor, and toxaphene by Frontier Chemical Waste Process, Inc., in December 1984. Traces of a few heavy metals were found. Frontier Chemical Waste Process, Inc., stated that the sample passed EP toxicity test and could be characterized as non-hazardous.

In 1985, NYSDEC submitted three soil samples collected at the Frontier Chemical Pendleton site to RECRA Environmental Laboratories. The samples were designated R-985-054-01, R-985-054-02, and R-985-054-03 and correspond to sample numbers 13 HS-S, 15 HS-S, and 16 HS-S which were collected by Golder Associates. The samples were analyzed for select Hazardous Substance List compounds, Priority Pollutant metals, total recoverable phenolics, cyanide, and EP Toxicity metals. Table 4-2 summarizes detectable compounds.

Golder Associates excavated five test pits in May 1988 as part of their hydrogeological investigation of the Frontier Chemical Pendleton site. Four composite soil/waste samples were collected from four test pits. The samples were analyzed for EPA-624 volatile organic compounds by BLT Technical Services, Inc. Results of detected compounds are indicated in Table 4-3.

Surface Soil: In June 1984, the NYSDEC collected two soil samples designated R-984-020-01 and R-984-020-02. The sample depths and locations are unknown. The samples were analyzed for EP toxicity metals, BNA compounds, pesticides, and volatiles by Versar, Inc., of Springfield, Virginia. Parameters which were measured above detection limits for these samples are summarized in Table 4-4. Trace concentrations of a few

leachable heavy metals, pesticides, and volatile organic compounds were detected.

4.2.2 Soil Gas and Electromagnetic Survey

A photoionization detector (PID) was used in the remedial investigation activities to screen for volatile organics in the shallow in-situ soil (approximately 18 inches in depth). Volatile organic gases were detected at levels over 200 ppm in the center of the former process area. These levels gradually decreased away from the center of the process area to background levels away from the filled area south of Quarry Lake. The survey was conducted in June 1990 and results are depicted on Figure 4-1.

A terrain conductivity survey (electromagnetic survey) was undertaken over much of the same 40-foot grid as the soil gas survey in July 1990 (except in the main portion of the process area). Conductivity measurements were taken on the grid with an EM-31 instrument in the quadrature-phase and the in-phase modes. The in-phase mode is especially sensitive to metallic objects.

The results of the survey indicated the presence of three highly conductive anomalies within the filled area depicted in Figure 3-10, just east of the main process area. These anomalies can be attributed to inorganic chemical waste, groundwater contamination or buried metallic objects. In areas where significant anomalies were not detected the presence of fill or buried metallic objects is unlikely. No anomalies occurred outside the filled area south of Quarry Lake.

The complete geophysical report is given in Appendix D.

4.2.3 Subsurface Soil and Waste Sampling

During the first round of investigation, 10 soil samples were taken from borings, 5 soil samples were taken from test trenches, and 5 soil samples were taken from borings at monitoring well locations. These samples, collected in July and August 1990, were subjected to chemical analysis for target compound list (TCL) volatiles, semi-volatiles, pesticides/PCBs, metals, cyanide, total phenols, and miscellaneous inorganic parameters. These samples, and accompanying analytical results are given in Table A-1 of Appendix A. The locations of the samples are shown on Plate 1. Two additional subsurface samples were taken in the second round of investigation (February 1991) from borings B-11 and B-12 to the north of Quarry Lake. These results are also presented in Table A-1.

The samples analyzed to date can be divided into two groups: 1) samples taken in the known filled area delineated in Figure 3-10 (15 samples total) and 2) samples taken outside the known filled area (7 samples total).

Table 4-6 shows the organic compounds detected in the 15 subsurface samples located within the filled area. A total of 56 compounds and total phenols were detected in these samples. The most prevalent compounds and number of sample detections included pyrene (14), tetrachloroethene (12), 1,2 dichloroethene (11), benzene (11), xylenes (11), and phenanthrene (11). Total phenols were detected in all 15 samples. PCBs were also widespread (Aroclor-1260 in 9 samples). The compounds detected in the highest concentration included toluene (1,600,000 ppb), tetrachloroethene (160,000 ppb), xylenes (120,000 ppb), 1,2-dichlorobenzene (120,000 ppb), and nitrobenzene (120,000 ppb). All of these detections occurred in test pit TP-5.

Many different groups of compounds including aromatics, chlorinated hydrocarbons, phenols, polycyclic aromatic hydrocarbons, pesticides, and polychlorinated biphenyls are represented in the mix of compounds found in subsurface fill materials. The most common and most highly concentrated compounds on site generally belong to two chemical groups including the benzene, toluene, ethybenzene, and xylenes group (constituents of fuel) and the chlorinated hydrocarbon group (used as industrial solvents and degreasers).

The pattern of contamination of these two groups of compounds in the subsurface soil is depicted in Figures 4-2 and 4-3 respectively. These patterns both indicate high concentrations in the center of the former process area. The pattern of contamination of polycyclic aromatic hydrocarbons (PAHs) is quite different (Figure 4-4) in that these compounds are more widespread and less centralized in the process area.

Only six organic compounds and total phenols were detected in the seven subsurface soil samples not taken in the known filled area (Table 4-7). All were detected at concentrations of 8 ppb or less. Also, one of the compounds (2-Hexanone) was not detected in the filled area and may not be attributed to the site.

Table 4-8 is a comparison of metals concentrations between subsurface fill and subsurface soil. Several elevated metals concentrations in the filled materials can be noted from this comparison. The maximum concentration in fill materials of arsenic, cadmium, chromium, copper, lead, and mercury exceeded, by at least one order of magnitude, the mean concentration found in soil samples. The distribution of metals contamination, as depicted by an isopleth map of chromium (Figure 4-5), is different than the pattern of organics contamination in the fill (Figure 3-10). The chromium concentrations appear highest in the areas of lake sediment/metal sludge spoils in the center of the process area and at the northeastern end of the filled area.

4.2.4 Surface Soil and Waste Sampling

Nine surface soil or waste samples were collected during the first round of environmental sampling at the Frontier Chemical-Pendelton Site. These samples were taken within 3 feet of the ground surface in June and July 1990. The samples were analyzed for TCL parameters and other miscellaneous parameters using NYSDEC ASP Protocols. Three additional surface soil samples were taken in the second round of sampling. These samples were analyzed for hexavalent chromium (3), dioxins/furans (2), and TCLP Parameters (2). The locations of each surface soil sample are shown on Plate 1. Table A-2 of Appendix A presents the concentrations of chemical analytes found in each sample except dioxins/furans which are shown in Table A-8.

The samples can be divided into two groups: 1) samples taken from near the surface of the known fill area and, 2) surface samples taken from areas away from the known fill area including a defined background sample (SPS-1).

Table 4-9 shows the organic compounds detected in the 6 surface samples located in the known area of fill. A total of 43 compounds and total phenols were detected in these sample. The most prevalent compounds and number of sample detections include 1,2-dichlorobenzene (5), 1,2,4-trichlorobenzene (5), phenanthrene (5), and chrysene (5). Total phenols were detected in all six samples. The compounds detected in the greatest concentration were bis(2-ethylhexyl)phthalate (18,000 ppb) a common laboratory contaminant, aroclor-1254 (11,000 ppb), toluene (6,100 ppb), 1,2-dichloroethene (5,600 ppb), and 1,2 dichlorobenzene (4,900 ppb). These detections occurred among three different samples, two of which were saturated with leachate (SPS-5 and SPS-6).

These compounds represent several chemical groups. Volatile compounds were largely limited to the leachate soaked soil samples. Polycyclic aromatic hydrocarbons, chlorobenzenes and polychlorinated

biphenyls were the most common and widespread groups of compounds detected.

Only five organic compounds were detected among the three samples taken outside the known filled area (Table 4-10). Of these, four were detected in a sample (SPS-3) from the berm surrounding Quarry Lake. Pentachlorophenol, the only compound detected in the background sample, was not detected in surface or subsurface materials found elsewhere onsite. Dioxins (total HpCDD, OCDD) were detected in both samples for which they were analyzed, while furans were not detected.

Table 4-11 is a comparison of metals concentrations between surface soil samples within and outside the area of known fill. A few elevated metals concentrations can be noted from this comparison. The maximum concentration of three metals in surface samples taken from the filled area exceeded the mean concentration found in either the subsurface or surface soil samples taken away from the known filled areas by at least one order of magnitude. These included cadmium, calcium and chromium. No detectable hexavalent chromium was found in any of the three samples analyzed.

4.3 Lake Water and Sediments

This section discusses the analytical data obtained from water and sediment samples from Quarry Lake.

4.3.1 Previous Investigations Of Quarry Lake Water

Four prior investigations of Quarry Lake water chemistry have been conducted. The analyses were performed in July 1978, June 1981, June 1982, and October 1982. Analytical results from these investigations are summarized in Table 4-12. Since 1978, the pH at Quarry Lake water has increased from 2.8 to 7.1 in response to neutralization by treatment with

lime and sodium hydroxide. As a result, concentrations of many parameters (notably, Cd, Cr, Cu, Fe, Ni, and Zn) have decreased. Ammonia concentrations in June 1981 and October 1982 remained well above the USEPA drinking water standards. The ammonia concentrations may reflect a bacterial influence.

4.3.2 Quarry Lake Water Sampling

A single water sample was taken from Quarry Lake and analyzed for TCL and miscellaneous inorganic parameters during the first phase of the RI investigation (July 1990). Three samples were taken and analyzed for TCL parameters only during the second phase (December, 1990). The results are presented in Table A-3 of the Appendix A. Two organic compounds were detected at low levels in the western basin of Quarry Lake including 1,2-dichloroethene (2 detections; Max = 4 ppb) and toluene (2 detections; Max = 4 ppb). One organic compound was detected in the eastern basin (di-n-butylphthalate at 0.4 ppb). Total dissolved solids have decreased considerably (from 2,223 mg/l to 629 mg/l) since the last sampling of the lake water in June 1982. Metals concentrations have also remained low, with only iron and nickel concentrations exceeding applicable aquatic ARARs for Class "D" water.

4.3.3 Previous Investigations of Quarry Lake Sediments

At least four investigations of Quarry Lake sediment/sludge chemistry were performed between February 1980 and May 1986. In February 1980, Frontier Chemical Laboratory conducted an analysis on a lake sludge sample from an unknown location. The report prepared by R.B. MacMullin Associates on February 29, 1980 states that the sludge is composed of calcium sulfates mixed with Fe, Ni, Cu, and other metal salts. Frontier's analysis apparently revealed a 3.25 ppm concentration of total chlorinated hydrocarbons calculated as lindane in the sludge. Phenol concentration was less than 1 ppb.

In November 1982, one composite sample was taken by Frontier Chemical from various locations along the edges of Quarry Lake when it had been pumped down. The sample was analyzed by Frontier Chemical Laboratory for Total Halogenated Organics (THO) such as lindane and EP toxicity metals. Results of this analyses revealed THO (< .1 ppb), Mn (.1 ppm), and Ni (.1 ppm). All other metals were below detectable limits.

In May 1986, eight soil/sludge samples were analyzed for EP toxicity metals by Advanced Environmental Systems, Inc. The samples ranged in depth from 8 to 18 inches and were widely distributed across the lake. Results of the metals analyses showed a considerable range in Cr (590 - 14,950 ppb), Cd (120 - 4,800 ppb), Pb (1,000 - 1,330 ppb), Hg (BDL - 5 ppb), Se (BDL - 6 ppb), and Ag (BDL - 180 ppb).

The NYSDEC collected three samples of Quarry Lake sludge/sediment in May 1986. The samples were analyzed by NYSDOH for EP toxicity inorganics. Results of detected metal concentrations ranged from 40 - 1,400 ppb (cadmium), < 5 - 6.5 ppb (arsenic), < 100 - 690 ppb (chromium). Other metals were below detection limits.

Seven samples of Quarry Lake sludge/sediment were collected with a hand sampler from four locations by SLC Consultants/Contractors, Inc. in December 1984. Sample depths ranged from 0 - 82 inches. The samples were analyzed by Frontier Chemical Waste Process Inc. Results showed only trace concentrations of barium (7-32 ppm), cadmium (<0.1 - .97 ppm), chromium (<.05 - .14 ppm), and lead (<0.1 - 4.0 ppm). All other metals, methoxychlor, and toxaphene were also below maximum allowable limits.

In August 1985, twenty-four sediment sludge samples were collected at ten sampling stations within Quarry Lake. Sample depths ranged from 0 to 5.5 feet. The lake had been pumped dry at the time. Four of the samples were analyzed for priority pollutants by Zenon Environmental, Inc., for Frontier Chemical Waste Process, Inc. The NYSDEC submitted two

duplicate samples to RECRA Environmental Laboratories that were also tested for priority pollutants. Table 4-13 compares the analytical results. Pesticides and PCBs were not detected in the analyses conducted by RECRA Environmental Laboratories or Zenon Environmental, Inc.

The other twenty samples were tested for EP toxicity, total halogenated organics, and ammonia nitrogen by Frontier Chemical Waste Process, Inc., and Advanced Environmental Systems. RECRA conducted similar testing on 3 duplicate samples submitted by NYSDEC. Table 4-13 summarizes these data.

4.3.4 Quarry Lake Sediment Sampling

Seventeen (17) lake sediment samples were taken at roughly evenly spaced random locations on Quarry Lake in July and August 1990 (Plate 1). All samples were taken from the upper 2 feet of the lake bottom sediments. These samples were analyzed for TCL compounds and miscellaneous inorganic parameters. The results are presented in Table
A-3.

The lake can be divided into eastern and western basins (Fig. 3-9). The basins are separated by the remnants of a berm constructed in the mid-1980s to facilitate lake dewatering and removal of metal-contaminated sludge from the western portion of the lake.

Twenty-nine organic compounds were detected in lake sediments in Quarry Lake (Table 4-14). This included two compounds found exclusively in the eastern basin, twenty compounds found exclusively in the western basin, and seven compounds identified in both basins. Organic compounds were found in higher concentrations and more frequently detected in the sediments of the western basin. The higher degree of contamination observed in the western basin may be related to the proximity of the basin to the former process area.

The most prevalent compounds detected and number of samples included 1,2-Dichloroethene (8), di-n-butylphthalate (6), flouranthene (6), pyrene (6), butylbenzylphthalate (6), and di-n-octylphthalate (6). The compounds detected in the highest concentration included aroclor-1254 (300 ppb), fluoranthene (120 ppb), benzo(b)fluoranthene (110 ppb), and 1,2,4-trichlorobenzene (100 ppb).

Table 4-15 is a comparison of metals concentrations between lake bottom sediments, and surface and subsurface soils taken away from the known area of fill. Three (3) significantly elevated metals concentrations in the sediments can be noted from this comparison. The maximum concentration of cadmium, chromium, and cyanide in sediment exceeded, by at least one order of magnitude, either the mean concentration in background surface soil or in background subsurface soil. Unlike the pattern of organic compound contamination observed in lake sediments, the metals contamination appears to be centered in the eastern basin of Quarry Lake. Figure 4-6 indicates the total chromium concentration at each of the seventeen (17) lake bottom sediment sample locations. Several of the highest concentrations of chromium appear to correspond to the occurrence of a stringy black sludge that was found during sampling. The highest chromium concentrations in lake bottom sediments occurred in the eastern basin.

4.4 Creek Water and Sediments

The evaluation of the nature and extent of contamination in the sediments and waters of Bull Creek make use of analytical data collected in the first round of environmental sampling. To assess the impact of the site upon stream biota, a benthic study has also been included.

4.4.1 Previous Investigations Of Bull Creek Water

In February 1980, a water sample was collected from Bull Creek at an unknown location. The sample was analyzed by Ecology and Environment, Inc., for pH, total suspended solids, total dissolved solids, and BOD_5. The results were, respectively, 7.4, 37 ppm, 660 ppm, and 2.8 ppm.

In June 1982 the USGS collected and analyzed two surface water samples for the USEPA from a drainage ditch adjacent to the Frontier Chemical Pendleton site along Townline Road. The ditch drains into Bull Creek at the Townline Road bridge. One sample was collected near Bull Creek and the other was collected near the existing main entrance gate. Table 4-16 summarizes the results of the analysis.

4.4.2 Bull Creek Water Sampling

Two water samples were taken at Bull Creek in June 1990 at a period of low (base) flow including a downstream and upstream (background) sample (Plate 1). Samples were taken again in December 1990 from roughly the same locations during a period of high (near-flood stage) flow. The results of these analyses are given in Table A-4 of Appendix A.

Seventeen organic compounds were detected in the two samples taken in June 1990 including thirteen found only in the upstream sample (SW-2), and four in both the upstream and downstream samples. Twelve of the compounds detected were polycylic aromatic hydrocarbons (PAH). All detected compounds were of a concentration of 26 ppb or less. Metal concentrations in the downstream sample were within one order of magnitude of the upstream sample.

Only one organic compound was detected between the two samples taken in December 1990 (xylenes at downstream sample). Metals concentrations were also lower in these samples than in the June samples. This decrease

in contaminant occurance in Bull Creek between the sampling events is likely due to the greater dilution capacity of Bull Creek during the second sampling event.

4.4.3 Bull Creek Sediment Sampling

Four (4) sediment samples were taken at Bull Creek at the same locations and dates as the surface water samples. These samples were analyzed for TCL parameters. The results of the analyses are given in Table A-4 of Appendix A.

Eleven organic compounds were detected in the two samples taken during the first sampling event in June 1990 including two found exclusively in the downstream sample, one found exclusively in the background sample, and eight common to both samples. Nine of the compounds detected were polycylic aromatic hydrocarbons. Eight compounds detected in the sediments were also detected in stream water. The concentrations of the PAHs were from 2 to 5 times greater in the downstream samples when compared to the upstream. Only one metal (cadmium) was found in the downstream sample at a concentration of more than one order of magnitude greater than the background sample.

Ten organic compounds were detected in the two samples taken during the second sampling event in December 1990, including eight in the upstream sample and six in the downstream samples. Six of the detected compounds were common with those detected in the first sampling event. Only benzene, benzoic acid, 2-methylnaphthalene, and diethylphthalate were detected exclusively in the second round. With the exception of these four compounds, all detected analytes (including metals) were found at similar or lesser levels than those found in the first event.

4.4.4 Benthic Survey

The purpose of the benthic macroinvertibrate survey was to document any effect of leachate from the site on the Bull Creek biological community. Alterations of the macroinvertibrate community can be used as an indication of stream perturbations which may otherwise have gone undetected by analytical testing methods. Field work for the benthic survey was conducted in June 1990.

Three samples were taken at each of four locations within Bull Creek; immediately upstream of the site, adjacent to the site, immediately downstream of the site (just beyond the crossing at Town Line Road), and approximately 2000 feet downstream of the site. Sampling was done at the head of riffles (shallow turbulent areas) in 8 to 12 inches of water. Samples were collected using a standard Surber sampler with a 1024 micron mesh net and a 12 square inch collection area. Therefore, each selection represents the number of organisms per square foot. Sample site selection included habitat characterization to ensure identical sampling area. Samples were sorted from debris and, where possible, identified to the species level. Lists of taxa (orders, families, species, etc.) are provided in Appendix P. Characterization of the macroinvertibrate community is discussed below.

In order to give fullest possible characterization of the benthic macroinvertibrate community at each location, a number of indices were calculated which included: 1) number of individuals, 2) species richness, 3) equitability, 4) diversity, 5) similarity index 6) presence of microbiological deformities, and 7) biotic index.

1) Number of Individuals. The number of individuals present in a sample provides a rough indication of community productivity and the presence of toxic substances in the environment.

2) Species Richness. The number of taxa identified at each location. Richness is lowered by environmental stresses.

3) Equitability. A measure of the evenness of population distribution according to the expression:

$$e = \frac{s_i}{s}$$

Where s = number of taxa

s_i = tabulated value supplied by USEPA methods manuals (Williams, 1972)

Generally, a community with an e value greater than 1.5 is considered well balanced.

4) Diversity. A measure of both species richness and equitability. The number is calculated using the modified Shannon expression (Shannon, 1948):

$$a = C(\log_{10} N - \frac{1}{N} \sum n_i \log_{10} n_i)$$

Where ni = number of individuals in the ith taxa

C = 3.321928 (conversion of base 10 log to base 2)

N = total number of individuals

5) Similarity Index. A measure of the similarity of taxa between any two sample sites. A coefficient of 1.0 indicates complete similarity and a 0 shows no taxa in common. Sites are considered to be similar when c is greater than 0.6. The coefficient of similarity between two stations is calculated using Van Horn's equation (Van Horn, 1950) as modified from the general formula described by Gleason (1920):

$$c = \frac{2w}{a + b}$$

The variables in the expression can be used either on the number of taxa present or absent at each station, or on actual numerical data collected at each site. In this study, the presence/absence method was used:

a = number of taxa collected at one station
b = number of taxa collected at other station
w = number of taxa common to both station.

6) Presence of Microbiological Deformities. By identifying and plotting the location of populations with a high incidence of deformities, a source of pollution by organics or heavy metals may be estimated.

7) Biotic Index. An index for using anthropod fauna to evaluate organic stream pollution. It is based on tolerance values for individual species and uses an expanded scale 0-10 (Hilsenhoff, 1984).

Table 4-17 summarizes the statistical analyses calculated for Bull Creek macroinvertibrates. There appears to be no noticeable difference between any of the four sites. The biotic index for each is in the fair range of 5.51 - 6.5 (Hilsenhoff, 1984); and in all cases equitability also falls within the fair range (Williams, 1972). Similarity indices show a similarity only between the upstream (UP) and onsite (OS) sites.

From the information collected it can be concluded that the overall impact of the site on the water quality of Bull Creek is negligible.

4.4.5 Runoff Pathway Sampling

In addition to the sampling completed in Bull Creek, several other sediment and surface water samples were taken from intermediate surface water bodies that potentially import contamination to Bull Creek during periods of intense rain and/or snowmelt. These pathways, which include ditches along Townline Road (TL Ditch) and the abandoned railroad right-of-way to the southeast of the site (RR Ditch) were sampled during high water conditions in December 1990. These pathways are depicted on Figure 3-3 and the sample locations shown on Plate 1.

The surface water sample taken at the Townline Road Ditch contained two detected organic analytes including 1,2-dichloroethene (2 ppb) and total phenols (15 ppb). Both of these analytes are attributable to the site but are not found in the downstream Bull Creek samples. Metals concentrations in the Townline Road ditch sample are at similar or lower levels than those found in the downstream Bull Creek Samples.

Seven (7) semi-volatile compounds, mostly PAHs, were detected in the sediments in the ditch located adjacent to Townline Road. Fourteen (14) semi-volatile compounds were detected in the sediments in the ditch located adjacent to the railroad right-of-way. No other organic compounds except total phenols (also semi-volatiles) were found in the two samples. Although these compounds are found onsite, they also may be attributed to a local source (i.e., Townline Road and RR ROW). Chromium was found at a high level in the right-of-way ditch (696 ppm). This was the only metal found to be at least one order of magnitude greater than any corresponding metal found in the background Bull Creek sediment samples.

Additionally, two sediment samples were taken from the bottom of the rectangular pond located to the northeast of Quarry Lake. Results indicate that these two samples are clean (2 organic detections, background level metals).

4.4.6 Conclusions of Bull Creek Analyses

Contamination was detected (primarily polycylic aromatic hydrocarbons) in both the stream sediments and water at the locations sampled, including upstream and downstream sites. Since the background sample contained significant contamination, and the background location is located near a potential local source of PAH contamination (RR right-of-way), the observed contamination may not be attributable to the Frontier Site. Although two organic analytes attributable to the contaminated portion of the Frontier site were observed in the ditch adjacent to Townline Road, these anlaytes were not found in the downstream Bull Creek samples. It is apparent that during periods when the runoff pathways from the site are active (snowmelt or heavy rains), the dilution capacity of Bull Creek correspondingly increases to a point where site contaminants cannot be detected in the water or sediments. Furthermore, the results of the benthic survey indicate that the overall impact of the site on the water quality of Bull Creek is negligible.

4.5 Groundwater

The evaluation of groundwater at the Frontier Chemical - Pendelton Site makes use of geological, hydrogeological, and chemical data gathered from all subsurface drilling and environmental sampling programs, past and present. The following subsections present a summary of the pertinent field data and analytical results, and a brief discussion of the nature and extent of groundwater contamination in the three water-bearing zones defined at the site.

4.5.1 Previous Groundwater Investigations

In 1982, the United States Geological Survey installed and sampled a monitoring well which penetrated to 3 feet depth. The well was installed approximately 300 feet south of the southwest corner of Quarry

Lake. The sample was analyzed for selected metals. Results showed concentrations of copper (18 ppm), cadmium (2 ppm), iron (3,000 ppm), nickel (53 ppm), and zinc (1,700 ppm).

Earth Dimensions, Inc. installed ten wells at the Frontier Chemical site in July 1985 for Frontier Chemical Process, Inc. The wells range in depth from 10 - 39 feet. The wells consist of two-inch flush threaded PVC screen and riser. Water samples from these wells were collected by Frontier Chemical personnel in the fall of 1985 and split with the NYSDEC.

The Frontier Chemical samples were submitted to Zenon Environmental, Inc., and analyzed for EPA Priority Pollutant volatile organics, acid extractables, base-neutral extractables, pesticides and PCBs, and inorganics. Results are shown in Table 4-18.

The NYSDEC submitted four groundwater samples from Wells 2R, 5R, 7R, and 3S to RECRA Environmental Laboratories. Samples were subjected to the same testing parameters as those submitted to Zenon Environmental, Inc. Table 4-19 summarizes these data. Although the RECRA results are similar to those of Zenon's, a few differences exist. For example, RECRA detected toluene at 110,000 ppb in water from Well 3S, whereas, Zenon did not detect any toluene. Similarly, RECRA reported concentrations of vinyl chloride (710 ppb) in water from 3S and none was detected in Zenon's analysis. Except for well 3S, located in the former processing area, no other perimeter wells showed any significant contamination.

In May and June 1988, Golder Associates conducted a hydrogeological investigation of the site for Frontier Chemical Process, Inc. Twenty-two monitoring wells were installed at fourteen locations on the site. The majority of the wells are located in the former plant processing area. The wells were installed by Empire Soil Investigations. Groundwater samples from these wells were collected between October 25 and October 29,

1988. During this investigation groundwater samples were also collected from the wells installed by Earth Dimensions in 1985.

Thirty-two groundwater samples were collected in December 1988 - January 1989 and analyzed by BLT Technical Services. Samples were analyzed for EPA priority pollutant metals, EPA-624 target compound list volatile organic compounds, EPA-625 base/neutral and acid extractable compounds, total phenols and total cyanide. Water samples from the 1988 well network were not analyzed for pesticides and PCBs. These results are also summarized in Table 4-18.

The 1988 chemical analysis data shows fairly significant concentrations of a few chlorinated compounds and heavy metals in Well 3S, 7A, 8A, 9A, 10A, and 14A. The 1985 series perimeter wells showed only trace levels, ranging from 0.1 to 86 ppt.

4.5.2 Groundwater Sampling

Twenty-nine groundwater samples were collected in the first round of RI environmental sampling (August 1990). Samples were analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs, and metals. In several cases, however, the parameter list was shortened for individual samples due to insufficient sample volume resulting from slow well recovery. Twenty-eight groundwater samples were collected in the second round of environmental sampling (February 1991). In addition, the New York State Department of Health (NYSDOH) sampled groundwater from a private well.

4.5.2.1 Private Well

In response to information that one local residence (4179 Beach Ridge Road) still used their well for drinking water, NYSDOH sampled their water from a kitchen sink tap. This sample was collected in December 1990 and was analyzed for aromatic purgables; ketones; pesticides/PCBs;

Priority Pollutants, base neutrals and acid extractable compounds; and metals.

No organic compounds or unusually high metals concentrations were detected in this sample. Analytical results form the NYSDOH sample are included in Appendix B.

4.5.2.2 Shallow Monitoring Wells

Twenty-three samples were taken from 19 wells screened in fill or weathered clay monitoring the upper water bearing zone in two rounds of groundwater sampling. The analytical results for these samples are given in Table A-5 of Appendix A. Thirty-nine (39) organic compounds were detected among the samples (as summarized in Table 4-20). Nearly all of these detections occurred in groundwater from wells located within the known filled area depicted in Figure 3-10. Trace levels of organic contaminants were detected in second round groundwater samples at four of five wells located outside the filled area. 2-butanone was detected in 85-7S (2 ppb), 85-5S (1 ppb) and URS-9S (2 ppb), and toluene (1 ppb) was detected in URS-8S. These compounds were not detected in first round sampling at these wells, and their detection during the winter sampling event is likely a result of lower groundwater/air temperatures, or laboratory contamination. No organic detections were noted in offsite well MW-14S.

Similar results were noted in both rounds of analysis in wells that were sampled twice. No compounds were detected in the second round of sampling that did not appear among the first round samples.

The most prevalent compounds detected in the known fill area and number of detections included: trichloroethene (9), 1,2-dichloroethene (total) (8), 1,1,1 trichloroethane (7), and 1,1-dichloroethane (5). The compounds detected in the highest concentration included toluene (260,000

ppb), 1,2-dichloroethane (230,000 ppb), 1,2-dichloroethene (41,000 ppb), and trichloroethene (36,000 ppb). Seventeen volatiles and twenty-two semivolatiles were included among the detected compounds. Pesticides and PCBs were not detected. Compounds of greatest concern (i.e. frequency and concentration) in shallow groundwater include the benzene, toluene and xylene group associated with fuel products, and chlorinated hydrocarbons. The pattern of contamination exhibited by these two groups of compounds are depicted on Figure 4-7 and 4-8. The patterns are similar, and the contamination appears confined to the former process area in both cases.

Table 4-21 provides a comparison of metal concentrations for monitoring wells located within and outside the known limits of fill, with applicable chemical-specific groundwater ARARs. Several elevated metals concentrations in the groundwater of the filled area can be noted from this comparison. The maximum concentration of antimony, arsenic, barium, cadmium, chromium, iron, magnesium, manganese, potassium, selenium, sodium, and cyanide in groundwater from wells within the fill area exceeded, by at least one order of magnitude, the mean concentration in groundwater from wells outside the fill area, or applicable ARAR values. However, the mean concentration of metals in groundwater from some wells outside the filled area (background) also exceeded the applicable ARAR values. These metals included antimony, iron, magnesium, manganese, and sodium. Unusually high metals concentrations were detected in well 85-5S in the second round of sampling, as well as a great deal of sediment (probably due to failure of well materials); therefore, these results are not included in Table 4-21.

The results of this investigation confirm the results of previous investigations. The most significant difference is the absence of detectable pesticides in the most recent event (1990). However, this discrepancy may be due to differences in the analytical methodologies with pesticides reported in previous investigations at low part per trillion levels (detections at these low levels may not be reliable).

4.5.2.3 Intermediate Monitoring Wells

Twenty samples were taken from twelve wells screened within the confining clay (2 wells, 3 samples) or within the permeable silty sand confined beneath the clay (10 wells, 17 samples). The analytical results for these samples are given in Table A-6 of Appendix A. Fourteen organic compounds were detected among the samples including thirteen volatiles and one semivolatile as summarized in Table 4-22. The compounds detected in the largest number of samples included toluene, benzene, and tetrachloroethene. The compounds detected in the highest concentrations included 1,2-dichloroethene (110 ppb) and tetrachloroethene (150 ppb). Most of the organics detected, and all of the chlorinated hydrocarbons, occurred at only three locations, including four wells within the process area (88-10B, 88-10C, 88-11B and 88-11C) and a single well along the western perimeter of the lake (85-5R). These contaminants are present in much higher concentrations in the shallow well samples and may be migrating downward to the lower aquifer through the clay confining unit within the process area and/or entering through excavated portion(s) of the adjacent lake bottom.

Two compounds detected in the intermediate groundwater, bromodichloromethane and 1,1,2,2-tetrachloroethane were not detected in any shallow (source) matrix onsite including shallow groundwater, surface water, sediment, and soil. These compounds may not, therefore, be attributable to the site. Only two detections of organic compounds, including benzene (2 ppb) and toluene (1 ppb), occurred between the two upgradient wells, (URS-8I and 85-7R) in the two rounds of sampling.

Volatile results from intermediate wells sampled twice, generally, did not compare well between the two rounds of sampling. Several volatiles were present in trace concentrations in the first event at 85-2R, 85-5R, 85-7R, and URS-9I that were not detected in the second event. The two compounds detected at URS-8I in the second event were not present

in the first. The moderate levels of volatiles observed at 88-11B and 88-11C compared well between the two rounds. These results indicate that the contamination observed in the lower aquifer is local to the area centralized at well locations 88-11 and 88-10.

Table 4-23 is a comparison of metals concentrations in intermediate groundwater samples with applicable chemical-specific groundwater ARAR values. Several elevated metal concentrations can be noted from this comparison. The maximum concentrations of antimony, iron, magnesium, and manganese all exceeded applicable ARAR values. However, the concentrations for these metals may fall within background groundwater levels.

4.5.2.4 Deep Monitoring Wells

Fourteen samples were taken from eight wells screened within the bedrock unit. The analytical results for these samples are given in Table A-7 of Appendix A. Thirteen volatile organic compounds were detected among the samples (Table 4-24). Phenolic compounds were detected in ten samples. The most prevalent compounds detected and number of samples included toluene (5), benzene (5), and trichloroethene (4). The compounds detected in the highest concentration included acetone (250 ppb), trichloroethene (49 ppb), total phenols (32 ppb) and tetrachloroethene (28 ppb). The remaining compounds were detected at levels of 13 ppb or less. The upgradient well (88-12D) contained both toluene (13 ppb) and benzene (1 ppb).

Two compounds detected in the deep groundwater, bromodichloroethane and dibromochloromethane, were not detected in any shallow (source) matrix onsite including shallow groundwater, surface water and sediment, and soils. These compounds may not, therefore, be attributable to the site.

Volatile results from deep wells sampled twice did not compare well between the two rounds of sampling. Of 22 volatile organic detections observed at the six well locations in the two rounds of sampling, only three were common to both events an individual well.

Table 4-25 is a comparison of metals concentrations in bedrock (deep) groundwater samples with the applicable ARAR value. Several elevated metals concentrations can be noted from this comparison. The maximum concentrations of antimony, iron, and magnesium exceeded applicable ARAR values. However, metals concentrations for these elements may fall within background groundwater levels.

4.6 Air

Air monitoring was performed during several of the tasks conducted for this study. During the soil gas survey, air in the breathing zone (4-6 feet above ground level) was monitored with a PID for the presence of organic vapors. No readings above background levels were recorded at that time.

During drilling and trenching activities, air in the breathing zone and immediately above the augers or in the trench was monitored for organic vapors and explosivity. In addition, air downwind from the drilling rig was monitored for particulate content while the boring MW-9I was advanced.

During the drilling of site-perimeter borings, no organic vapor readings above background were recorded in either the breathing zone or at the top of the augers. In the process area, high readings (up to 250 ppm) were obtained at the top of the augers for organic vapor concentration at B-1, B-2 and B-3 and in the trench at TP-5. PID readings above background were also recorded in the breathing zone at TP-5, B-2 and B-3. No explosive gases were detected at the site.

Due to the clay-rich nature of soils, very little particulate matter was generated by drilling and trenching. However, dusty conditions were noted when the ground surface was disturbed during surface soil sampling at SPS-11 and SPS-12.

5.0 CONTAMINANT FATE AND TRANSPORT

Groundwater contamination has been detected within the shallow aquifer between the Quarry Lake and the old railroad bed. The source of the contamination is located in the center of the old process area along the access road.

In order to evaluate the potential for offsite migration of contaminants from the Frontier Chemical site, a contaminant transport analysis was performed. The model was based on field data gathered during the Remedial Investigation.

5.1 Approach

The model employs a two-step approach in investigating the potential for migration of contaminants from the old process area. First, groundwater flows are analyzed in order to determine the pathways of the contaminant migration. Second, the migration along those pathways is traced using the analytical methods of calculation. For detailed calculations, see Appendix R.

5.2 Groundwater Flow Regime

5.2.1 Shallow Aquifer

The shallow aquifer between the Quarry Lake and the old railroad bed is made up of fill and weathered clay. The nature of fill is highly variable and ranges from C&D debris to metal and organic sludges. The hydraulic conductivity of the fill material depends mostly on the type of soil matrix and, as recorded from slug tests, ranges from 9E-3 to 2E-4 cm/s. The thickness of the fill layer is highly variable due to the presence of disposal mounds. The hydraulic conductivity of the weathered clay layer has been shown to be between 9E-5 and 7E-6 cm/s. The thickness

of this layer varies from almost zero to about 10 feet. The flow is probably governed by secondary porosity (fractures). The total saturated thickness of the shallow aquifer is about 10 feet.

The flow pattern within the shallow aquifer in the vicinity of the contaminated portion of the site can be described as radially divergent. A recharge mound is formed at the center of the site in the area roughly corresponding to the location of the source of the contamination. The presence of the recharge mound is probably due to the fact that this area is covered mostly by the permeable and unvegetated fill material which offers little resistance to infiltration. The groundwater is flowing in all directions from the mound in a radial pattern.

To the west and north, the groundwater flow is intercepted by the Quarry Lake. The water levels monitored on 3/6/91 indicate that to the east groundwater flow in the shallow aquifer does not cross the old railroad bed. Instead, flows from the site and from the area east of the site seem to be intercepted by a ditch located along the railroad bed. To the south, the flow away from the recharge mound is not inhibited by any barriers or boundaries.

5.2.2 Confining Unit

The confining unit is formed by a 5 to 25 foot thick layer of clay/silty clay. The hydraulic conductivities measured by both slug tests and laboratory tests yielded results of 1E-8 cm/s to 1E-7 cm/s. No appreciable horizontal groundwater flow is present within this unit.

5.2.3 Lower Aquifer - Silty Sand Unit

This unit is formed by a 10 to 15 foot thick layer of silty sand. The values of hydraulic conductivity, as recorded from slug tests are between 9E-6 and 8E-3 cm/s. The groundwater flow within this unit is

generally in the southwestern direction and takes place under moderate gradients of about 0.0026 ft/ft.

5.2.4 Lower Aquifer - Bedrock Unit

The bedrock unit consists of a hard, fractured dolostone. Relatively high hydraulic conductivities of - 1E-3 cm/s to 2E-4 cm/s were recorded. A westward flow of groundwater was observed; however, it takes place under very low gradients of approximately 0.0005 ft/ft.

5.2.5 Vertical Flows

As determined by the water level measurements, strong downward gradients exist between the shallow and lower aquifers south of Quarry Lake. Also, slight downward gradients exist between the silty sand and bedrock units of the lower aquifer.

5.3 Contaminant Transport

5.3.1 Contaminant Migration Pathways

Based on the groundwater flow patterns determined in Section 5.2, the following contaminant migration pathways were established:

- Horizontal within the upper aquifer (Path 1)
- Vertical from the upper aquifer to the silty sand unit of the lower aquifer (Path 2)
- Horizontal within the silty sand unit of the lower aquifer (Path 3)
- Vertical from the silty sand unit to the bedrock unit of the lower aquifer (Path 4)
- Horizontal within the bedrock unit (Path 5)

5.3.2 Contaminant Concentration

- **Shallow Aquifer (Pathway 1)** - The radially divergent flow pattern within the shallow aquifer indicates the potential for widespread contamination. However, flows to the west, north and east are intercepted by either the Quarry Lake or the ditch along the old railroad bed. The groundwater flow can continue uninhibited only in the southward direction. Therefore, a potential receptor was placed south of the site, 600 feet from the center of contamination (Note: there is no receptor currently at that location). The concentration of the contaminant in the groundwater at that receptor was investigated as a function of time. The flow from the recharge mound to Quarry Lake, as calculated for the lake water balance, was used to estimate the recharge flow created by the mound. The thickness of the aquifer was assumed based on the geological sections, and the porosity was taken from the literature (Bear, 1979). The radial flow pattern created by the recharge mound was approximated by that caused by a recharging well. The following values of parameters were used in the calculation process:

Recharge Rate	50 cu. ft./day
Aquifer Thickness	10 ft.
Aquifer Porosity	0.5

The value of the hydrodynamic dispersivity was obtained by calibrating the model to the observed concentrations of contaminants and was determined to be 20 feet.

The modeling results indicate that the contaminants will reach the receptor in appreciable concentrations (here assumed to be 1E-5 times the concentration of the source) after about 80

years. Also, the model was used to determine the sensitivity of the results to various hydraulic parameters. According to the model, the contaminant propagation is governed mostly by the magnitude of the recharge flow. For example, if the recharge was assumed to be 3 times greater than determined before, the contaminants would reach the receptor in 20 to 30 years.

- **Horizontal Migration from the Shallow to the Lower Aquifer (Pathway 2)** - Downward gradients were observed in the area between the Quarry Lake and the old railroad bed. The flow downward through the clay layer separating the shallow and the lower aquifers was calculated based on the following parameters:

Average thickness of clay layer	15 feet
Vertical hydraulic conductivity of clay	1E-7 cm/s
Effective porosivity of clay	0.5
Vertical gradient	0.2

Based on those parameters, the travel time between the shallow and intermediate aquifers was calculated to be about 362 years. Since the contaminants were deposited on site in the 1970s, at the present time the lower aquifer is comparatively clean.

- **Other Pathways (Pathway 3, 4, and 5)** - Because of the very slow rate of the vertical migration from the shallow aquifer, the contaminant transport via pathways 3, 4, and 5 is unlikely to occur.

6.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Table 6-1 is a comprehensive list of state and federal applicable, relevant and appropriate requirements (ARARs) for consideration during the remediation of the Frontier Chemical site that have been approved by NYSDEC.

Action-specific ARARs will be identified when alternatives for remediation are developed. RCRA (40 CFR 264) and the Clean Water Act (CWA) provide the most pertinent action-specific requirements. Section 121 of SARA exempts onsite CERCLA activities from obtaining permits; however, permit requirements are listed as TBCs as the substantive requirements of the permit regulations must be met.

Chemical-specific ARARs are listed in Table 6-2 for groundwater, surface water (NYS Classes C and D), sediments, and soil. In every case, only the most stringent ARAR is listed. Stream sediment criteria have been determined by the equilibrium partition method in NYSDEC Division of Fish and Wildlife's "Cleanup Criteria for Aquatic Sediments" (1989) and are presented in Table 6-4. Soil and waste standards are based on the EPA Toxicity Characteristic Rule (40 CFR 261) and the former EP Toxicity Method (former 40 CFR 261). The calculated values for surface water criteria have been determined by formulas in NYSDEC TOGS 1.1.1 (April 1, 1987) and are presented in Table 6-3.

7.0 BASELINE HEALTH RISK ASSESSMENT

7.1 Introduction

The following baseline health risk assessment is an analysis of site conditions and the impact which they might have upon public health in the absence of remedial measures at the Frontier Chemical Pendleton site. In other words, it is an assessment of the no-action alternative. However, incorporated within the total assessment is a future use scenario that additionally develops exposure potentials and health impacts for use of the site as a recreational area.

Health risk assessments are generally studies conducted in an attempt to qualify the risk of adverse health effects occurring following a person's exposure to a carcinogen or toxin. The risks associated with exposure to the agent are related not only to the toxicity of the agent but to the degree to which the person is exposed. As a result, risk assessment usually involves two steps: assessing the extent of exposure and assessing the toxicity of the agent of interest.

Risks associated with an exposure can be expressed in terms of risks to an individual or risks to a population. Individual risks can typically be calculated with a higher degree of certainty because more information may be known about an individual's exposure than a group's. For example, information may be available about whether the agent is present in the person's home and, if so, the concentration of the agent may be found. Also, information is likely to be available regarding the person's lifestyle and physical characteristics, such as activity level and smoking habits.

However, when calculating risks to a population, the exposure parameters for the population may not be well defined. Assumptions may have to be made about the number of the people exposed to the agent, the

concentrations to which they are exposed, and their physical characteristics and lifestyles. For example, estimates must be made about the fraction of the population experiencing high levels of exposure or having exposures of a particular duration. Having to make assumptions about the characteristics of a population contributes additional uncertainty to the population risk estimates. The theoretical population risk estimates generally form the basis for public health policies, while individual risk estimates may be what causes a person to undertake a preventative action.

7.2 Site Background

The Frontier Chemical Pendleton Site is located in the drainage basin of the Niagara River at a point approximately 5 miles east-northeast of the river, 15 miles south of Lake Ontario, and 15 miles north of Lake Erie. Relief in the area is very gentle ranging from 593 feet above mean sea level to 573 feet mean sea level within a one mile radius of the site. The site itself is relatively flat, its only significant relief appearing around Quarry Lake in the form of a berm (0-5 feet) encompassing the lake and in the waste and fill piles of the "old" process area (up to 20 feet).

Additional information regarding climate, demography and land use, soils, ecology, surface water hydrology, geology and hydrogeology, and Quarry Lake water balance may be found in Section 3.0 of this Remedial Investigation Report.

7.3 Identification of Chemicals of Potential Concern

In Section 4.0 of this report, contaminants considered attributable to the site were identified for each sampled environmental media during the first remedial investigative phase. Contaminant sources appear to be confined to the 8-acre filled area south of Quarry Lake depicted in Figure 3-10. The area includes many piles of general C&D refuse, metal sludges,

lake bottom sediment spoils, and black, dry sludge-like material mixed with non-intact drums. No intact drums were observed. High concentrations of chlorinated hydrocarbons and aromatic hydrocarbons were found in the shallow groundwater in the immediate vicinity of the filled area. Great quantities of chlorinated hydrocarbons, aromatic hydrocarbons, poly-aromatic hydrocarbons, and metals (especially cadmium and chromium) were found in the subsurface and surface soils in the filled area. Because of the thick clay layer underlying the fill, groundwater contamination appears to be currently confined to the former process area. Metal sludges and volatile contaminated sediments remain in portions of the lake bottom. Trace volatile contamination was detected in Quarry Lake waters as a result of groundwater leaching into the lake from the highly contaminated process area. No significant contamination was detected away from these areas. For the purpose of this health risk assessment, only the contaminated filled portion of the site, in addition to Quarry Lake, will be considered.

Based upon the data presented in Section 4.0 and upon comparison to background concentrations and applicable ARARs, the media of interest in evaluating the human health risk posed by the Frontier Chemical Pendelton Site are surface soils, shallow groundwater, and Quarry Lake water. Although contaminants of potential concern were detected in Quarry Lake sediments and subsurface soils of the process area, no direct or indirect human contact with these media is likely in any reasonable scenario, Further, the lake is not amenable to fish propagation. Bull Creek is also considered an unlikely pathway. Contaminated groundwater does not enter the creek and surface water from the lake enters only during the highest creek flows when dilution renders the contaminants virtually undetectable.

Chemicals of Potential Concern (CPC) at the Site are presented in Table 7-1 and were developed from the surface soil, shallow groundwater, and Quarry Lake water matrices by the following criteria:

Surficial Soil - Organic CPC criteria: all detected organic compounds found in the filled area (see Table 4-9) were considered as CPCs. Inorganic CPC criteria: maximum concentrations found in the filled area that are least one order of magnitude greater than the mean of the background surface or subsurface soils (see Table 4-11).

Shallow Groundwater - Organic CPC criteria: all detected organic compounds found in the shallow wells of the filled area (see Table 4-20). Inorganic compounds: maximum concentrations found in the fill is at least one order of magnitude greater than the mean of the background samples (See Table 4-22).

Quarry Lake Water - Organic CPC criteria: all detected organic compounds in lakewater (toluene, 1,2-dichloroethane, and di-n-butylphthate). Inorganic criteria: exceeds applicable ARARs (since this is an enclosed water body and no background samples were readily available for comparison). Note; Iron is the only inorganic substance to meet this criterion.

7.4 Exposure Assessment

Exposure assessments are conducted to estimate the extent to which a person is exposed to the agent. The extent of exposure is dependent on, and hence the exposure assessment focuses on, two parameters: (1) the concentration of the agent present in the media of interest (such as available at a source or transported to the surrounding air, water, or soil) and (2) the amount of the media (air, water, soil) taken in, or absorbed, by an individual. The amount of media taken in by an individual is dependent on lifestyle and physical characteristics which place him/her in contact with the contaminants. Therefore, in an exposure assessment, information about the agent's concentration in the environment and about the characteristics of the exposed person are combined to form an estimate

of the extent of exposure. The toxicity of the particular contaminant must then be considered as described in Section 7.5.

7.4.1 Characterization of Exposure Setting

The Frontier Chemical Pendleton Site is situated in the Town of Pendleton. The Town has a population of 4,926 according to preliminary results of the 1990 Census. The population of the neighboring Town of Wheatfield is 11,053. Approximately 2,203 people live within a 2 mile radius of the site. Aerial photography shows the surrounding land use to be primarily agricultural with residences located along the main highways of Beach Ridge Road and Townline Road. Various wooded pockets are also located within a 2-mile radius of the site. The nearest suburban and urban areas are located approximately 2 miles to the southeast in the City of North Tonawanda. There are a few commercial establishments (restaurant/diner, and auto repair shop) adjacent to the site along Townline Road, but no heavy industry. Vehicular and pedestrian traffic appears to be light to moderate along both bounding highways.

There is no demographic data to suggest that the population contains any members at greater risk to contaminants other than children, elderly, and pregnant women members one would expect to find in a population of this type. The activity patterns of the residential and farming groups are also expected to be normal. At present there is little access to the site. It is completely fenced and locked. However, there is evidence that the site is used for recreational purposes (small game hunting) and it presents the expected attraction to adolescent children and young adults.

The future use of the site has also been considered in the health risk assessment. This future use may allow greater contact of contaminants, exposure of sensitive populations, additional pathways, and so on. The future use scenario in this assessment is to assume that the

site will not be developed residentially or commercially, but rather available to the public (primarily residents of the Town of Pendelton) as a recreational area. Recreational uses include picnicking, swimming, etc. It does not include any construction with intrusive activities.

7.4.2 Identification of Exposure Pathways

This Section describes the completed pathways of human exposure to contaminants from the Frontier Chemical Pendelton Site under "no-action" and future use scenarios. A completed exposure pathway is the mechanism by which a population or individual is exposed to contaminants originating from a site and consists of four necessary elements: (1) a source and mechanism of chemical release; (2) an environmental transport medium (e.g. groundwater, soil, surface water, soil, or air); (3) a potential human exposure point; and (4) a likely route of human exposure (e.g. ingestion, dermal absorption, or inhalation).

The populations that are currently at potential risk from contaminants at the site are nearby RESIDENTS and TRESPASSERS. The future use scenario of the site as a recreational area presents a potential risk again to RESIDENTS and additionally to USERS of the recreational facilities. In this scenario there are no trespassers. These populations, and their individual receptor members, are not mutually exclusive. That is, a resident may also be a trespasser and vice versa.

The sources of contamination to the populations are:

Surficial Soil - is of concern to trespassers and future users of the site because contact with surface soils is common and accidental ingestion and dermal contact is very possible.

Shallow Groundwater - in certain seasons the ground rises to the surface of the site. This makes it available for contact by trespassers or future users and may result in accidental dermal contact.

Quarry Lake Water - while the lake is a Class D water, the possibility exists that trespassers or users will be exposed to chemicals in the water by accidental ingestion or dermal contact while swimming . The lake bottom sediments have not been considered a potential pathway. The lake is not conducive to fish propagation (clay bottom, steep sloping side morphology) and contact with the bottom is considered remote while swimming.

We have identified a total of 14 pathways by which receptors may be exposed. The pathways outline two mechanisms for exposure: point sources (physically coming into contact with contaminated media) and exposures occurring from contaminants that are transported from the site to passive receptors.

No.	PATHWAY DESCRIPTION	EXPOSURE MECHANISM
1	Trespasser Ingestion of Surface Soil	Point Source
2	Trespasser Dermal Contact with Surface Soil	Point Source
3	Tresspr. Dermal Contact with Shallow Groundwater	Point Source
4	Trespasser Inhalation of Vapors	Transport
5	Resident Inhalation of Vapors	Transport
6	Trespasser Inhalation of Fugitive Dust	Transport
7	Resident Inhalation of Fugitive Dust	Transport
8	User Ingestion of Surface Soil	Point Source
9	User Dermal Contact with Surface Soil	Point Source
10	User Dermal Contact with Shallow Groundwater	Point Source
11	User Inhalation of Vapors	Transport
12	User Inhalation of Fugitive Dust	Transport
13	User Ingestion of Lake Water While Swimming	Point Source
14	User Dermal Contact with Lake Water While Swimming	Point Source

Figure 7-1 indicates graphically these complete human exposure pathways which we feel to be of potential significance at the Frontier Chemical Pendleton site.

7.4.3 Quantification of Exposure

Exposure is defined as the contact of an organism with a chemical or physical agent. If exposure occurs over time, the total exposure can be divided by a period of interest to obtain an average exposure rate per unit time. This average exposure rate can also be expressed as a function of body weight. For the purposes of this risk assessment, exposure normalized for time and body weight is termed "intake", and is expressed in units of mg chemical/kg body weight-day.

Tables 7-2 through 7-11 list calculations of the absorbed dose or intake values in (mg/kg-day) for the exposure pathways of concern. Appendix S presents the equations utilized to estimate population intakes, the assumptions made for the variables in these equations, and contaminant transport models. Pathways 1, 2, 3, 8, 9, 10, 13 and 14 exhibit point source exposures to the receptor and as such require no transport model to develop intakes. Pathways 4, 5, 6, 7 11, and 12 exhibit exposure concentrations that are the result of contaminant fate and transport mechanisms and have therefore been modeled as exposures to receptors.

Each intake variable in the equation has a range of values. Intake variables for this assessment have been selected so that the combination of all intake variables results in the reasonable maximum exposure (RME). Under this approach, some intake variables may not be at their individual maximum values, but when combined with other variables will result in estimates of the RME. A determination of "reasonable" cannot be based solely on quantitative information, but also requires the use of professional judgement.

Because of the uncertainty associated with any sampling of exposure concentrations, the chemical concentration terms in the intake equations are the Upper Confidence Limit (UCL) at the 95th percentile of the arithmetic mean of the concentrations detected in the media of interest. Where detections do not occur in all samples in a particular media, the sample quantitation limit is used to calculate the average. There are standard statistical methods which can be utilized to calculate the upper confidence limit on the arithmetic mean. Gilbert (1987, Sections 11.6 and 13.2) has been applied as below to the data:

$$UCL_{95} = x\ [t_{0.95} * SD/n]$$

Where:

x = average of the contaminant concentrations of the samples. Where a compound is not detected, 1/2 the sample quantitation limit was used. Where a compound was not analyzed for a sample, the degrees of freedom and N value in the equation was decreased by one.

$t_{0.95}$ = t value from table in Gilbert

SD = standard deviation

n = square-root of the # of samples analyzed.

7.5 Toxicity Assessment

In a toxicity assessment, the types of adverse health effects associated with chemical exposure are identified. Additionally, and importantly, the relationship between the magnitude of exposure (in certain cases expressed as "dose") and the occurrence of the adverse effects is characterized. This relationship, once established, is used

later in the risk assessment as a gauge for predicting the likelihood of adverse health effects occurring following exposure at the particular level being evaluated.

In this risk assessment, toxicity information has been assembled regarding toxic effects that occur following exposure to the chemical being evaluated. Particular attention has been paid to the route of exposure, frequency, and length of exposure.

Several sources of toxicity values have been utilized for this risk assessment:

INTEGRATED RISK INFORMATION SYSTEM (IRIS). IRIS is an EPA data base containing up-to-date health risk and EPA regulatory information for numerous chemicals. IRIS contains RfDs (reference doses) and slope factors (utilized in Section 7.6 Risk Characterization) that have been verified by the RfD or CRAVE (Carcinogen Risk Assessment Verification Endeavor) Workgroups and consequently is considered to be the preferred source of toxicity information. Information in IRIS superceeds all other sources.

HEALTH EFFECTS ASSESSMENT SUMMARY TABLES (HEAST). HEAST is a tabular presentation of toxicity information and values for chemicals for which Health Effects Assessments (HEAs), Health Effects Environmental Effects Documents (HEEDs), Health and Environmental Effects Profiles (HEEPs), Health Assessment Documents (HADs), or Ambient Air Quality Criteria Documents (AAQCDs) have been prepared. HEAST summarizes interim (and some verified) RfDs and slope factors as well as other toxicity information for specific chemicals. In addition, HEAST directs readers to the most current sources of supporting toxicity information through an extensive reference section. HEAST, which is updated quarterly, has also been utilized as another valuable reference on chemicals that are not in IRIS.

EPA CRITERIA DOCUMENTS. These documents include drinking water criteria, drinking water Health Advisory summaries, and air quality criteria documents, and contain general toxicity information that has been used if information for a chemical is not available through IRIS or the HEAST references.

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR). ATSDR is a system of toxicological profiles for 275 substances found at Superfund sites. These polices contain general toxicity information and levels of exposure associated with lethality, cancer, genotoxicity, neurotoxicity, developmental and reproductive toxicity, immunotoxicity, and systemic toxicity (i.e. hepatic, renal, respiratory, cardiovascular, gastrointestinal, hematological, musculoskeletal, and dermal/ocular effects).

7.5.1 Hazard Identification

Table 7-1 is a list of contaminants detected in environmental media that have been determined to have a potential human health risk. These media are surfical soil, shallow groundwater, and Quarry Lake water. Selection of these media follows the process identified in Section 7.3, Identification of Potential Chemicals of Concern. A total of 73 contaminants are listed in Table 7-1 along with an indication of the environmental medium where it was found. Health risk has been evaluated for each of these contaminants.

7.5.2 Toxicity Summaries

Descriptive information concerning the toxicity of each of the 73 contaminants is presented in detail in the toxicity profiles in Appendix U. Health effects discussed in the profiles is to be regarded as potential because they are derived from chemicals studied individually, and in pure form. Such conditions do not exist at the Frontier Chemical

site. No attempt has been made to assess the complex issue of toxicity relative to mixtures of compounds. Identified potential toxic effects of compounds will not necessarily be experienced at the concentrations found at the Frontier Chemical site.

7.5.3 Dose-Response Assessment

The dose-response assessment in this section relates chemical exposure (dose) to expected human health effects (response). This relationship allows a quantitative assessment of human health risk. In the following discussion, dose-response information is provided separately for carcinogenic and non-carcinogenic health effects. The information is based upon a number of different references the most important of which is the Integrated Risk Information System (IRIS), a USEPA database containing verified values for non-carcinogenic reference doses (RfDs), carcinogenic slope factors, and up-to-date health risk and regulatory information for numerous chemicals. IRIS has been utilized as the first and highest priority source for the above values and information.

7.5.4 Toxicity Information for Carcinogenic Effects

Table 7-12 summarizes does-response information for the potentially carcinogenic chemical compounds which were detected in one or more of the environmental media at Frontier Chemical. For each of these compounds, the following information is provided:

(a) Weight of evidence for carcinogenicity expresses the degree of confidence relating exposure to a given chemical and the likelihood that the chemical causes cancer in humans. this weight of evidence is based upon the following EPA classification system:

Group A - Human Carcinogen

This category indicates that there is sufficient evidence from epidemiological studies to support a causal association between an agent and cancer in humans.

Group B - Probable Human Carcinogen

This category generally indicates that there is at least limited evidence from epidemiological studies of carcinogenicity to humans (Group B1) or that, in the absence of positive data on humans, there is sufficient evidence of carcinogenicity in animals (Group B2).

Group C - Possible Human Carcinogen

This category indicates that there is limited evidence of carcinogenicity in animals in the absence of positive human data.

Group D - Not Classified

This category indicates that there was no data to evaluate or that the evidence for carcinogenicity in humans and in animals was inadequate, at best.

Group E - No Evidence of Carcinogenicity to Humans

This category indicates that there is no evidence for carcinogenicity in at least two adequate animal tests in different species or in both epidemiological and animal studies.

(b) Slope Factor, or cancer potency factor, represents a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. This slope factor allows the calculation of

incremental lifetime cancer risk associated with exposure to the chemical at a known or estimated dosage. Where applicable and available, Table 7-12 provides separate slope factors for oral and inhalation routes of exposure. (In the absence of published slope factors for dermal routes of exposure, the oral slope factor has been applied in this risk assessment to estimate cancer risk associated with dermally absorbed chemical doses.)

(c) References, including source(s) and date(s), are provided to indicate the basis for identified slope factors.

(d) Type of cancer, upon which the slope factor and weight of evidence are based, is also identified for Group A carcinogens.

7.5.5 Toxicity Information for Non-carcinogenic Effects

Unlike carcinogens, non-carcinogenic compounds are thought to have threshold dosage levels below which adverse effects are not expected. This section provides information concerning these threshold levels. Two assumptions in the subsequent exposure assessment and risk characterization affect the presentation of non-carcinogenic dose-response information. These are:

1. Based upon existing and future land use scenarios at Frontier Chemical as well as onsite contamination patterns, exposures will be evaluated on a lifetime (chronic) basis. In this health risk assessment, subchronic exposures will not be evaluated.

2. Although non-carcinogenic chemicals generally have different critical effects, or end points, their effects will initially be combined by direct addition in the non-carcinogenic risk characterization. This combination of potentially dissimilar effects produces a conservatively high total. If that total exceeds a health risk or safety criterion, then the initial assumption of additivity will be reexamined. Otherwise, it

may safely be assumed that there is no significant health threat posed by the non-carcinogenic chemicals.

Table 7-13 summarizes dose-response information for the non-carcinogenic chemical compounds which were detected at Frontier Chemical. (Note that some chemicals (e.g., arsenic) have both carcinogenic and non-carcinogenic effects, and are therefore listed on both Table 7-12 and Table 7-13). For each of the Table 7-13 compounds, the following information is provided, separately for oral and inhalation routes of exposure where appropriate:

(a) Potency measure, expressed in mg/kg/day for non-carcinogenic chemical compounds, generally identifies the threshold dosage level below which adverse health effects are not expected. The most common, and preferred, criterion for expressing potency is the reference dose (RfD), which is an estimate of the average daily exposure level below which significant, adverse non-carcinogenic health effects are not expected. The Integrated Risk Information System (IRIS) maintains an updated listing of all verified Rfd values. For those compounds without listed RfD values, EPA has established the following hierarchy of standards and guidelines:

1. Drinking Water Equivalent Level (DWEL), Lifetime Health Advisatory (HA), or Maximum Contaminant Level Goal (MCLG), established under the Safe Drinking Water Act. In order to be used as surrogates for the RfD, each of these alternate regulations/guidelines must first be adjusted. HAs and MCLGs are not appropriate non-carcinogenic potency measures for chemicals which are also either Group A or B carcinogens.

2. Acceptable Intake Chronic (AIC), which is listed for many chemicals in EPA's Superfund Public Health Evaluation Manual (EPA, 1986), and can be used directly as a surrogate for RfD when all other criteria are unavailable.

3. Ambient Water Quality Criteria (AWQC), which have been developed by EPA for the protection of human health, and which must be adjusted to units consistent with those of RfD.

4. Acceptable Daily Intake (ADI) and Suggested No Adverse Response Level (SNARL), which have been developed by non-regulatory agencies such as the National Academy of Sciences and World Health Organization, and which also must be adjusted before they can be used as surrogates for the RfD.

7.6 Risk Characterization

To characterize the risks associated with a particular exposure, the extent of the exposure calculated in the exposure assessment is compared with the information regarding potential adverse health effects collected in the toxicity assessment. Specifically, the exposure-response or dose-response relationship developed in the toxicity assessment is used to predict the likelihood of adverse health effects occurring following the estimated exposure. This summation and integration of the outcomes of the exposure and toxicity assessments lead to qualitative and quantitative expressions of risk for given exposure levels.

7.6.1 Risk Characterization for Carcinogenic Substances

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime (70 years) as a result of exposure to the potential carcinogen.

As described previously, the slope factor (SF) converts estimated daily intakes averaged over a lifetime of exposure directly to incremental risk of an individual developing cancer. Because relatively low intakes are most likely from environmental exposures at sites, such as Frontier Chemical, it generally can be assumed that the dose-response relationship

will be linear in the low-dose portion of the multistage model dose-response curve. Under this assumption, the slope factor is a constant, and risk will be directly related to intake.

LINEAR LOW-DOSE CANCER RISK EQUATION

Risk = CDI x SF

Where:

Risk = a unitless probability (1.0 E-04 to 1.0 E-07) of an individual developing cancer;

CDI = chronic daily intake averaged over 70 years (mg/kg-day from Tables 7-2 through 7-11); and

SF = slope factor, expressed in $(mg/kg\text{-}day)^{-1}$.

Because the slope factor is often an upper 95th percentile confidence limit of the probability of response based on experimental animal data used in the multistage model, the carcinogenic risk estimate will generally be an upper-bound estimate. This means that EPA is reasonably confident that the "true risk" will not exceed the risk estimate derived through use of this model and is likely to be less than that predicted.

At a site like Frontier Chemical, one must assess potential health effects of more than one chemical (both carcinogens and other toxicants). Estimating risk or hazard potential by considering one chemical at a time might significantly underestimate the risks associated with simultaneous exposures to several substances. To asses the overall potential for cancer and noncancer effects posed by multiple chemicals, guidance has been developed that can also be applied to the case of simultaneous

exposures to several chemicals from a variety of sources by more than one exposure pathway. Although the calculation procedure differs for carcinogenic and noncarcinogenic effects, both sets of procedures assume dose additivity in the absence of information on specific mixtures.

Information on specific mixtures found at sites is rarely available. Even if such data exist, they are often difficult to use. Monitoring for "mixtures" or modeling the movement of mixtures across space and time present technical problems given the likelihood that individual components will behave differently in the environment (i.e., fate and transport).

The cancer risk equation described below estimates the incremental individual lifetime cancer risk for simultaneous exposure to several carcinogens. This equation represents an approximation of the precise equation for combining risks which accounts for the joint probabilities of the same individual developing cancer as a consequence of exposure to two or more carcinogens.

CANCER RISK EQUATION FOR MULTIPLE SUBSTANCES

$$Risk_T = Risk_i$$

Where:

$Risk_T$ = the total cancer risk, expressed as a unitless probability (Table 7-42); and

$Risk_i$ = the risk estimate for the i^{th} substance.

The risk assumption techniques described in the equation assume that intakes of individual substances are small. They also assume independence of action by the compounds involved (i.e., that there are no synergistic or antagonistic chemical interactions and that all chemicals produce the

same effect, i.e., cancer). The USEPA has, through its National Oil and Hazardous Substances Pollution Contingency Plan (NCP), established an acceptable incremental lifetime carcinogenic risk (ILCR) range for the remediation of Superfund sites. This range is from 1.0 E-04 to 1.0 E-06.

There are several limitations to this approach that must be acknowledged. First, because each slope factor is an upper 95th percentile estimate of potency, and because upper 95th percentiles of probability distributions are not strictly additive, the total cancer risk estimate might become artificially more conservative as risks from a number of different carcinogens are summed. If one or two carcinogens drive the risk, however, this problem in not of concern. Second, it often will be the case that substances with different weights of evidence for human carcinogenicity are included. The cancer risk equation for multiple substances sums all carcinogens equally, giving as much weight to class B or C as to class A carcinogens. In addition, slope factors derived from animal data will be given the same weight as slope factors derived from human data. Finally, the action of two different carcinogens might not be independent.

7.6.1.1 Carcinogenic Risk Characterization Summary

Carcinogenic risks at the Frontier Chemical - Pendleton site are outlined by pathway and summed over common pathways affecting like populations in Table 7-42. These values are probabilities of an individual developing cancer over a 70 year lifetime. None of the pathways present probabilities of risk greater than the upper bound of the EPA ILCR range, i.e. 1.0 E-04. The pathway of greatest risk (9.73 E-05) is dermal contact with groundwater by recreational Users of the facility in the future with no remedial action (Pathway No. 10). Benzene is almost totally responsible for this value.

The next greatest risk (5.01 E-05) is presented to Trespassers under the current use scenario from dermal contact with groundwater (Pathway No. 3). Benzene is responsible for over 80% of this value.

The ranking of risk exposure continues with User dermal contact with surface soils (3.67 E-05), User ingestion of surface soils (7.36 E-06), and Trespasser dermal contact with surface soils (6.66 E-06). These represent Pathway Nos. 9, 8 and 2 respectively. Aroclor-1254 is the largest single contributor in each of these pathways.

The model used to estimate inhalation exposures to vapor phase chemicals (Appendix S) is conservative in a number of ways. For example, exposure conditions on-site are expected to be constant. That is, the Trespasser's exposure has been estimated over 30 years with his always being in a contaminated area while on site. This may be unlikely. The concentrations of the chemicals themselves has been assumed to be at the 95th percentile of the upper confidence mean limit. The Resident's exposure has also been estimated over 30 years and assumes that emissions are coming from one-half of the site directly downwind. While the transport model allows for dispersion, it is conservative in that no allowance has been made for changing prevailing winds and that Residents are exposed for 30 years continuously. Both the Resident and Trespasser exposures are estimated assuming no remediation whatsoever.

Carcinogenic risks to Users, Residents, and Trespassers are significant when summed over pathways that are common to each group (Table 7-42). Resident/Users in the future are at the highest risk (1.44 E-04). Users alone in the future are next (1.41 E-04). Resident/Trespassers in the present are third (6.26 E-05). In fact, all of the summations are within, or above, the ILCR range as a result of contributions from the common pathways. Again, the most significant contributions are from benzene in the shallow groundwater with no remedial effort at the site.

7.6.2 Risk Characterization for Non-Carcinogenic Substances

The measure used to describe the potential for noncarcinogenic toxicity to occur in an individual is not expressed as the probability of an individual suffering an adverse effect. EPA does not at the present time use a probabilistic approach to estimating the potential for noncarcinogenic health effects. Instead, the potential for noncarcinogenic effects is evaluated by comparing an exposure levels over a specified time period (30 years) with a reference dose derived for a similar exposure period. This ratio of exposure to toxicity is called a hazard quotient.

The noncancer hazard quotient assumes that there is a level of exposure (i.e., RfD) below which it is unlikely for even sensitive populations to experience adverse health effects. If the exposure level (E) exceeds this threshold (i.e., if E/RfD exceeds unity), there may be concern for potential noncancer effects. As a rule, the greater the value of E/RfD above unity, the greater the level of concern. E/RfD's are not statistical probabilities; a ratio of 0.001 does not mean that there is a one in one thousand chance of the effect occurring. Further, it is important to emphasize that the level of concern does not increase linearly as the RfD is approached or exceeded because, RfDs do not have equal accuracy or precision and are not based on the same severity of toxic effects. Thus, the slopes of the dose-response curve in excess of the RfD can range widely depending on the substance.

NONCANCER HAZARD QUOTIENT

Noncancer Hazard Quotient = E/RfD

Where:

E = exposure level (or intake);

RfD = reference dose; and

E and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or shorter-term).

To asses the overall potential for noncarcinogenic effects posed by more than one chemical, a hazard index (HI) approach has been developed. This approach assumes that simultaneous subthreshold exposures to several chemicals could result in an adverse health effect. It also assumes that the magnitude of the adverse effect will be proportional to the sum of the ratios of the subthreshold exposures to acceptable exposures. The hazard index (Chronic Risk) is equal to the sum of the hazard quotients, as described below, where E and the RfD represent the same exposure period. When the hazard index exceeds unity, there may be concern for potential health effects. While any single chemical with an exposure level greater than the toxicity value will cause the hazard index to exceed unity, for multiple chemical exposures, the hazard index can also exceed unity even if no single chemical exposure exceeds its RfD.

NONCANCER HAZARD INDEX

$$\text{Hazard Index} = E_1/RfD_1 + E_2/RfD_2 + E_i/RfD_i$$

Where:

E = exposure level (or intake) for the i^{th} toxicant;

RfD = reference dose for the i^{th}toxicant; and

E and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or shorter-term).

7.6.2.1 Non-Carcinogenic Risk Summary

Non-carcinogenic, or chronic, risks at the Frontier Chemical Pendleton site are outlined by pathway and summed over common pathways affecting like populations in Table 7-42. These values are summations of hazard quotients and are not probabilities of disease. They are instead indexes where a value over 1.0 E 00 indicates concern for potential health effects.

In contrast to the carcinogenic risks, chronic risk seems to be more attributable to contaminated soil. The pathway of greatest concern (1.26 E 01) is the inhalation of fugitive dust from the site by nearby Residents (Pathway No. 7). Virtually all of the concern in this pathway is due to a single metal: Chromium. None of the other pathways individually exceeded unity.

The risk of exposure to contaminated soil continues with User dermal contact with surface soil (7.06 E-01), User inhalation of fugitive dust (6.03 E-01), Trespasser inhalation of fugitive dust (1.45 E-01), and Trespasser dermal contact with surface soil (1.28 E-01). These are pathways 9, 12, 6, 8, and 2 respectively. Chromium alone drives the pathway values in No.'s 6, 8, and 12. Chromium and Cadmium drive the pathway values in No.'s 2 and 9.

Of the 5 highest ranked pathways of most concern, three are fugitive dust exposures to Residents, Users, and Trespassers (Pathways 7, 12, and 6). The model used to estimate these fugitive dust exposures is conservative in that the Resident's exposure inside the house is assumed to be the same as outside the house over 365 days/year, 24 hours/day for 30 years. Again, the concentrations of the chemicals are at the 95th percentile upper confidence limit. On-site exposures (Trespassers and Users) are assumed to be completely from contaminated areas of trespass or

use and continue for 30 years. This may be unlikely. Further, all exposures have been estimated assuming no remediation at the site.

None of the individual pathway exposure indexes exceeds unity except for the previously noted Pathway No. 7. However, chronic exposure estimates are significant when summed over pathways that are common to each group (Table 7-42). Resident/Users in the future are again the highest concern (1.43 E+01). Residents/Trespassers in the present are next (1.31 E+01). Users in the future are third (1.70 E 00). All of these summations are above the ILCR upper bound limit as a result of contributions from all the common pathways. In the case of the highest two pathway summations, Pathway No. 7, with a singularly high level of chromium, is the most significant contributor.

7.7 Uncertainty Analysis

This risk assessment has been prepared with the best available information. There are, however limitations to the information stemming from the state-of-the-art laboratory analytical quantification and the lack of toxicological information for some chemicals. These uncertainties require that some assumptions be made in the risk assessment process. Presentation of uncertainty and subsequent use of assumptions is intended to strengthen the risk assessment process by providing an assurance that information used has been evaluated and used only when certain guidelines are met.

7.7.1 Hazard Evaluation

Selection of contaminants for analytical analysis follows NYSDEC and USEPA guidelines. However, mixtures of chemicals exposed to the environment may contain toxic components as yet beyond the ability of existing procedures or instruments to measure. Therefore there may be contaminants on site that were not identified.

The data are evaluated prior to use in the risk assessment. Quality assurance references are presented in Section 2.0 of the RI. Those chemicals that pass the QA screening and are used in the risk assessment are considered to be evaluated with precision and accuracy. It is possible that some contaminants will be identified as present at a site, but not be quantified due to limitations of instrumentation.

7.7.2 Exposure Assessment

The exposure assessment involves characterization of exposure setting, identification of exposure pathways, and quantification of exposure. The site has been characterized to the limits of the information available. A high degree of confidence is placed in existing analysis of physical characteristics of soil, geology, climate and hydrology. Site history was prepared using reliable sources of information including interviews and aerial photos.

The 14 exposure pathways presented include the most likely routes of human exposure to site contaminants, and together are considered to represent the significant risks posed by the site. There are however, certain pathways that have been eliminated from further consideration in the risk assessment. For a pathway to be complete, and thus pose a health risk, it must include a contaminant source or release mechanism, transport medium, point of exposure, and exposure route. Only those 14 pathways considered contain all of these factors. Below are some obvious pathways that were not considered, followed by reasons for their elimination from the risk characterization.

1. Exposure to Lake Sediments: Swimmers are not expected to dive the 12 or more feet to where contaminated lake sediments are found, and, therefore, no exposure route exists.

2. Exposure to Contaminated Fish: No game fish were present, and none are expected in this lake, therefore no transport medium exists.

3. Subchronic (Childhood) Exposures: Estimation of Subchronic risk is generally done when chronic risk is low, but subchronic risk may be significant. However, a preliminary screening of the Frontier Chemical site toxicity has already indicated that there is significant chronic risk in the vicinity of the old process area.

4. Also unlikely is the transport of contaminants to Bull Creek and exposures relating to contaminated stream water and sediment. Contaminated groundwater does not enter the stream, and surface water from the lake, when it does occasionally flow to the stream, is only during highest stream flows when dilution renders contaminants undetectable.

7.7.3 Toxicity Assessment

Most toxicological information is developed from experimentation using animal surrogates. The differences in sizes and physiology between man and experimental animals limits the usefulness of these data. For these reasons, toxicity coefficients (reference dose, reference concentration, and slope factor) are used as expressions of potential toxicological effects and do not represent thresholds or safe levels for any of the site contaminants.

For many chemicals no toxicological information is available. In some cases, it is possible to extrapolate toxicity coefficients from other structurally similar compounds for which there are available data. For example, toxicity values for aroclor-1260 are used for all PCBs; values for trans 1,2 - dichloroethene are used for total 1,2 - dichloroethene.

Nevertheless, there are still many missing toxicity values. In general this is not expected to change the risk assessment for a site because the most toxic contaminants are usually the best studied. It is almost always the case that one or a few compounds is responsible for most of the site or pathway risk. Also, it is usually clear whether a site risk has exceeded carcinogenic or hazard index guidelines. Only for borderline risk assessments would non-quantifiable compounds need to be qualitatively assessed.

7.7.4 Risk Characterization

Risk characterization is quantified by combining exposure point concentrations with toxicity coefficients and/or slope factors. For the Frontier Chemical site each pathway is evaluated separately, and then combined to represent the total risk to a single person whose life style satisfies all assessed pathways. This person is an adult male, lives nearby, and spends a good deal of his time trespassing on the Frontier Chemical site.

The total risk as it has been evaluated does not delineate target organs or tumor types. If this had been done, there would have been a series of reduced risks for this person, each related to a specific target organ or tumor type. The conservative approach taken reduces some of the uncertainty posed by the toxicity assessment in that humans may experience different toxicological end points than test animals. Target organ and tumor type information has been provided by chemical in Appendix U, Toxicological Profiles. All other assumptions have been made as directed by USEPA guidance documents.

7.8 Ecological Risk Assessment

7.8.1 Assessment Objectives

The objective of the Ecological Risk Assessment was to determine the impact of site contaminants on ecological resources in the area. Information from the remedial investigation report was utilized to evaluate the nature and extent of contamination. Literature and first hand information concerning natural resources of the site and potentially affected surrounding area was collected. With this information a habitat based assessment was conducted. This assessment was prepared following the USEPA Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual.

7.8.2 Scope of the Investigation

A detailed history of the Frontier Chemical site was conducted and is presented in the remedial investigation report. Land usage has been documented from 1938 to the present. The New York State Heritage program was contacted for information on possible threatened or endangered species and critical habitats. Wetland mapping was obtained from NYSDEC.

Each URS employee involved in remedial investigation activities at the site made casual observations of the plants and wildlife while performing their duties. Lists of flora and fauna were prepared from these observations.

A habitat based assessment was conducted as outlined in Division Technical and Administrative Guidance memorandum: Habitat Based Assessment, Guidance Document for Conducting Environmental Risk Assessments at Hazardous Waste Sites, Step 1 (NYSDEC, December 28, 1989).

In May, 1990 a site walkover reconnaissance of terrestrial resources as conducted. The purpose of the reconnaissance was to identify any areas of stained soils, stressed vegetation, or any other sign of natural resource damage potentially attributable to site contaminants.

Aquatic resources of Bull Creek were assessed in June 1990. A Surber Sampler was used to make semi-quantitative collections of benthic macroinvertebrates at locations upstream, downstream, and adjacent to potential contaminated areas.

The purpose of the preliminary investigation was to determine the need for more detailed studies.

7.8.3 Site Description

A site description appears in Chapter 3 of the Remedial Investigation Report. Below is a summary of key information contained in that report.

The site is in a rural/residential area of the Town of Pendleton, New York. Existing and future land use of the site is recreational with adjacent land use including rural residential.

Former land use was industrial and agricultural from the 1930s to the 1970s. Transportation included a rail line that is now abandoned.

The 75-acre triangular site is bounded by the abandoned railroad to the east, Townline Road to the south, and Bull Creek from the northeast to the southwest.

Prior industrial activities included excavation of a quarry that is now a 15-acre lake in the southeast part of the site. The remainder of the site is wetland with occasional upland inclusions.

7.8.4 Contaminants of Concern

A number of organic contaminants were detected in high concentrations in surface and subsurface soils and are apparently confined to fill areas south of Quarry Lake. Data are presented in Section 4.3.

There is widespread contamination by metals and organics of lake bottom sediments. Trace volatile organic contamination was detected in Quarry Lake. No contaminates attributable to the Frontier site were detected in Bull Creek water or sediments.

7.8.5 Exposure Characterization

Potential exposure pathways for biota of the Frontier Chemical site and listed below. They take into account observed aquatic and terrestrial organisms as well as species expected under the future recreational land use scenario outlined in the Human Health Risk Evaluation (Section 7.4.1). Because the potentially affected organisms are living in or on contaminated media, exposure pathways may be somewhat different than those identified in the Public Health Risk Assessment. Exposed pathways are:

A. Surface Soil: Plants and animals living in or on contaminated surface soil. Exposure is through dermal absorption and ingestion.

B. Subsurface Soil: Deeply rooted trees and burrowing animals may contact more highly contaminated subsurface soils. Exposure is through dermal absorption and ingestion.

C. Groundwater: The high water table allows contact of plants and animals to shallow groundwater. Exposure is through dermal absorption and ingestion.

D. Air: Direct inhalation exposure of plants and animals to organic vapors volatilized from soil and groundwater, and to chemicals adsorbed onto airborne particulates.

E. Surface Water: Direct exposure to organisms living in, on, or adjacent to Quarry Lake water. Other surface waters were either not contaminated, or the contamination was not attributable to the site.

F. Sediment: Contact with lake sediments by aquatic organisms.

G. Food Chain: Those organisms that live in or on highly contaminated soils or sediments may have contaminated tissues that are a source of contamination to otherwise unexposed organisms.

7.8.6 Risk Characterization

The area of greatest concern for exposure is the fill area and Quarry Lake sediments. Shallow groundwater, surface water, and air in the vicinity of the fill area are also important sources of contamination. These areas of concern are identified in Figures 4-2 to 4-8 of this report. Migration of contamination from the identified hot spots was investigated through study of the benthic macroinvertebrate population of Bull Creek. No visible signs of contamination were seen, nor were effects of contamination seen on the benthic macroinvertebrate community structure.

No bioassays were conducted of contaminated media; however, based upon contaminant concentrations of lake sediments, disposal area soils, and disposal area groundwater (leachate), acute toxic effects of these isolated media would be expected. For example, toluene at 100,000 mg/kg in soil and 260,000 mg/l in shallow ground water is an order of magnitude above the LC 50 for aquatic fish and within an order of magnitude of the LC 50 for plants (EPA, 1980).

It is probable that such effects are occurring within the vicinity of the former process area. At present the magnitude of the effect is most likely limited to the former process area.

The effect of toxicity by contaminants in the process area is long term under a no-action scenario. Although migration is reported to be minimal in the RI report, the potential does exist for movement of contaminants via food chain.

Presently the area of greatest concern is the shallow groundwater and subsurface soils of the process area. Affected organisms include wetland plants and burrowing animals. Because the area is in the early stages of succession following recovery from earlier land use practices, species currently at risk are not listed as threatened or endangered. Migratory waterfowl do occur in the area, but at present there is little evidence of use by these species.

Quarry Lake has water chemistry that could support aquatic life, and amphibians and waterfowl have been seen. However, the lake was recently quite acidic with a pH less than 3 in 1978 as cited in the RI report. Therefore, the potential toxicity of lake sediments is not presently affecting aquatic organisms. Under a no-action scenario the lake could be gradually populated by an aquatic community that would be affected by toxic lake sediments.

7.8.7 Risk Summary

The present site risk would be limited to areas of high contaminant concentration, and where biological resources have been documented. This includes the soil and shallow groundwater of the process area, and the nearby surface water of Quarry Lake. Those biological resources currently existing at the site include only pioneer species and do not include threatened or endangered species.

A no-action scenario would result in a continuation of ecological succession of the area as it recovers from past land use practices. As more sensitive species, such as fish and migratory birds, begin to inhabit the area, there would be some risk to these individuals posed by site contaminants.

7.8.8 Limitations of Conclusions

The ecological survey was of a limited scope based upon the assumption that no threatened or endangered species or critical habitats would be encountered, and based upon the knowledge that due to prior land use practices the ecological resources of the area were, until recently, quite limited. Therefore, the assessment of risk for this site is qualitative.

More attention was paid to the aquatic resources of Bull Creek because of the perceived potential of off-site migration of contaminants and subsequent toxic effects to biota of the stream. A semi-quantitative benthic macroinvertebrate survey indicated that there is no observed impact to the biota of Bull Creek. Observations of releases of contaminated water from Quarry Lake to Bull Creek only during periods of highest flow seem to indicate that any release is sufficiently diluted so as to limit toxicological effects.

The attention to detail paid to the collection of analytical data from the physical resources of the site provides a clear picture of the nature and extent of contamination. Based upon this information it has been concluded that ecological risk is limited to the process area at present, and may include the sediments in the future.

It is anticipated that remediation of these areas would adequately protect the remaining resources and allow for a continuation of

successional recovery of the area thus maximizing any proposed future land use designation.

7.9 Summary

Carcinogenic risk probabilities and non-carcinogenic (chronic) hazard indices have been developed for 14 separate exposure pathways at the Frontier Chemical-Pendleton Site. Further, the 14 pathways have been combined to illustrate risks to three population groups (Trespassers, Residents, and Users of the site in the future).

Our analysis suggests that in the three present population use (no-action) scenarios the site does not pose an unacceptable carcinogenic risk as defined by the USEPA remediation guideline of 1.0 E-04 to 1.0 E-06 probable risk range. Benzene in groundwater and aroclor-1254 in surface soil are primarily responsible for elevating risks into the guideline range. Consideration should be given to the fact, however, that the USEPA remediation guideline range is applied to making decisions regarding the advisability of conducting remedial actions and not safe levels of human health risk.

Chronic (non-carcinogenic) risks are significant. In two out of three no-action scenarios the total hazard index exceeds unity. Chromium and cadmium are the primary source of risk. USEPA has suggested that, at this level, consideration should be given to mitigating site conditions.

Our analysis further suggests that in both the future population use scenarios (use of the area as a recreational facility) the site does pose an unacceptable carcinogenic risk. Again, benzene in groundwater and aroclor-1254 in surface soils are the primary contaminants. Both scenarios exceed the upper bound of the USEPA remediation guideline range. It would appear that some remedial activity is advisable before using the site as a recreational area.

Chronic (non-carcinogenic) risks are also significant in the future use scenario due to chromium and cadmium. In both future use scenarios the total chronic risk exceeds unity. USEPA suggests that when the Hazard Index exceeds unity, there may be concern for potential health effect and mitigation of site conditions be considered.

8.0 SUMMARY AND CONCLUSIONS

Sections 1 through 7 of this report present the preliminary results of the Remedial Investigation performed at the Frontier Chemical-Pendelton Site. The purpose of this investigation was to collect data and characterize the site in sufficient detail to allow the identification and evaluation of alternatives, as part of the Feasibility Study. The key findings of the Remedial Investigation to date are summarized as follows:

- The site was formerly operated as a clay, brick, and tile manufacturing facility in the 1930s and it is from this activity that Quarry Lake was derived. Frontier Chemical Waste Process, Inc. obtained the property and operated the site as an industrial waste treatment facility from 1958 to 1974. The waste treatment is said to have involved lime neutralization of plating wastes, pickle liquors and other liquid acid wastes. Frontier's activities have caused contamination of the groundwater and soil in the former "process area" in addition to contamination of Quarry Lake sediments.

- The Frontier site is characterized hydrogeologically by a layer of fill (local at the southwest end of Quarry Lake) that overlies a layer of weathered and fractured clay. These materials overlie a clay confining unit which further overlies a relatively permeable lower aquifer consisting of a silty sand and gravel overburden and fractured dolostone bedrock.

- Beach Ridge Road is apparently underlain by a significant thickness of tight compact silt that replaces the clay and silty sand units found underneath the Frontier Site.

- Field data indicates that the horizontal hydraulic conductivities of the upper water bearing zone range from 1 x 10^{-4} to 1 x 10^{-7} cm/sec, the clay confining unit from 1 x 10^{-7} to 1 x 10^{-8} cm/sec., and the lower aquifer from 1 x 10^{-3} to 1 x 10^{-4} cm/sec.

- In the vicinity of the lake and adjacent fill area, shallow groundwater flow is characterized by steep gradients and groundwater mounding. There is radial groundwater flow away from the former process area south of Quarry Lake and away from the perimeter of Quarry Lake. Shallow groundwater is also apparently flowing away from the ridge that underlies Beach Road. Vertical gradients exhibit an upward flow direction north of Quarry Lake in the vicinity of Bull Creek and a downward gradient to the south of the lake. Groundwater flow in the lower aquifer is to the southwest under a low horizontal flow gradient.

- Bull Creek appears to be a gaining, or effluent stream. Several times a year, during periods of snowmelt or very heavy rains, water from Quarry Lake overflows into Bull Creek via a drainage ditch along Townline Road.

- A number of organic contaminants were detected at high concentrations in both the subsurface and surface soil samples. These contaminants appear to be confined to the fill area south of Quarry Lake.

- Quarry Lake water was found to contain trace levels of organics contamination including detections of 1,2-dichloroethene, toluene, and di-n-butylphthalate. Trace levels of organics and several localized concentrations of metals were found in the bottom sediments of the lake. This

contamination is likely the result of incomplete dredging and removal of metals sludges in the eastern basin of the lake and continued organics contaminant migration from the process area to the western basin.

- Based upon the surface and sediment results, and upon the results of the benthic survey, there is apparently no attributable affect on Bull Creek posed by the Frontier Site.

- A number of organic contaminants were detected in the shallow groundwater of the former process area. This contamination appears to be largely confined to the area of the former process area.

- A few organics of trace concentration were detected in the lower aquifer. Several of these compounds are of the same type as the pollutants detected in the shallow groundwater.

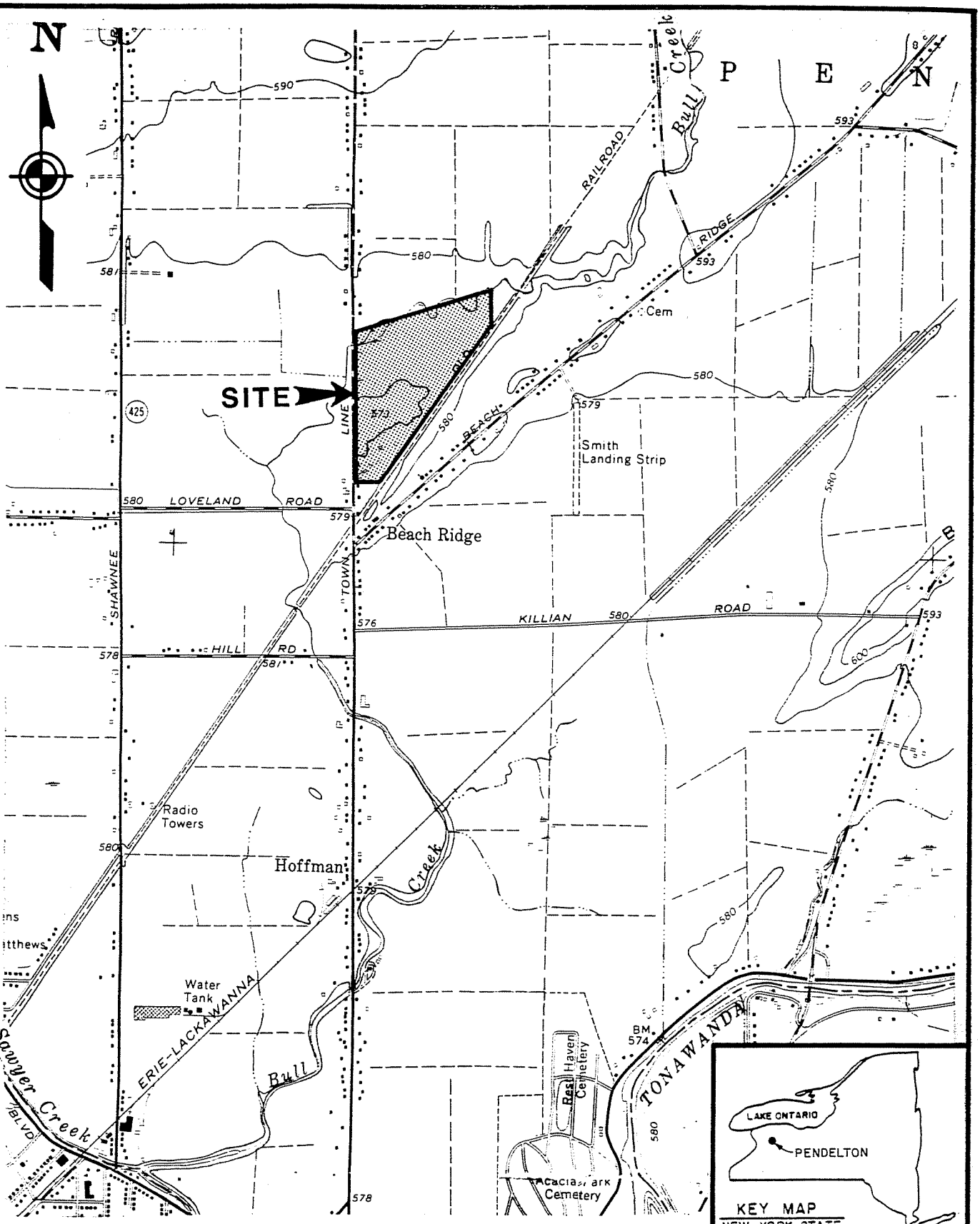
- Groundwater flow and transport modeling indicates that contaminants would be detected in appreciable concentrations at a distance of up to 600 feet away from the center of contamination in the upper water bearing zone in 80 years. Contaminated travel time between the upper water bearing zone and the lower aquifer was calculated to be 362 years.

- Analysis of human health risks indicate that the site does not pose an unacceptable carcinogenic risk as defined in the current no-action scenario. However, when a future recreational use scenario is considered, carcinogenic risk becomes significant. Benzene in groundwater and aroclor-1254 in surface soil are primarily responsible for the elevation of risk.

- Chronic (non-carcinogenic) risk posed by the site are significant in both the current no-action and future use scenario. Chromium and cadmium are the primary sources of risk.

- Qualitative assessment of ecological risk indicates that present site risk to the environment is limited to the soil and shallow groundwater of the former process area and the nearby surface water of Quarry Lake. The biological resources currently existing in these areas are pioneer species and do not include threatened or endangered species. As more sensitive species, such as fish and migrating birds, began to inhabit the area, there would be some risk to these individuals posed by site contaminants.

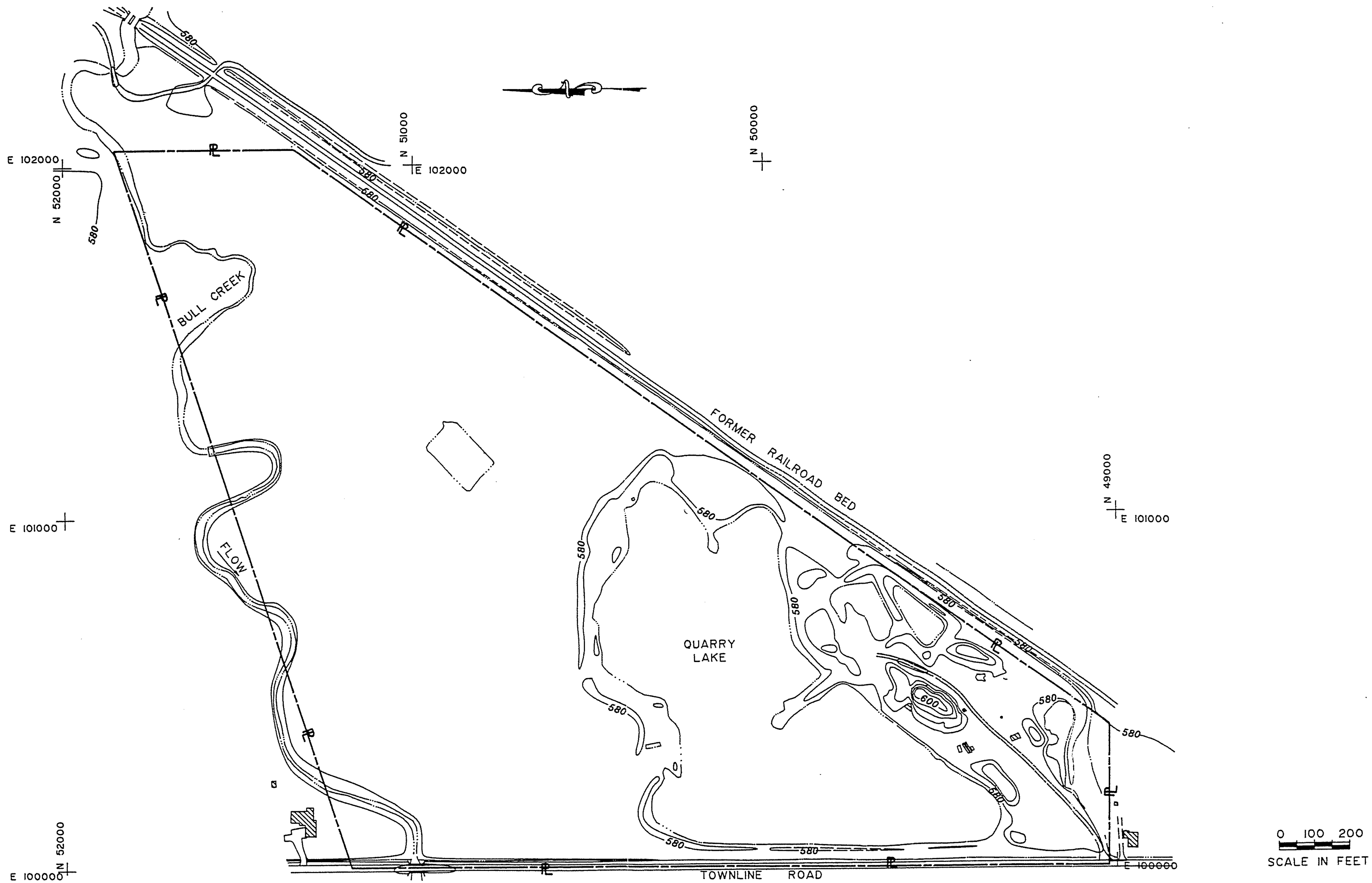
Figures



SOURCE:
USGS TOPOGRAPHIC 7.5 MINUTE
QUADRANGLE, TONAWANDA EAST, N.Y. 1965

URS CONSULTANTS, INC.	SITE VICINITY MAP	FIGURE 1-1

A-3222



SITE PLAN

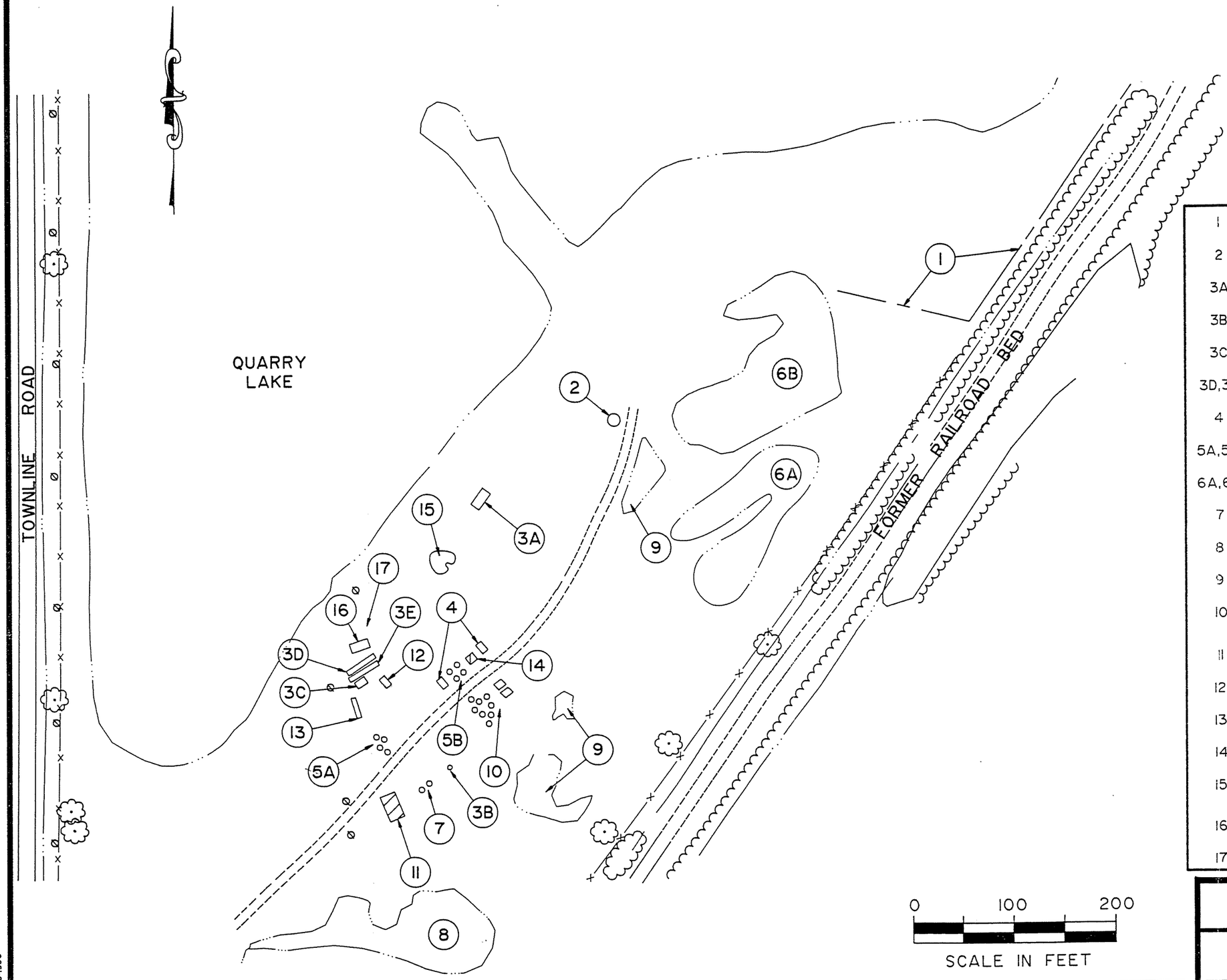
URS CONSULTANTS, INC.

FIGURE 1-2

1=100 01/10/91

CC-2014

1"=100' 11/16/90



KEY

1	6"-8" ELEVATED WATERLINE
2	LARGE WATER PUMP
3A	STEEL TANK "A" (5000 GAL.)
3B	UNDERGROUND TANK "B"
3C	SMALL TANK "C" (OPEN & EMPTY)
3D,3E	2 RAILROAD TANK CARS D & E
4	2 LARGE DUMPSTERS WITH SOIL
5A,5B	DRUMS WITH SOIL
6A,6B	SHALLOW HOLDING PONDS
7	2 FUEL PUMPS
8	POND
9	STANDING WATER
10	8 MANHOLE SECTIONS & 2 DISTRIBUTION BOXES
11	OLD GUARD SHACK
12	10 ROLLS OF STABILIZATION FABRIC
13	PVC PIPES & FITTINGS
14	WOODEN SHANTY
15	PILE OF TWISTED METAL & SMALL TANK "F" (300 GAL.)
16	OLD LIME SPREADER
17	OLD FOUNDATION

0 100 200

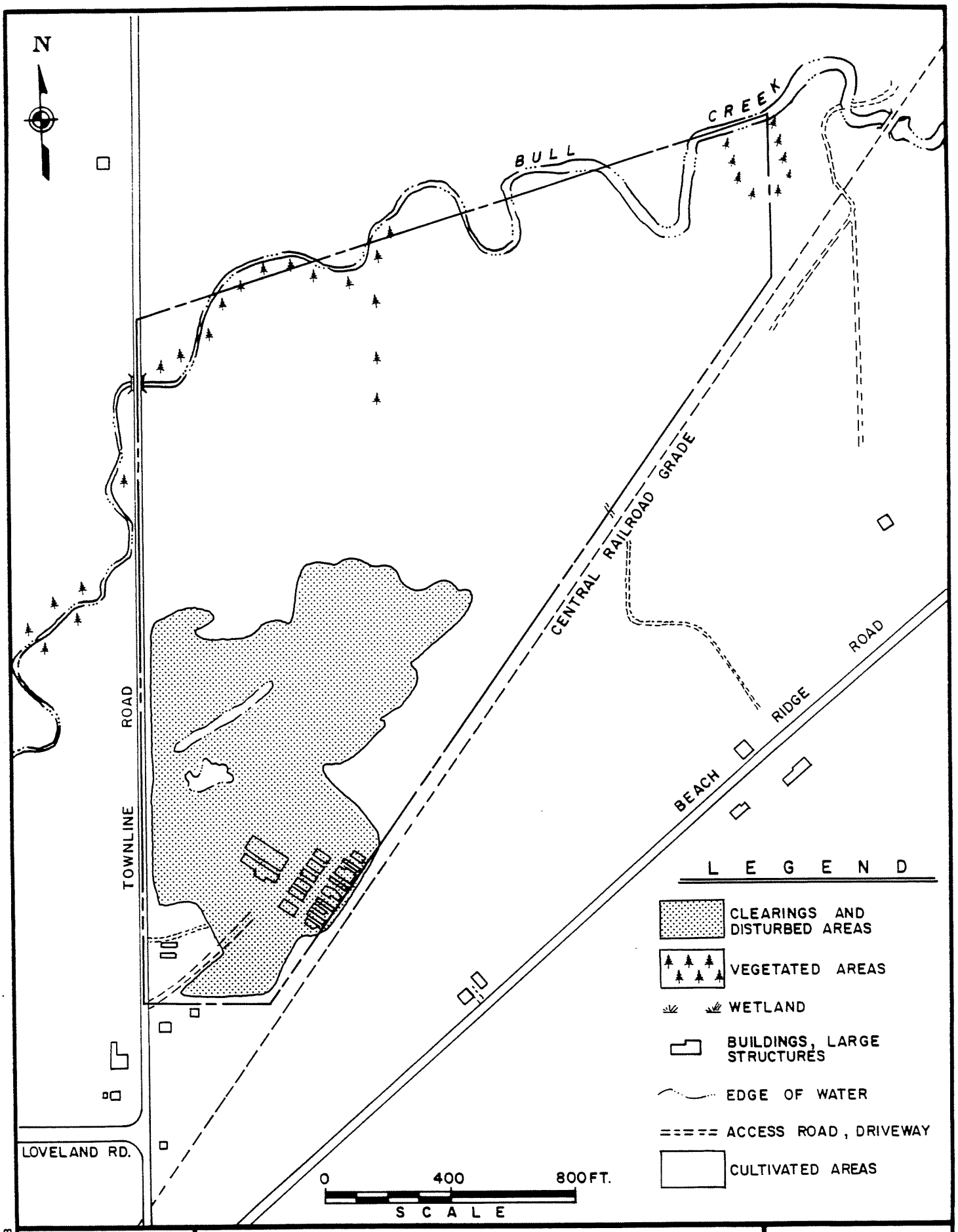
SCALE IN FEET

EXISTING SITE FEATURES

URS CONSULTANTS, INC.

FIGURE 1-3

CC-1990

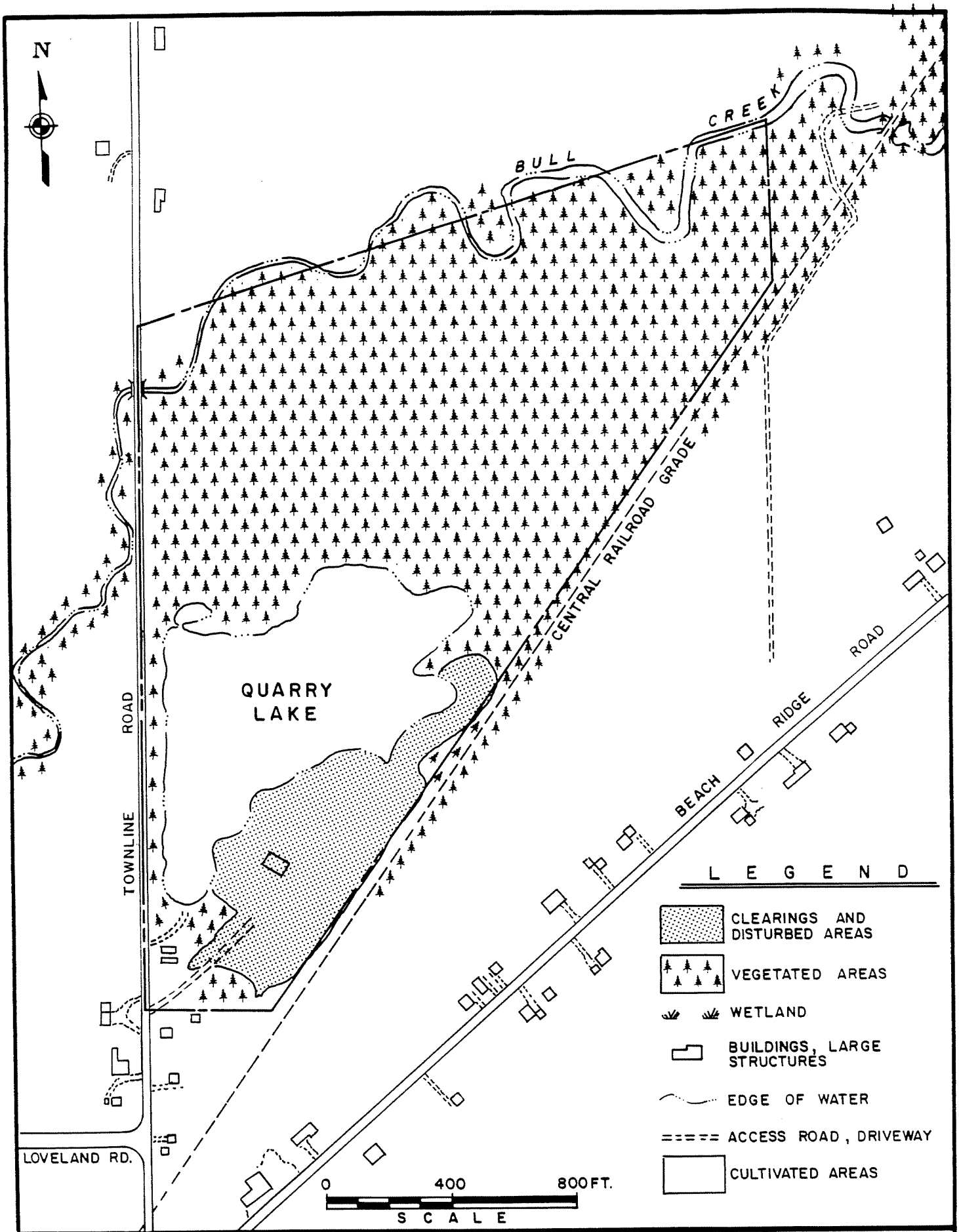


URS CONSULTANTS INC

FRONTIER CHEMICAL SITE AND VICINITY - 1938

FIGURE 1-4

A-3568

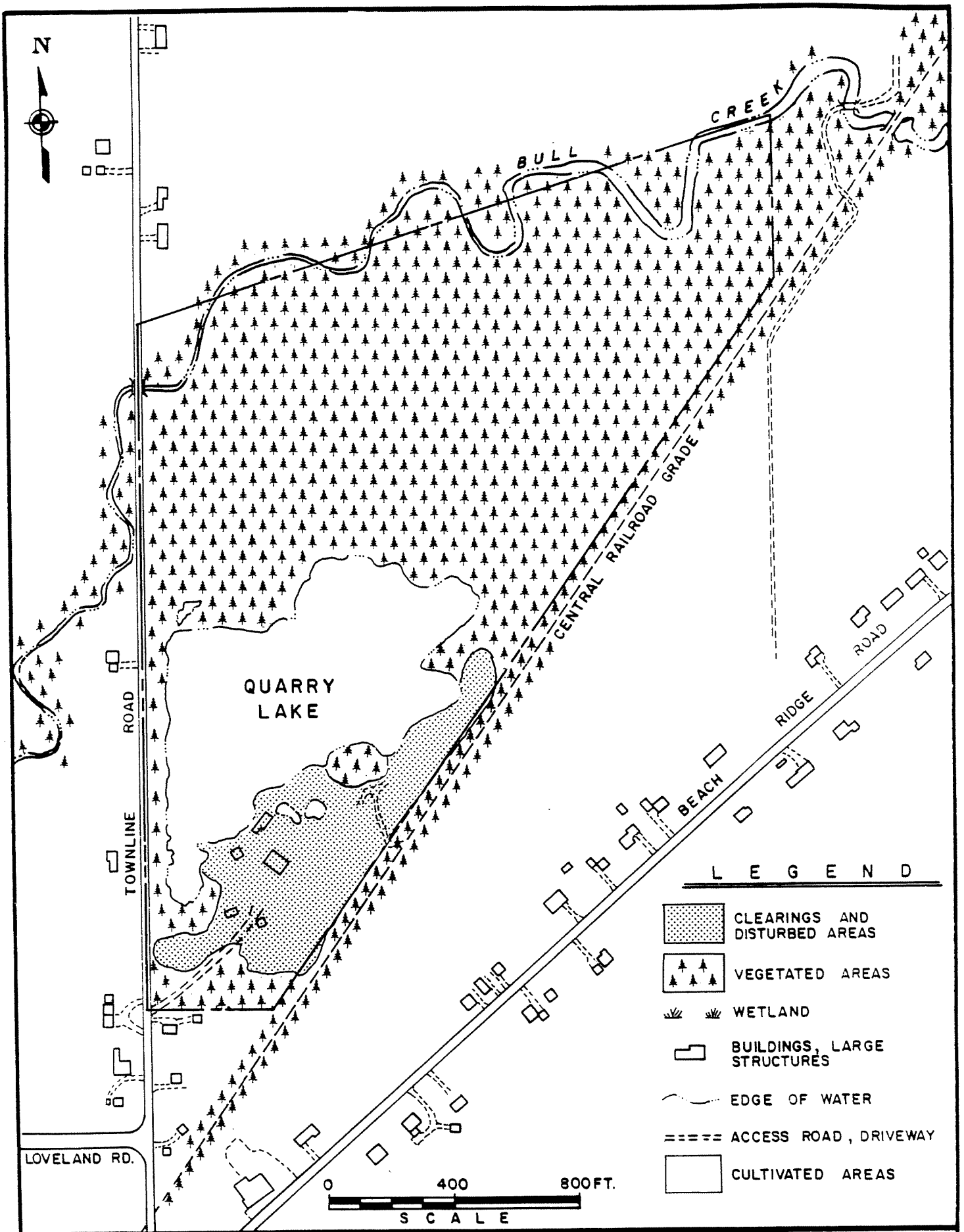


URS CONSULTANTS INC

FRONTIER CHEMICAL SITE AND VICINITY - 1958

FIGURE 1-5

A-3569

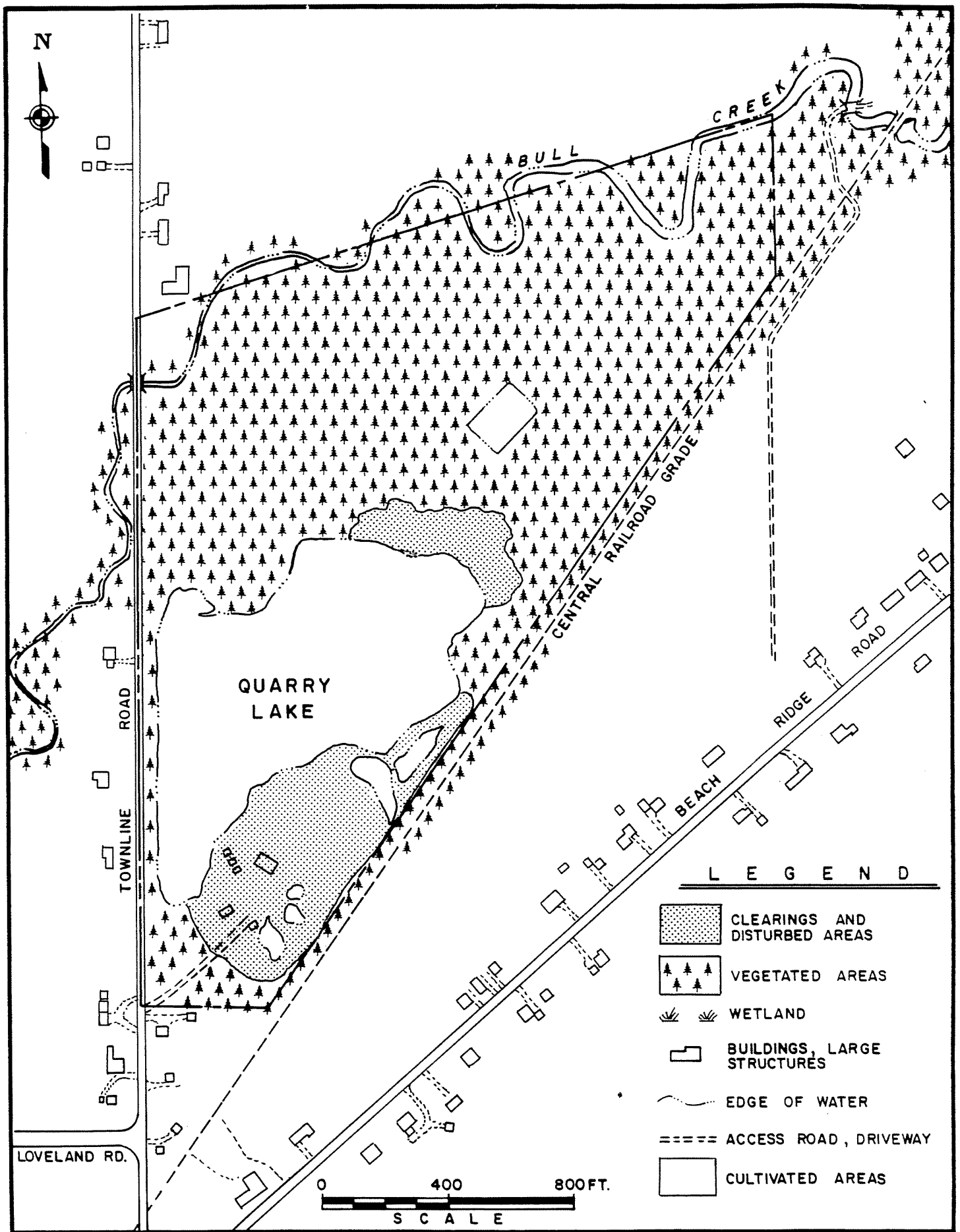


URS CONSULTANTS INC

FRONTIER CHEMICAL SITE AND VICINITY - 1966

FIGURE 1-6

A-3570

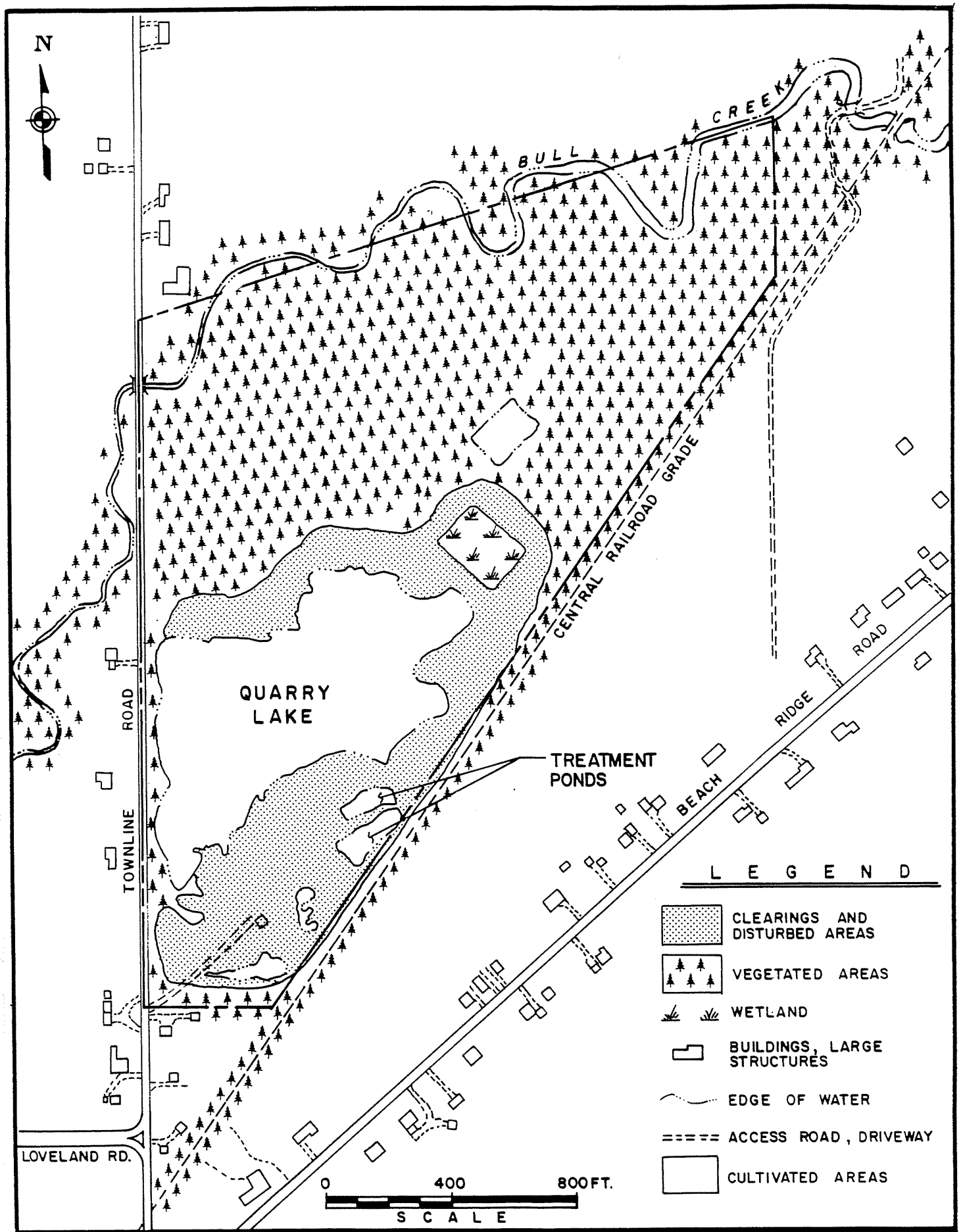


URS CONSULTANTS INC.

FRONTIER CHEMICAL SITE AND VICINITY - 1978

FIGURE 1-7

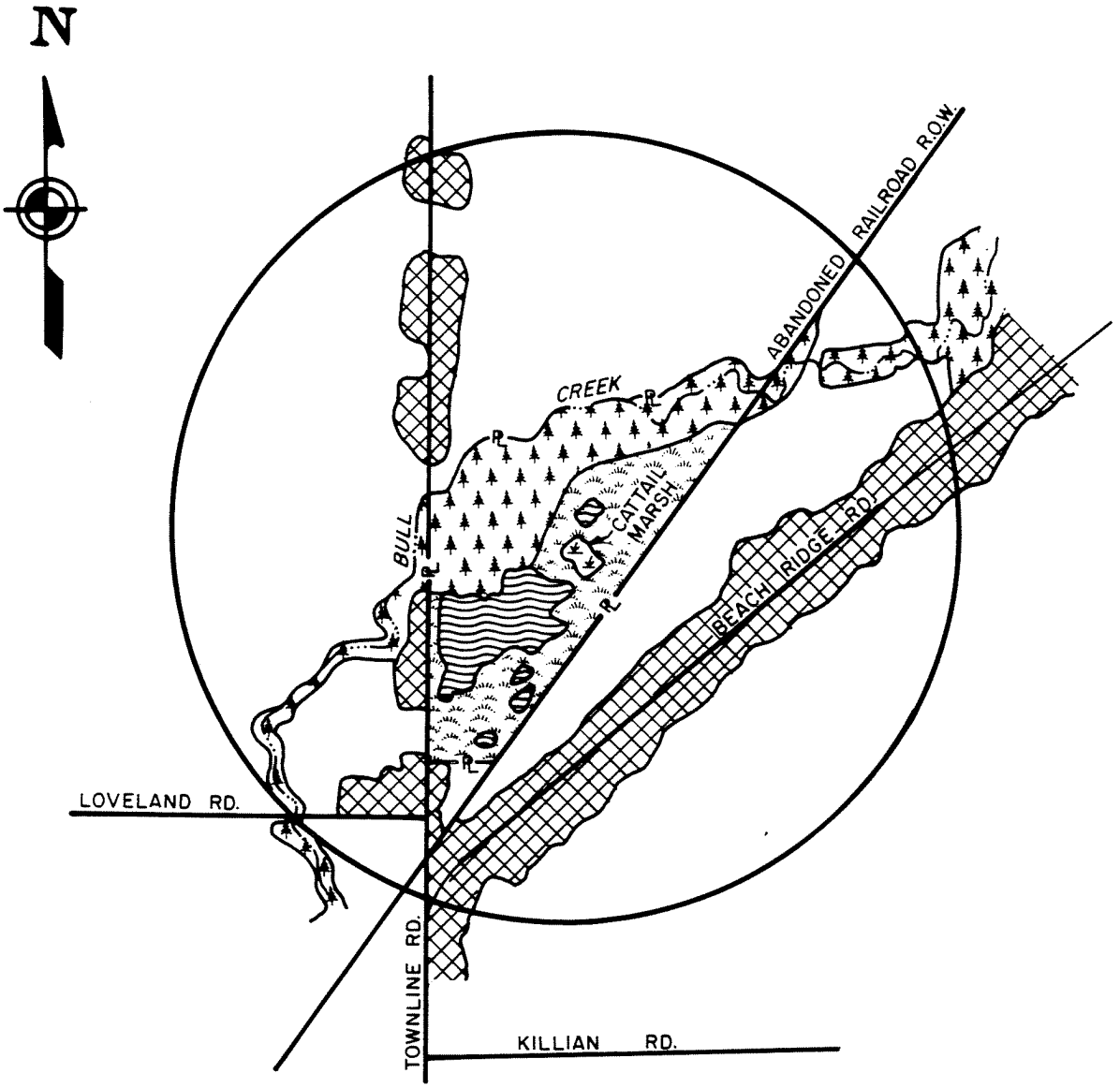
A-3571



URS CONSULTANTS INC.

FRONTIER CHEMICAL SITE AND VICINITY - 1985

FIGURE 1-8



LEGEND

- OPEN WATER (COVERTYPE 1)
- ASH-MAPLE FOREST ON BANKS OF BULL CREEK
- SITE PLANT COMMUNITIES (OTHER THAN ABOVE)

} (COVERTYPE 2)

- CATTAIL MARSH (COVERTYPE 3)
- CULTURAL DEVELOPMENT (COVERTYPE 4)
- CROPLAND (COVERTYPE 5)

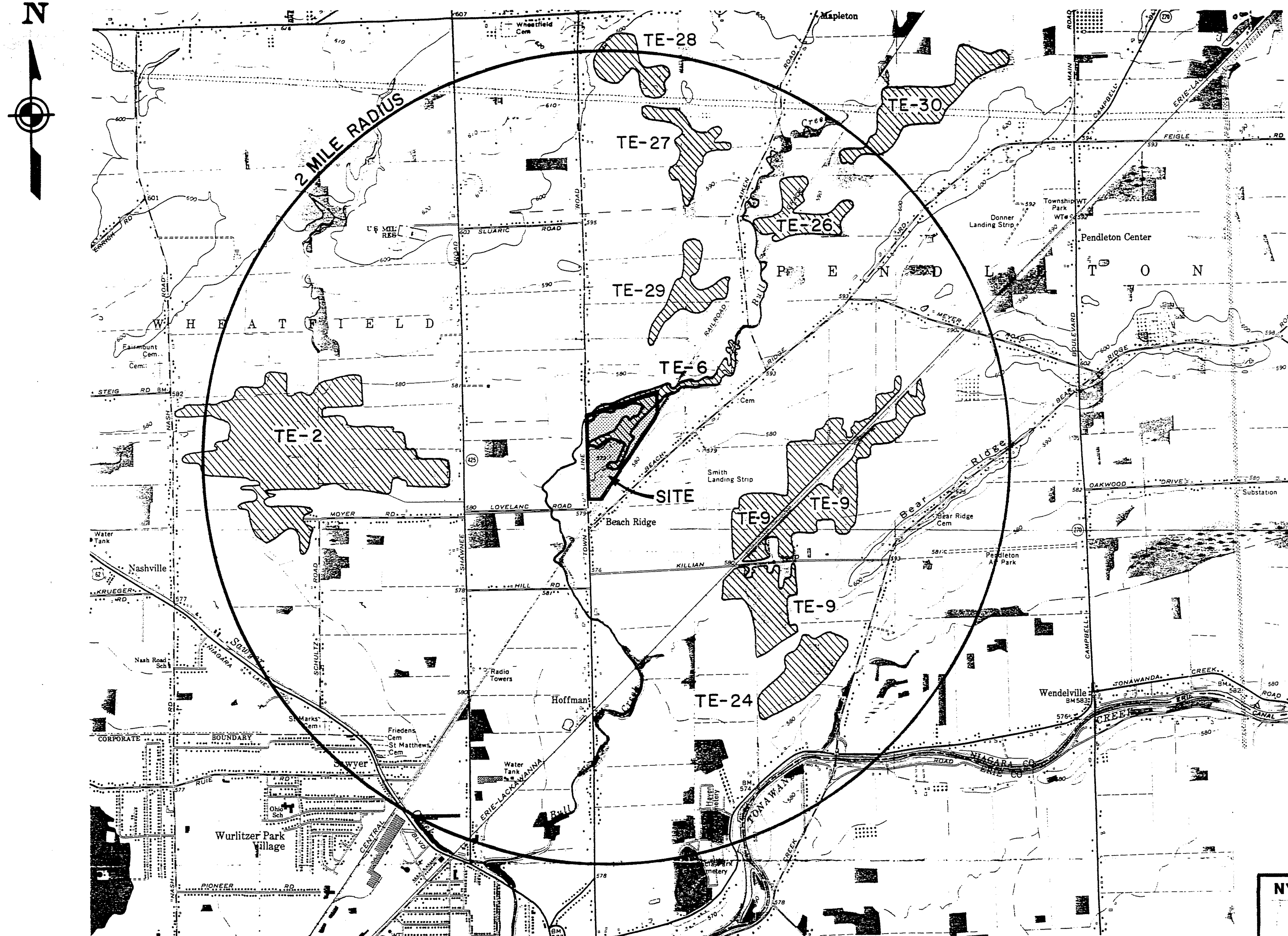
APPROX. SCALE: 1" = 1250'

URS CONSULTANTS, INC.

COVERTYPES WITHIN 1/2 MILE RADIUS OF FRONTIER CHEMICAL SITE

FIGURE 3-1

1-357



LEGEND

NYSDEC REGULATED WETLAND

SCALE

0 1/2 1 MILE

SOURCE
TONAWANDA EAST, N.Y. QUADRANGLE (1965)
USGS 7.5 MINUTE SERIES

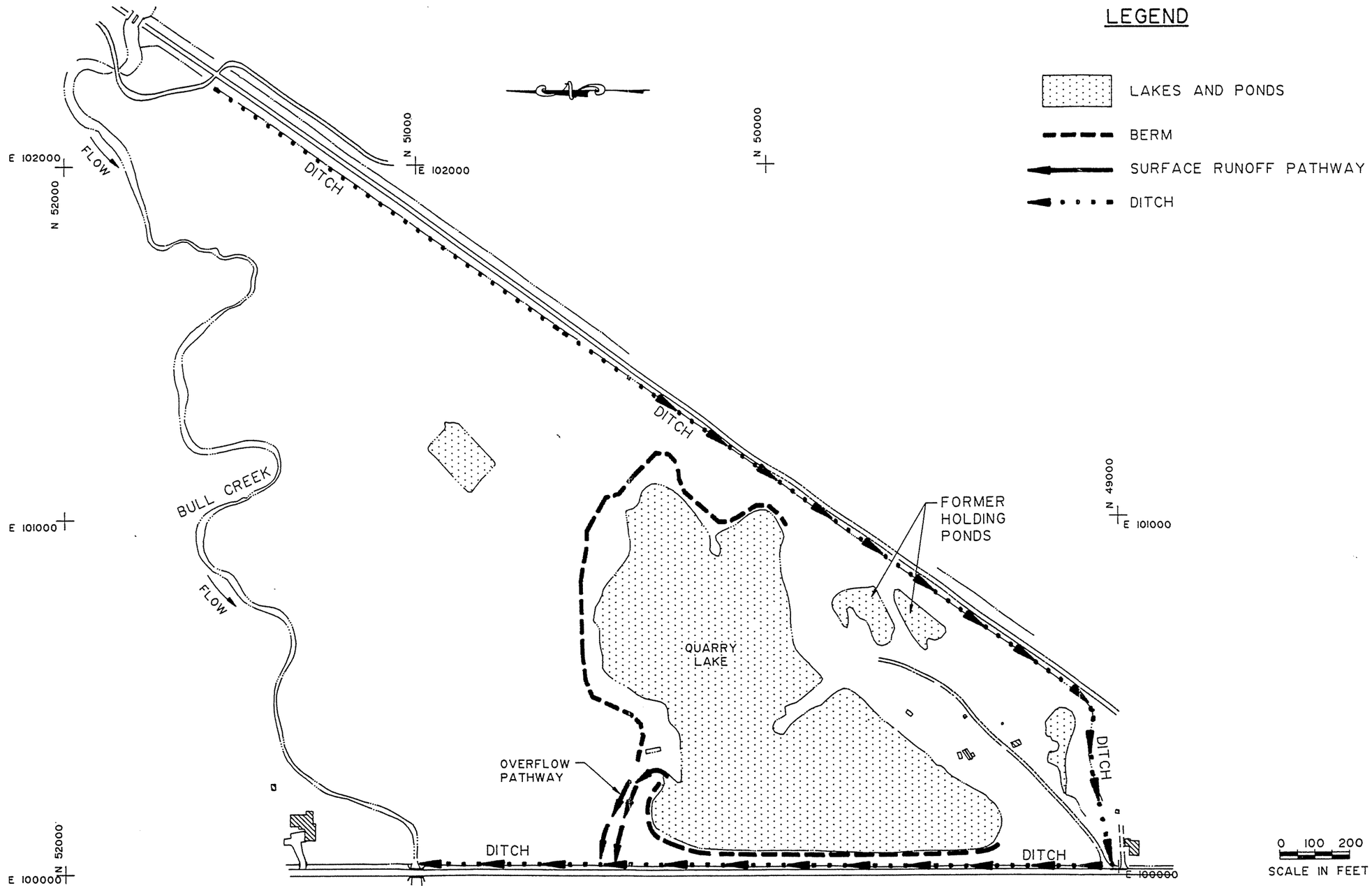
C-1901

NYSDEC REGULATED WETLANDS WITHIN 2-MILE RADIUS OF FRONTIER CHEMICAL SITE

URS CONSULTANTS, INC.

FIGURE 3-2

1=100 01/04/91

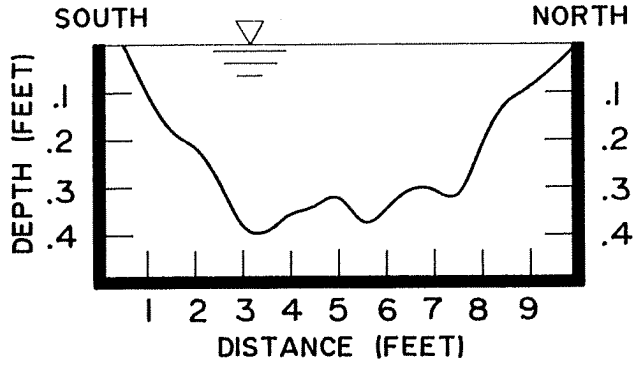


SITE DRAINAGE PATTERN

URS CONSULTANTS, INC.

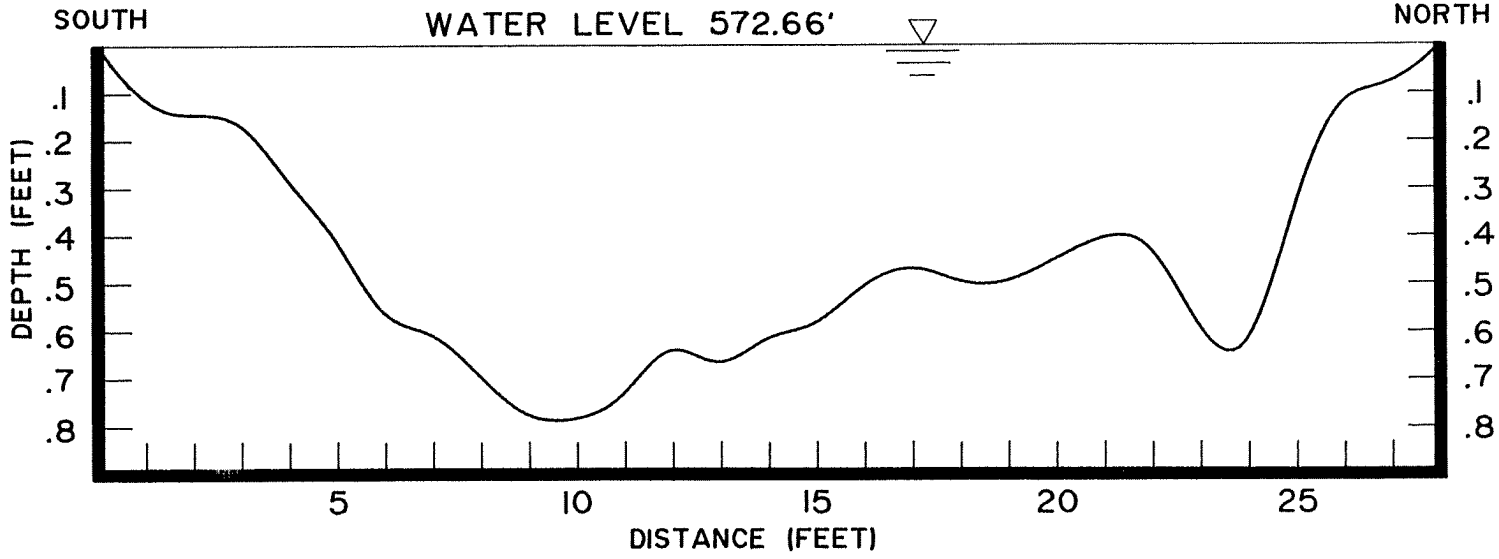
FIGURE 3-3

CC — 2017



WATER LEVEL 572.16'

LOCATION No. 1 - BULL CREEK
Q = 0.8 FT ^{3}/SEC ON 7/16/90



LOCATION No. 1 - BULL CREEK
Q = 5.5 FT ^{3}/SEC ON 7/20/90

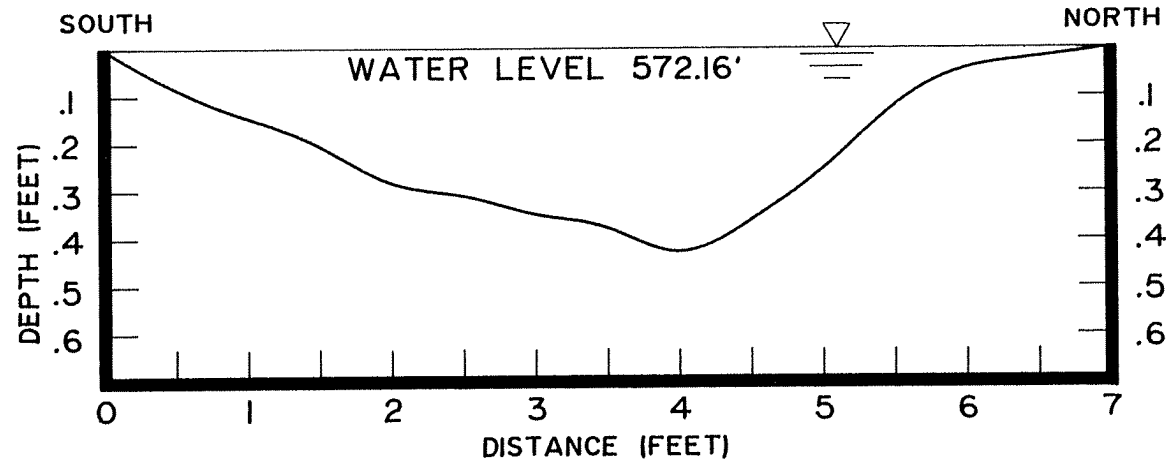
URS CONSULTANTS, INC.

BULL CREEK
VELOCITY PROFILE No. 1

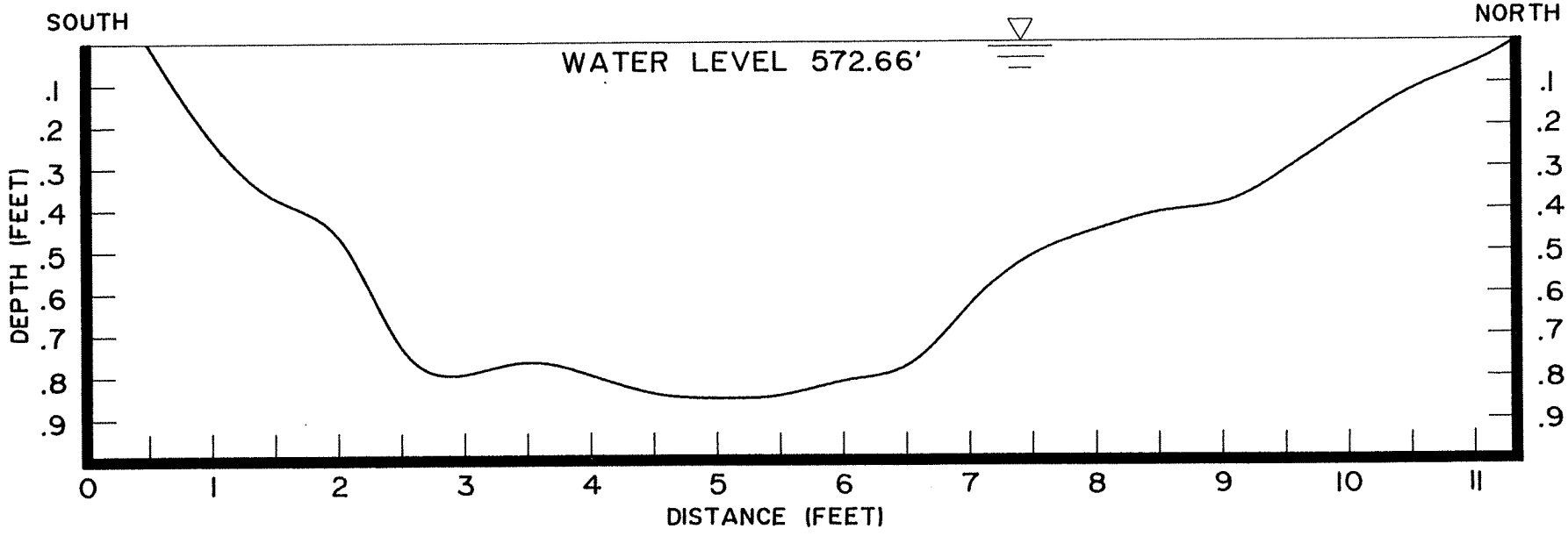
FIGURE 3-4

AC-3487

I=I 01/11/91



LOCATION No. 2 - BULL CREEK
Q = 0.6 FT ^{3}/SEC ON 7/16/90



LOCATION No. 2 - BULL CREEK
Q = 5.9 FT ^{3}/SEC ON 7/20/90

URS
CONSULTANTS, INC.

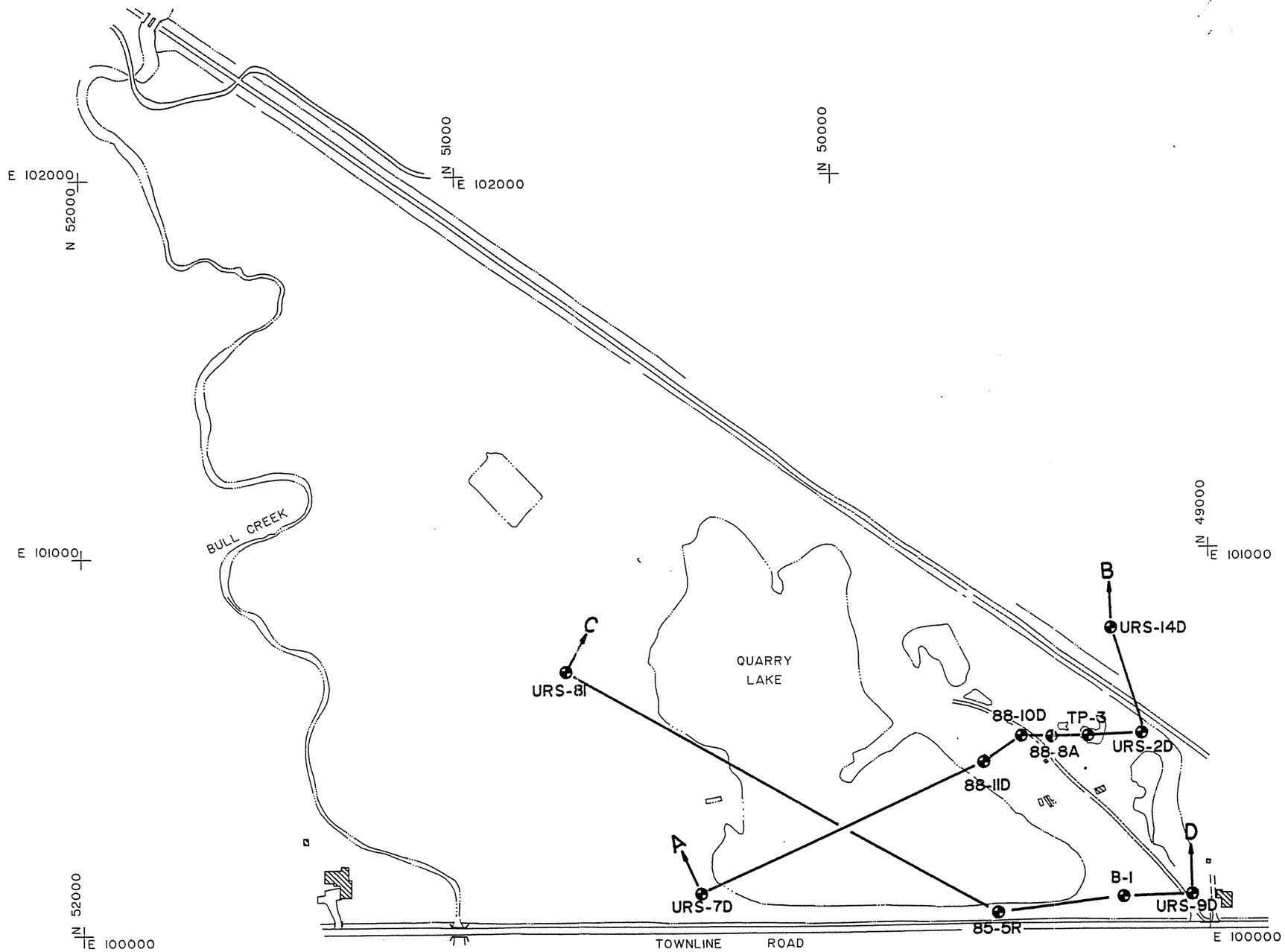
BULL CREEK
VELOCITY PROFILE No. 2

FIGURE 3-5

Hydrogologic Unit	Lithologic Unit	Stratigraphic Profile	Material Description	Hydrogeologic Properties	Origin
UPPER WATER BEARING ZONE	FILL	XXXXXX	Typical FILL includes brick and brick fragments in a silty clay to a sandy gravel matrix. Also includes various types of C & D debris, crushed drums and other metal objects, and lake bottom clay/metal sludge mixtures.	Rising head tests indicate hydraulic conductivities ranging from 10E-3 to 10E-4 cm/sec. Coductivities may range to 10E-6 cm/sec in areas of fill with significant clay matrix.	Man Emplaced
	WEATHERED CLAYEY SILT	\~\~\~\	Clayey silt with trace sand, overlying clay with some silt. Moderately plastic, gray to brown in color with a very stiff to medium stiff consistency. Generally dry to moist and fractured. Roots and other organics present. Many fractures contain smokey quartz crystals.	Groundwater flow in this zone may be dominated by fracture flow. This zone may contain seasonally perched water. URS rising and falling head tests from wells screened in this zone yield K values ranging from 10E-3 to 10E-6 cm/sec. Four laboratory vertical permeability tests from samples taken near the bottom of the unit reveal k values of 10E-8 cm/sec.	Near surface physical and chemical decomposition of lacustrine deposits.
	WEATHERED CLAY	~\~\~\			Near surface physical and chemical decomposition of lacustrine deposits.
CLAY CONFINING UNIT	CLAY	~\~\~\	Brown clay with some silt, soft to very soft, wet, plastic and sticky. Gray horizontal silty seams increase in size and number with depth.	Golder reports K values from rising head tests from two wells screened in the clay confining unit as on the order of magnitude of 10E-7 cm/sec. Six laboratory permeability tests from samples taken in the confining layer yield vertical k values on the order of 10E-8 cm/sec.	Lacustrine (Lake) deposits.
	SILTY CLAY	~\~\~\	Same general description as clay above. However, silty seams increase to an extent that changes the overall unit classification to silty clay.		Lacustrine (Lake) deposits.
LOCAL IMPERVIOUS UNIT	SILT	SSSSSSS	Silt, some clay, trace sand and gravel. Locally underlies Beach Ridge Road and may interfinger into silty sand unit below at southern portion of site.	Well screened in this unit is very slow to recover. Hydraulic conductivity is likely on the order of 10E-7 cm/sec.	Lodgement till formed underneath continental ice sheet.
LOWER AQUIFER	SILTY SAND	:.o.:~:.o	The top of this unit (silty sand) continues the gradational coarsening with depth of the unit above. This unit in general ranges from silty sand with some clay and gravel, to sandy silt with trace gravel to gravelly sand with some silt. Although loose at the top of the unit, the materials are typically dense to very dense. Typically saturated, isolated lenses may be dry to moist.	Five rising and falling head tests from wells screened in this interval reveal K values of 10E-3 to 10E-4 cm/sec. Golder reports values from similar tests of 10E-4 to 10E-5 cm/sec.	Lacustrine (lake) deposits at top of unit grade into glacial till deposits at bottom of unit.
	WEATHERED BEDROCK	/o/o/o/o/o	Highly broken, weathered dolostone. Includes mixtures of sand, silt and gravel.	K values likely 10E-3 to 10E-4 cm/sec	Near surface decomposition of bedrock.
	DOLOSTONE	/ / / / /	Dark gray, very hard dolostone, faintly and thinly laminated. Contains rare small crescent shaped fossils or fossil fragments (1 or 2 per 5 foot core run). Crystals present occasionally in small non-connected voids. A faint white residue appears on many fracture surfaces.	Although the primary permeability of dolostone is negligible, secondry permeability in the form of fractures may increase K values several orders of magnitude. Rising and falling head tests from wells screened in bedrock yield values of 10E-3 to 10E-4 (URS) and 10E-4 to 10E-6 (Golder) cm/sec.	Sedimentary bedrock. Highly fractured in top 10 - 20 feet due to glacial unloading.

U R S Consultants	Generalized Geologic – Hydrogeologic Column	Figure 3 – 6

1=300 03/14/91



0 300 600

SCALE IN FEET

CROSS SECTION LOCATIONS

URS CONSULTANTS, INC.

FIGURE 3-7

CC-1986

I=100 3/18/91

A
NW

B
SE

600
590
580
570
560
550
540
530

URS-7D
85-7S
85-7R

88-11A
88-11B
88-11C
88-11D

88-10D
88-10C
88-10B
88-10A

88-8A

ROAD

TP-3

URS-2D
85-2S
85-2R

DRAINAGE
DITCH

URS-14D
URS-14I
URS-14S

QUARRY LAKE

FILL

WEATHERED
CLAY

CLAY/SILTY CLAY

SILTY SAND

WEATHERED
BEDROCK

DOLOSTONE

DENSE
SILT

SECTION A-B

NOTE:
GEOLOGIC CONDITIONS SHOWN ARE REPRESENTATIVE OF CONDITIONS ENCOUNTERED AT EACH BORING LOCATION TO THE DEPTH DRILLED. EXTRAPOLATIONS BETWEEN BORINGS HAVE BEEN INTERPRETED USING STANDARD ACCEPTED GEOLOGIC PRACTICES AND PRINCIPLES. ACTUAL CONDITIONS MAY VARY BETWEEN BORINGS FROM THOSE SHOWN.

LEGEND

URS-8S — BORING AND MONITORING WELL NUMBER

— SCREENED INTERVAL OF MONITORING WELL

— BOTTOM OF BORING

0 100 200

SCALE IN FEET

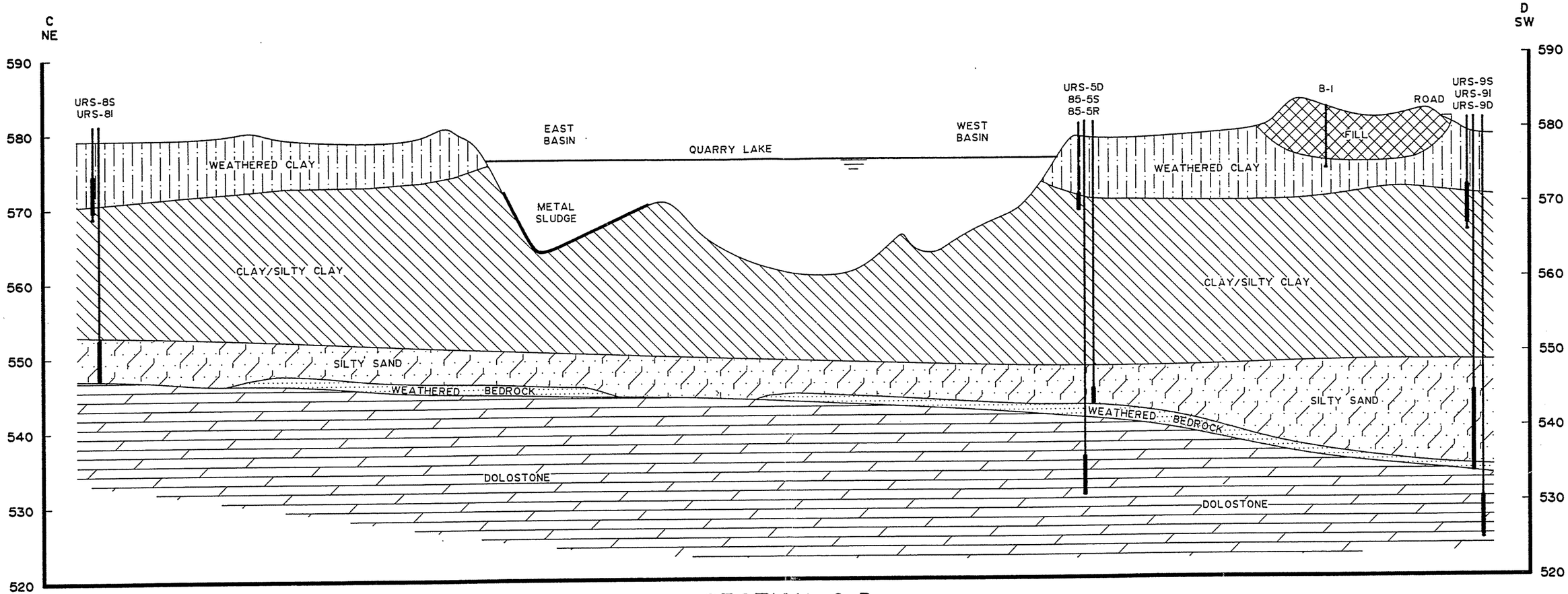
GEOLOGIC CROSS SECTION
A - B

URS
CONSULTANTS, INC.

FIGURE 3-8

CC-1955

10/01/00 1400



SECTION C-D

LEGEND

URS-8S ← BORING AND MONITORING WELL NUMBER

← SCREENED INTERVAL OF MONITORING WELL

← BOTTOM OF BORING

NOTE:
GEOLOGIC CONDITIONS SHOWN ARE REPRESENTATIVE OF CONDITIONS ENCOUNTERED AT EACH BORING LOCATION TO THE DEPTH DRILLED. EXTRAPOLATIONS BETWEEN BORINGS HAVE BEEN INTERPRETED USING STANDARD ACCEPTED GEOLOGIC PRACTICES AND PRINCIPLES. ACTUAL CONDITIONS MAY VARY BETWEEN BORINGS FROM THOSE SHOWN.

0 100 200

SCALE IN FEET

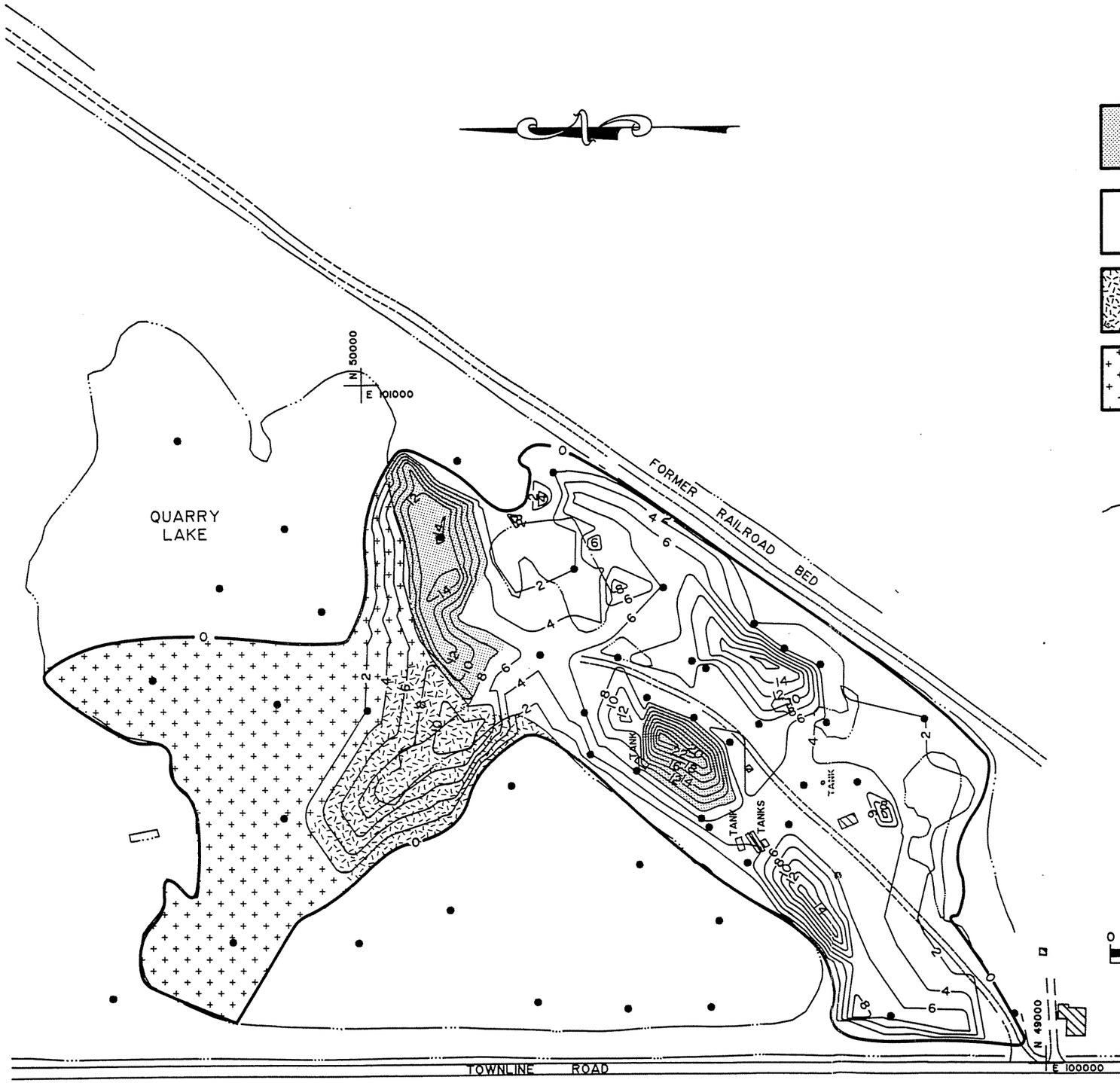
GEOLOGIC CROSS SECTION
C - D

URS CONSULTANTS, INC.

FIGURE 3-9

CC-1970

1=100 01/11/91



LEGEND

- LIKELY METAL SLUDGE\CLAY MIX DREDGE SPOIL PILES (~ 20,000 CU. YDS.)
- GENERAL FILL (CONTAMINATED OR UNCONTAMINATED) (~ 67,000 CU. YDS.)
- CLAY/FILL BERM (~ 12,000 CU.YDS.)
- METAL SLUDGE ON LAKE BOTTOM (~ 6,000 CU. YDS.)
- BORING, TEST TRENCH, OR SHALLOW PROBE LOCATION
- 8 FILL ISOPACH

NOTE:

VALUES ARE DERIVED FROM:

1.) INFORMATION FROM 49 BORINGS, TEST TRENCHES OR SHALLOW PROBES.

2.) PROJECTION OF CURRENT TOPOGRAPHY RELATIVE TO ADJACENT BORINGS.

3.) COMPARISION OF 1990 TO 1985 TOPOGRAPHIC MAPS.

0 100 200
SCALE IN FEET

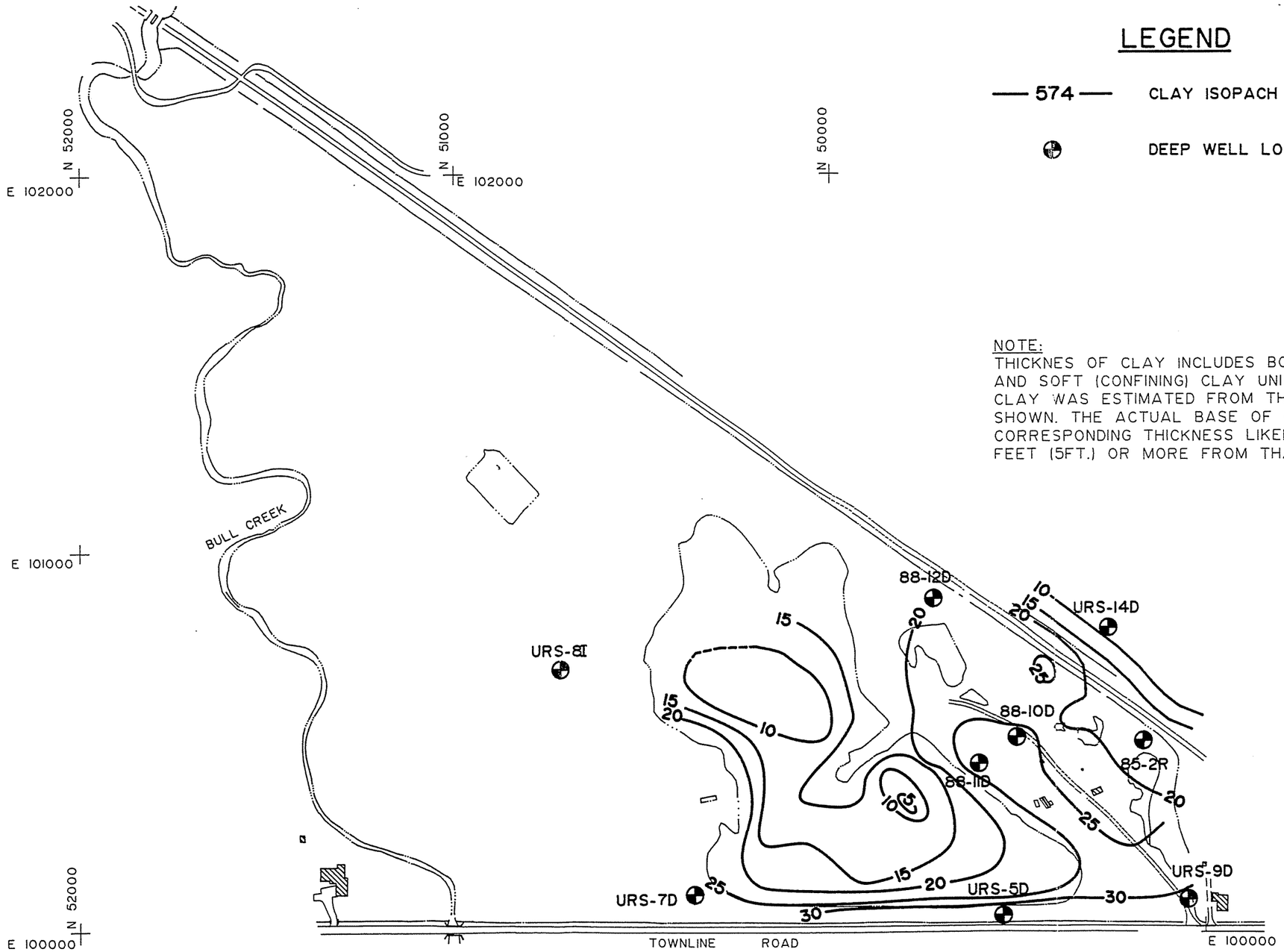
THICKNESS OF FILL

URS CONSULTANTS, INC.

FIGURE 3-10

CC-2018

1:300 3/18/91



LEGEND

— 574 — CLAY ISOPACH

DEEP WELL LOCATION

NOTE:
THICKNES OF CLAY INCLUDES BOTH WEATHERED AND SOFT (CONFINING) CLAY UNITS. BASE OF CLAY WAS ESTIMATED FROM THE EIGHT BORINGS SHOWN. THE ACTUAL BASE OF CLAY AND THE CORRESPONDING THICKNESS LIKELY VARIES FIVE FEET (5FT.) OR MORE FROM THAT SHOWN.

0 300 600

SCALE IN FEET

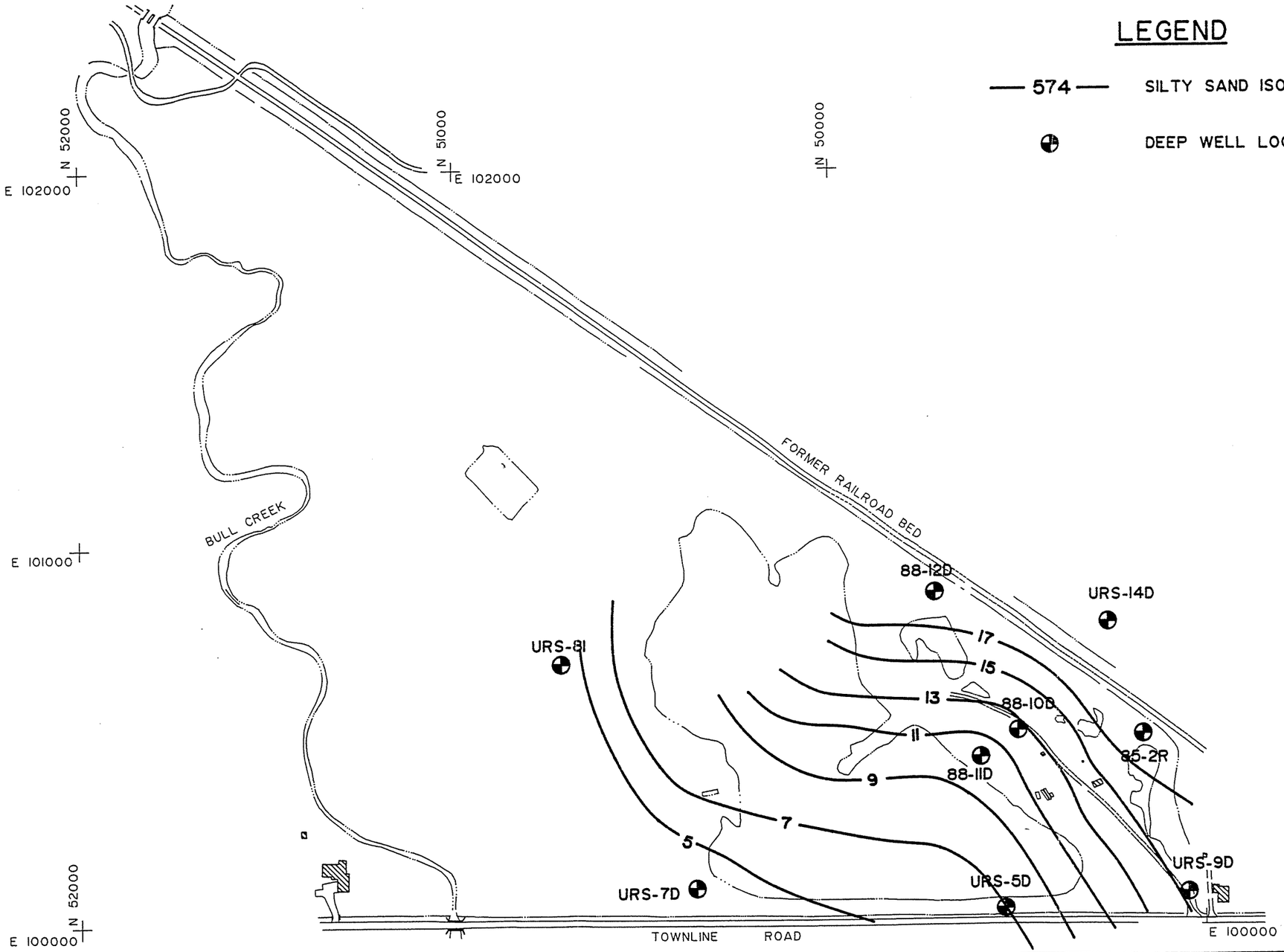
THICKNESS OF CLAY

URS CONSULTANTS, INC.

FIGURE 3-11

CC-2019

1:300 03/14/91



LEGEND

— 574 — SILTY SAND ISOPACH

DEEP WELL LOCATION

0 300 600

SCALE IN FEET

THICKNESS OF SILTY SAND

URS CONSULTANTS, INC.

FIGURE 3-12

CC-2020

1=300 3/18/91

LEGEND

— 574 — CONTOUR LINE & ELEVATION

DEEP WELL LOCATION

N 52000
E 102000

N 51000
E 102000

N 50000

N 49000
E 101000

E 101000

N 52000
E 100000

E 100000

BULL CREEK

URS-8I (547.0)

URS-7D (548.9)

88-12D (539.4)

URS-14D (548.00)

88-10D (537.0)

URS-2D (543.5)

88-11D (540.1)

URS-5D (540.2)

URS-9D (534.9)

540 542 544 546 548 538 536

TOWNLINE ROAD

0 300 600

SCALE IN FEET

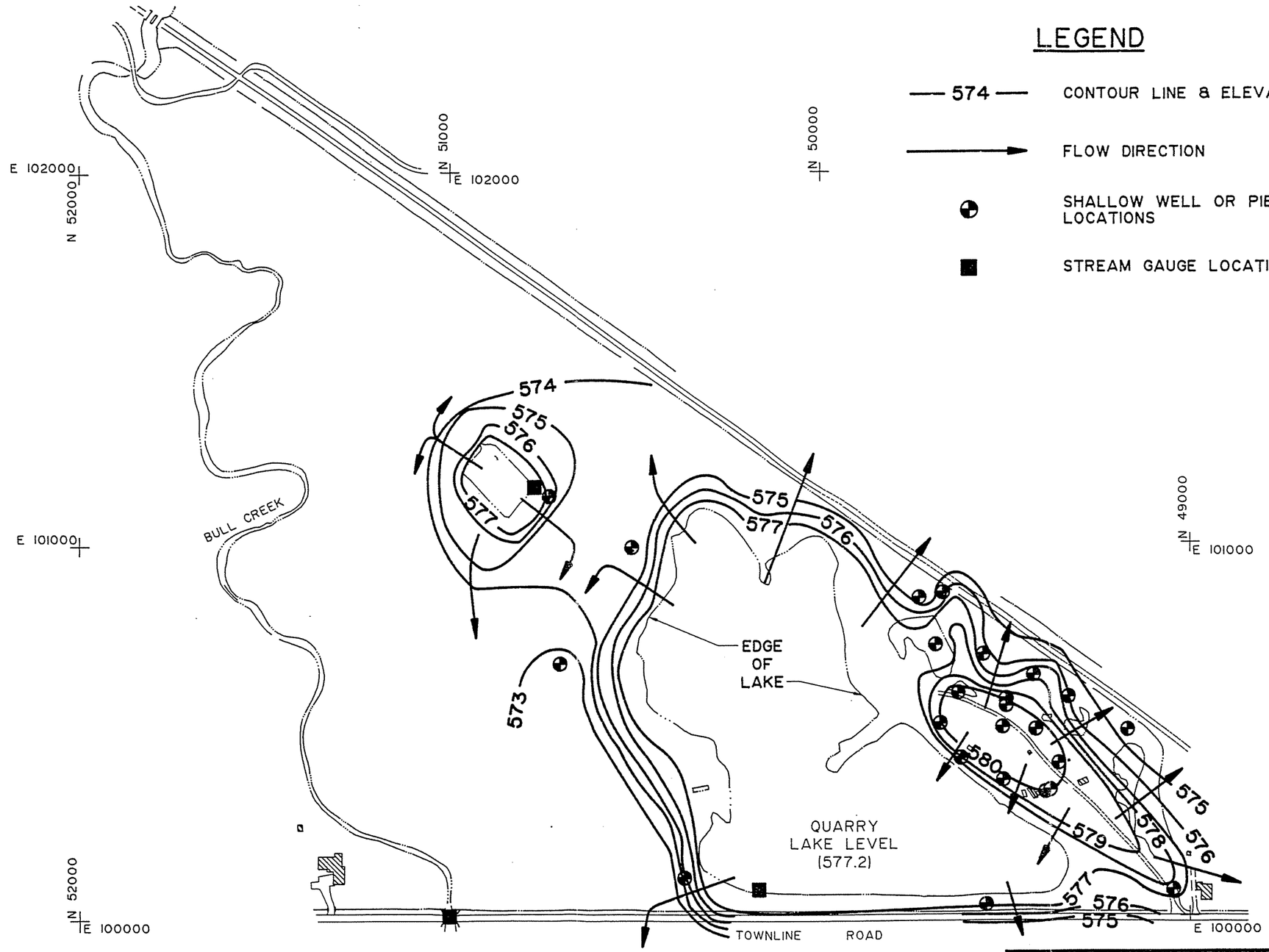
BEDROCK SURFACE MAP

URS CONSULTANTS, INC.

FIGURE 3-13

CC-1958

1=300 01/10/91



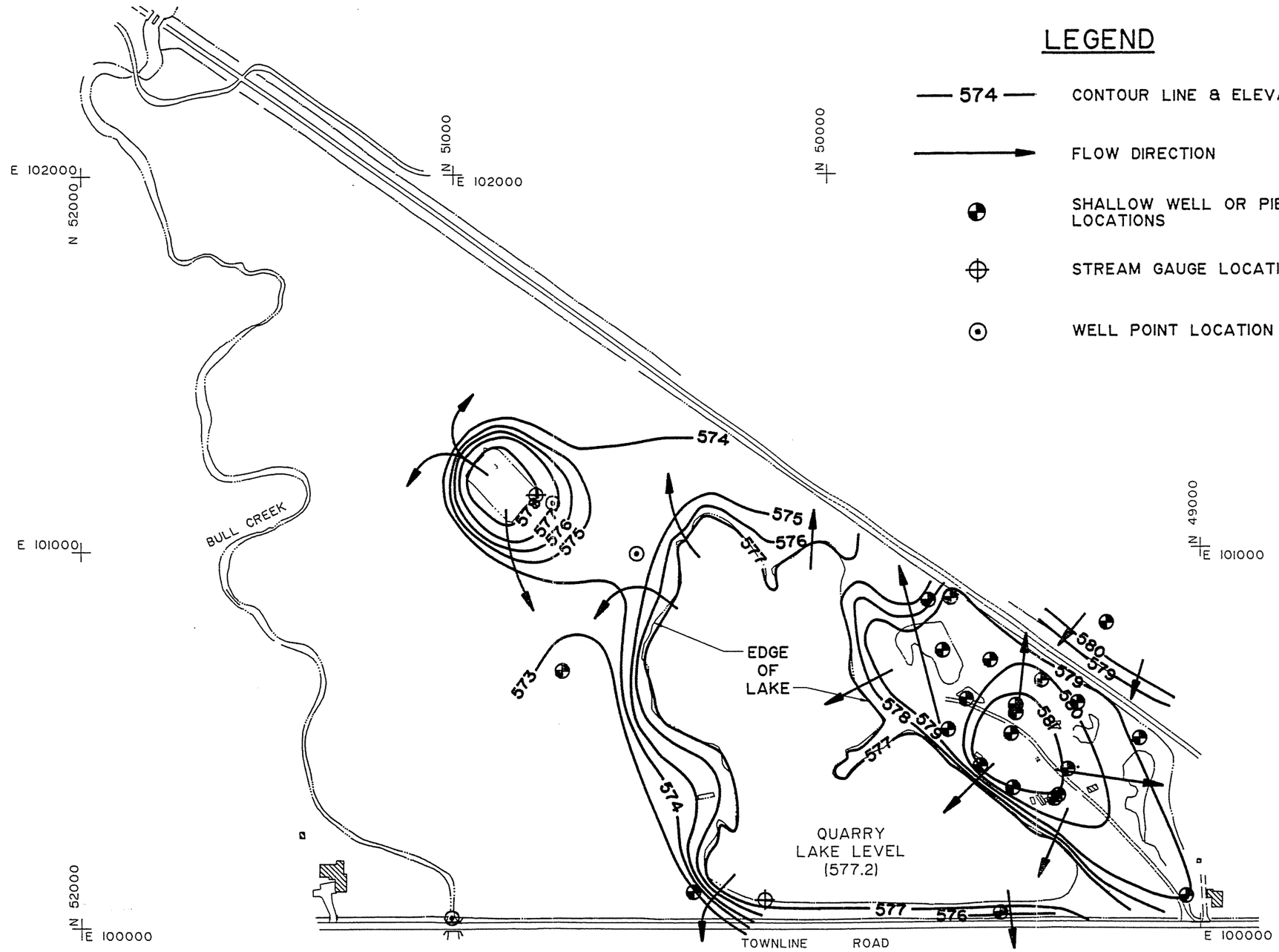
WATER TABLE SURFACE (10/16/90)

URS CONSULTANTS, INC.

FIGURE 3-14

CC-1969

I=300 3/18/91



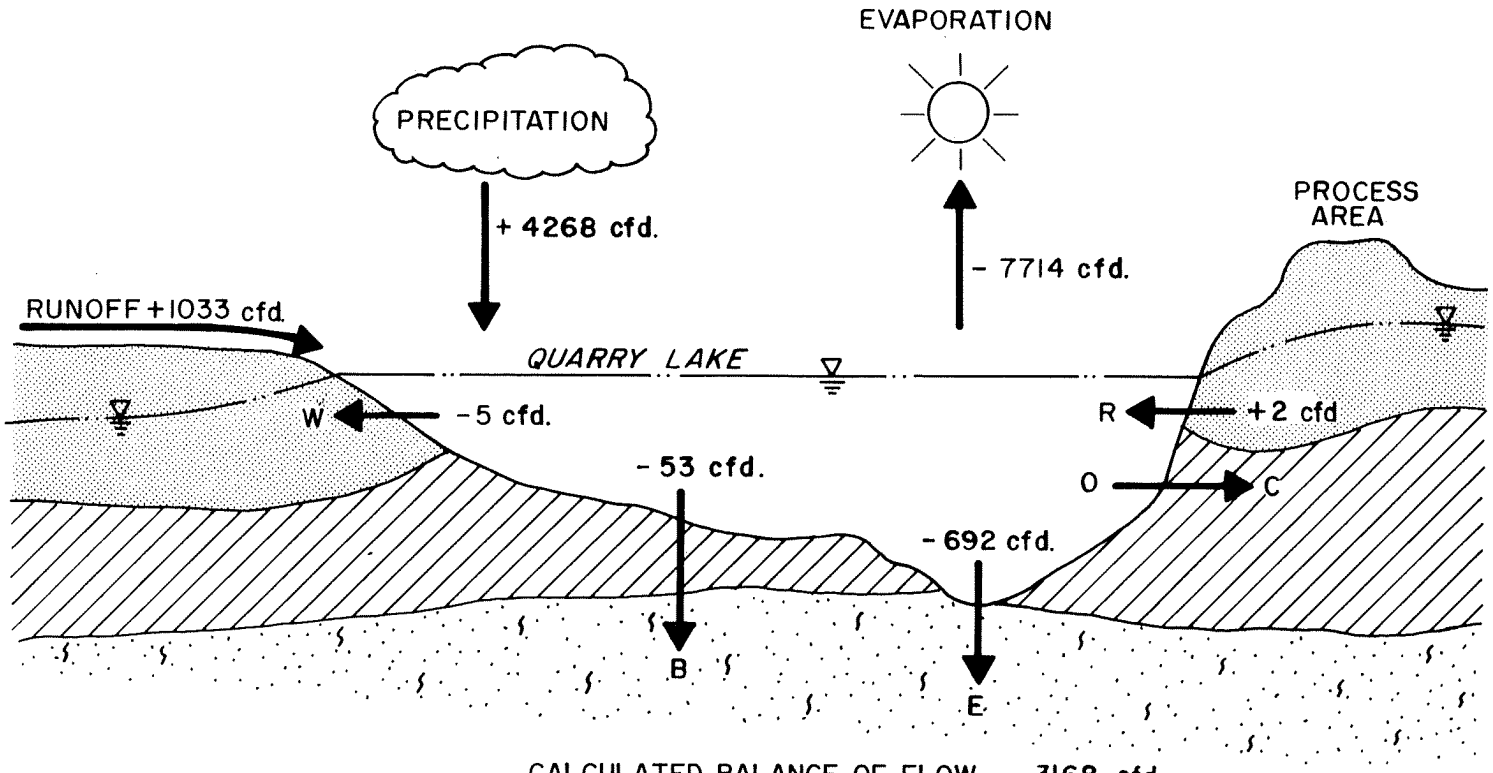
WATER TABLE SURFACE (3/6/91)

URS CONSULTANTS, INC.

FIGURE 3-15

CC-2096

A-3582



CALCULATED BALANCE OF FLOW = -3168 cfd.
OBSERVED LAKE BALANCE (7/11/90 - 8/9/90) = -2890 cfd.
ALL VALUES GIVEN IN ft^3/DAY (cfd.)

HYDROGEOLOGIC UNITS

- UPPER WATER BEARING ZONE
- CLAY CONFINING UNIT
- LOWER AQUIFER
- WATER TABLE SURFACE

KEY

R - RECHARGE FROM PROCESS AREA MOUND
W - FLOW THROUGH WEATHERED CLAY
C - FLOW THROUGH CLAY LAYER
B - FLOW THROUGH CLAY LINED BOTTOM
E - FLOW THROUGH EXCAVATED AREA OF LAKE BOTTOM

NOT TO SCALE

URS CONSULTANTS, INC.

QUARRY LAKE WATER BALANCE 7/11/90 - 8/9/90

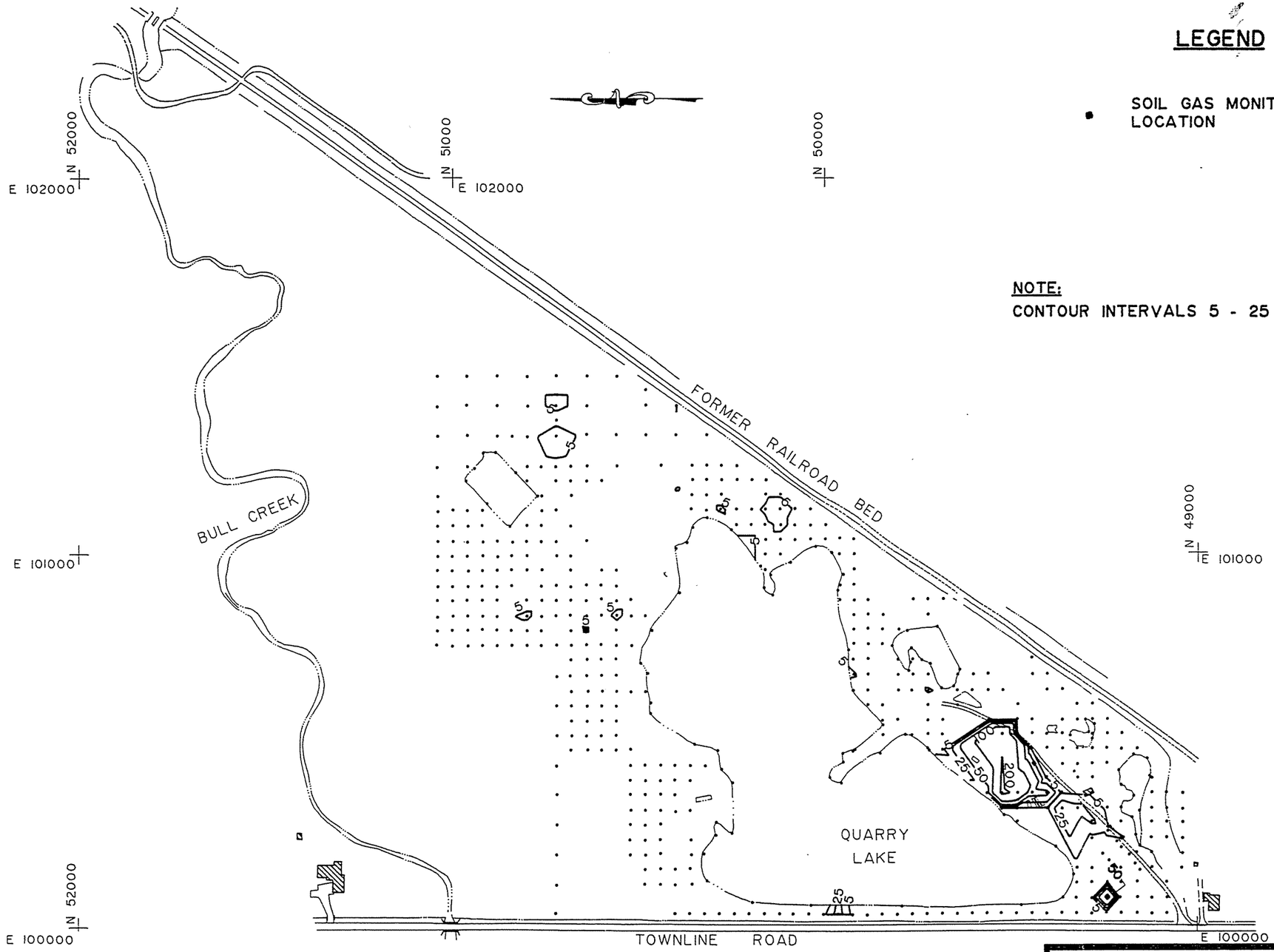
FIGURE 3-16

1=100 01/28/91

LEGEND

● SOIL GAS MONITORING LOCATION

NOTE:
CONTOUR INTERVALS 5 - 25 - 50 - 100 - 200 ppm



SOIL GAS SURVEY ISOPLETH MAP

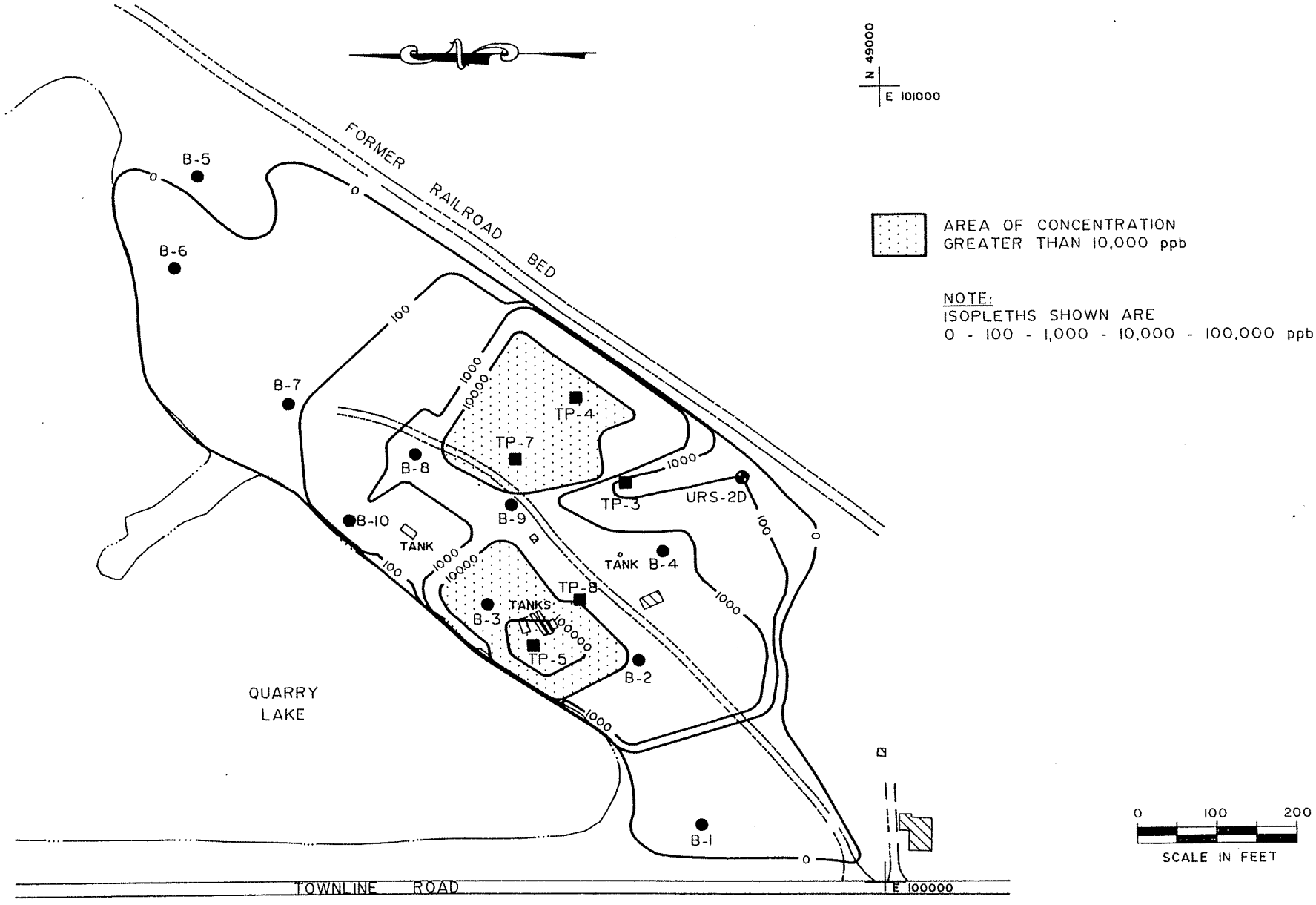
URS CONSULTANTS, INC.

FIGURE 4-1

CC-1959

AC-3592

1=100 01/18/90



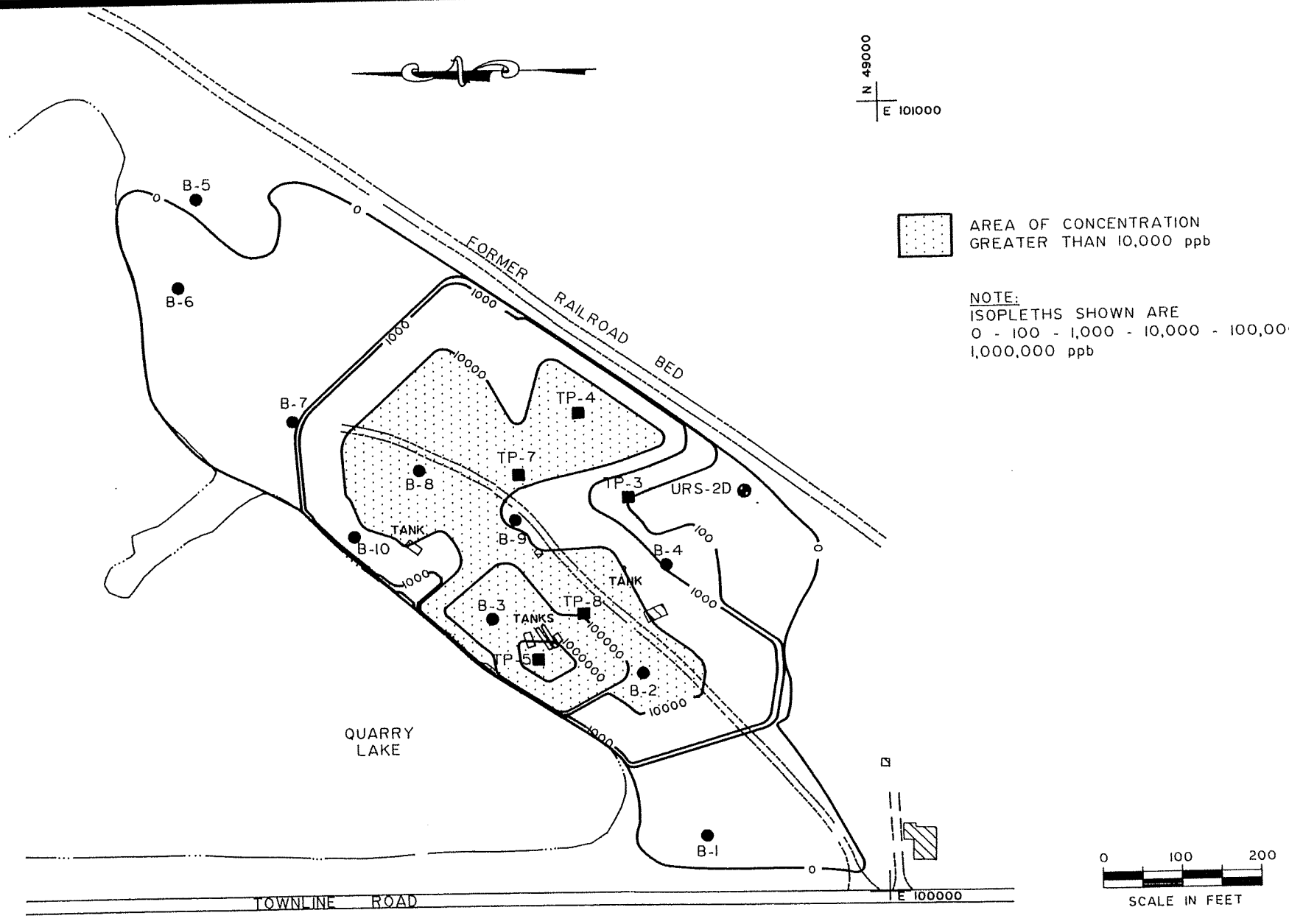
URS CONSULTANTS, INC.

TOTAL CHLORINATED HYDROCARBONS CONCENTRATION IN SUBSURFACE MATERIALS

FIGURE 4-2

AC-3593

1=100 1/18/91



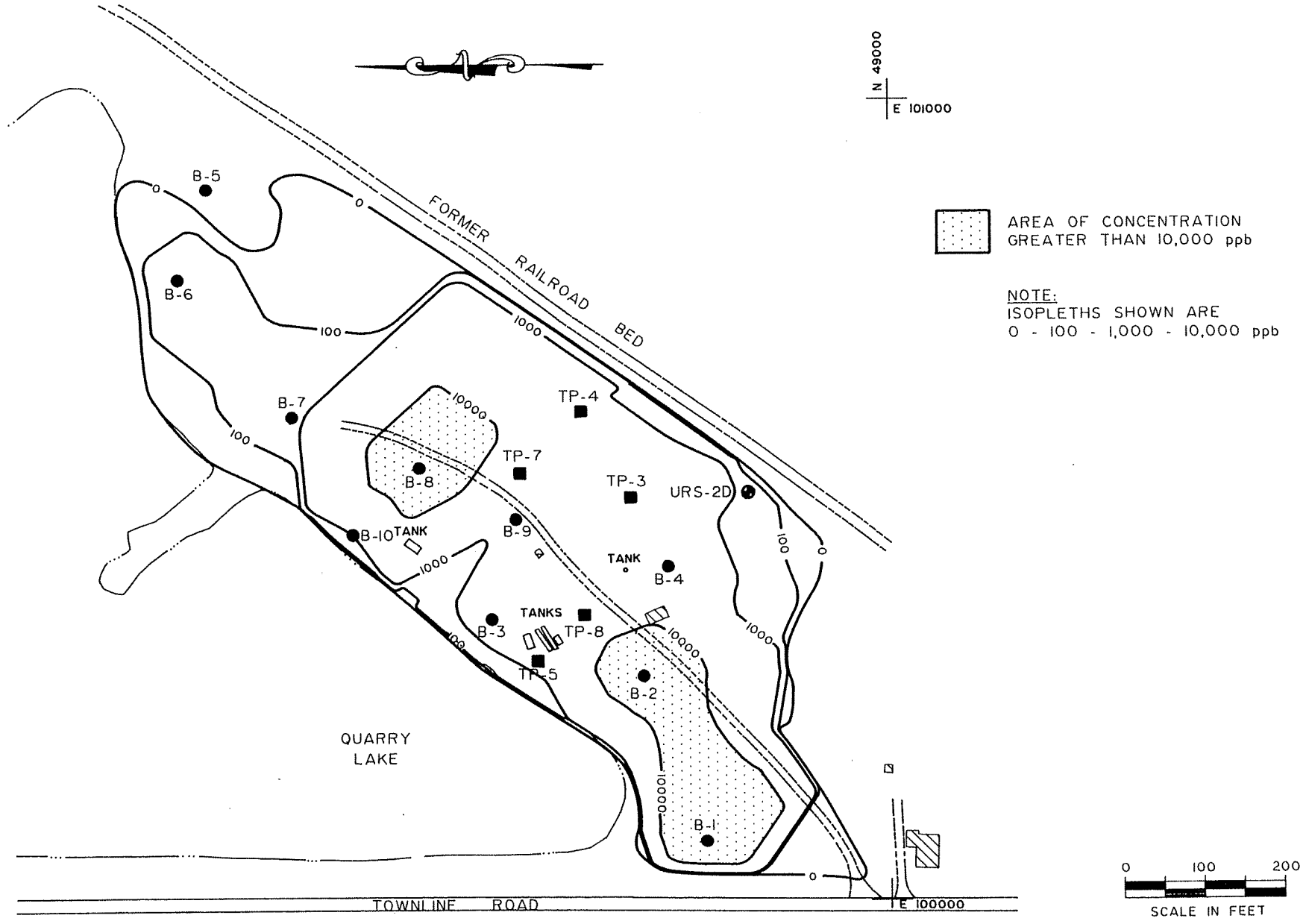
URS CONSULTANTS, INC.

TOTAL BENZENE, TOLUENE, ETHYLBENZENE AND XYLENE CONCENTRATION IN SUBSURFACE MATERIALS

FIGURE 4-3

AC-3595

1=100 01/18/91



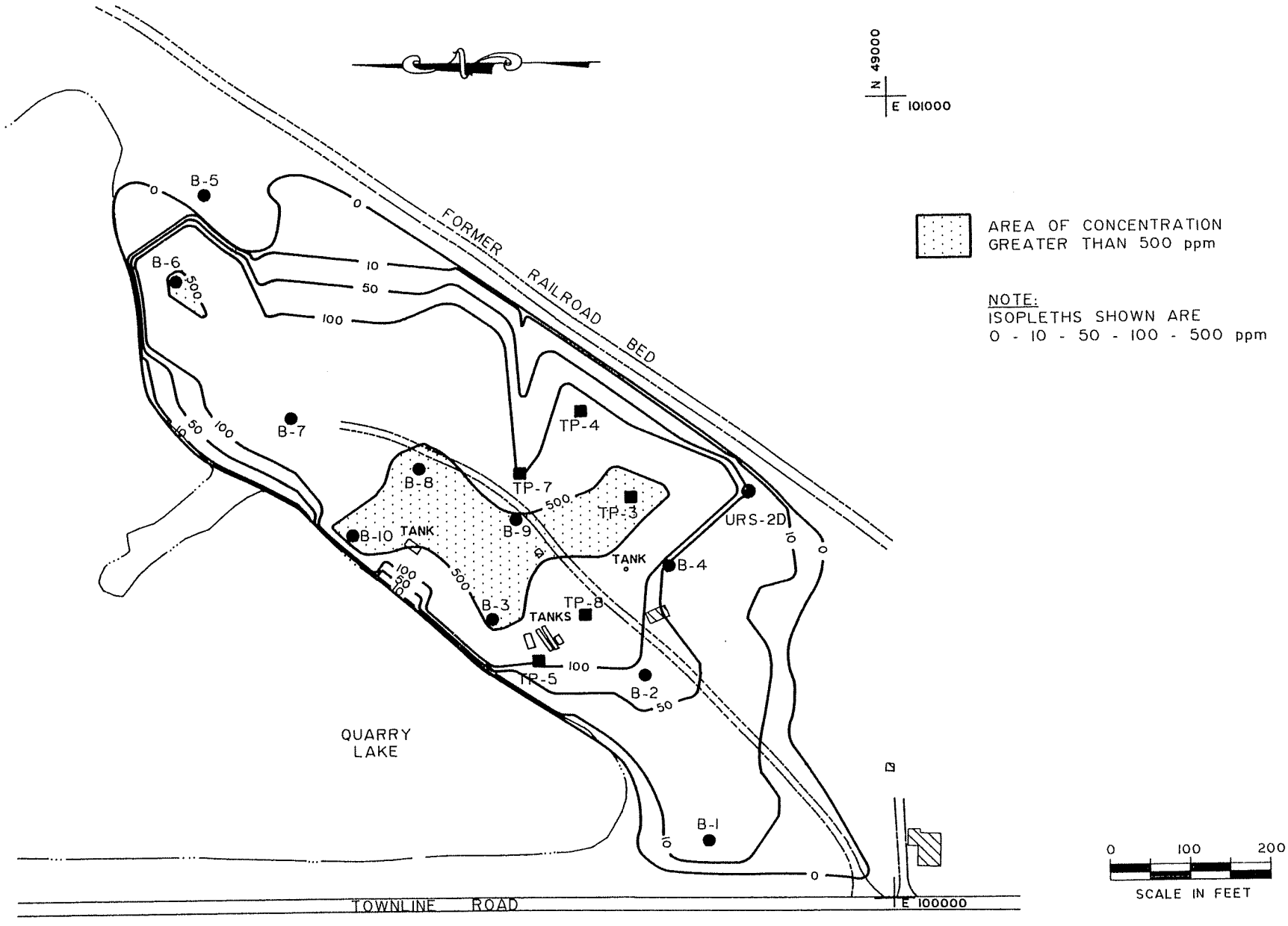
URS CONSULTANTS, INC.

TOTAL POLYCYCLIC AROMATIC HYDROCARBON CONCENTRATION IN SUBSURFACE MATERIALS

FIGURE 4-4

AC-3594

1=100 01/18/91



URS CONSULTANTS, INC.

TOTAL CHROMIUM CONCENTRATION IN SUBSURFACE MATERIALS

FIGURE 4-5

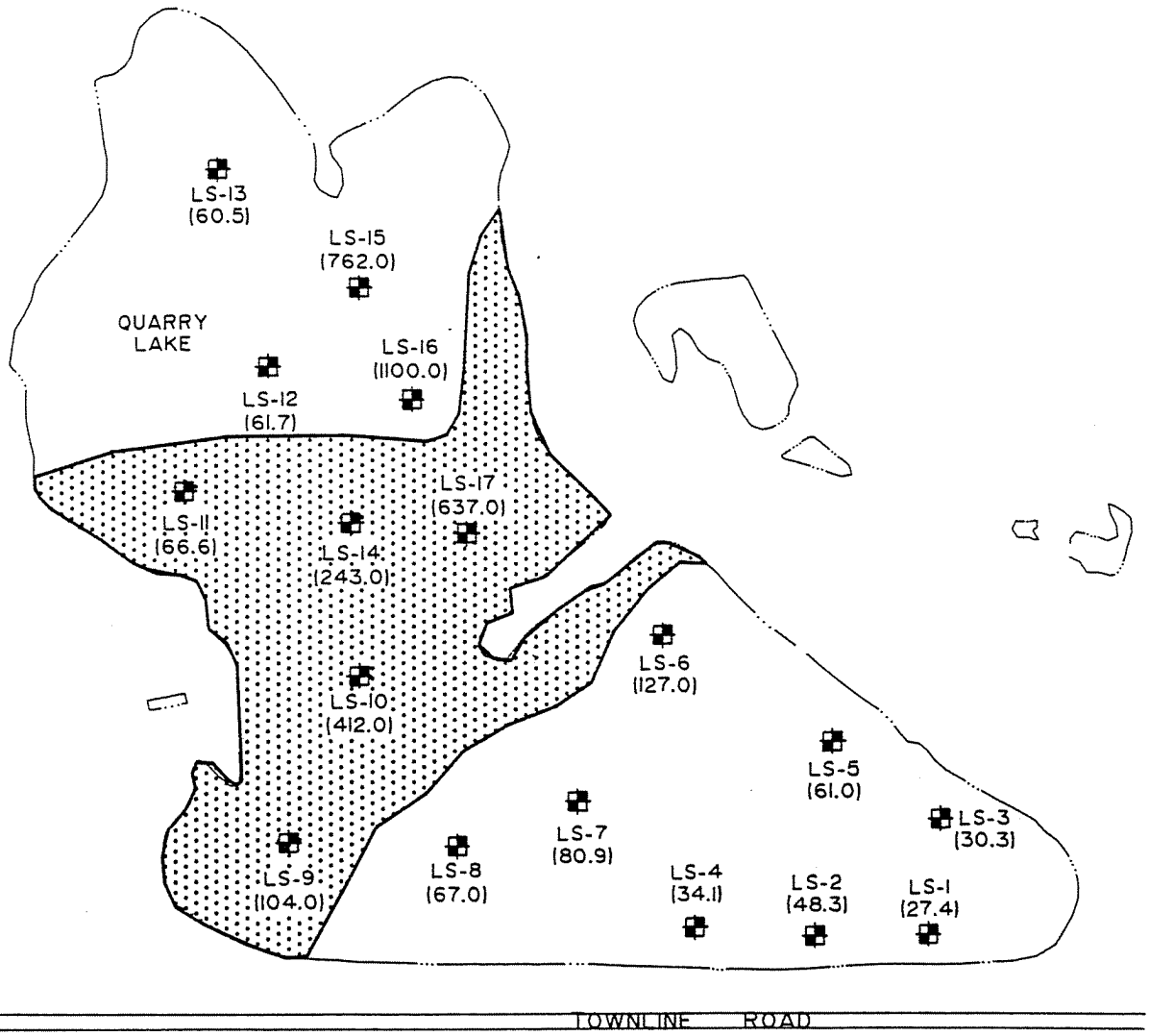
1:100 03/14/91

LEGEND

LAKE SEDIMENT SAMPLE LOCATION

(127.0) CHROMIUM CONCENTRATIONS WITHIN LAKE SEDIMENTS (PPM)

LOCATION OF METAL SLUDGE



AC-3561A

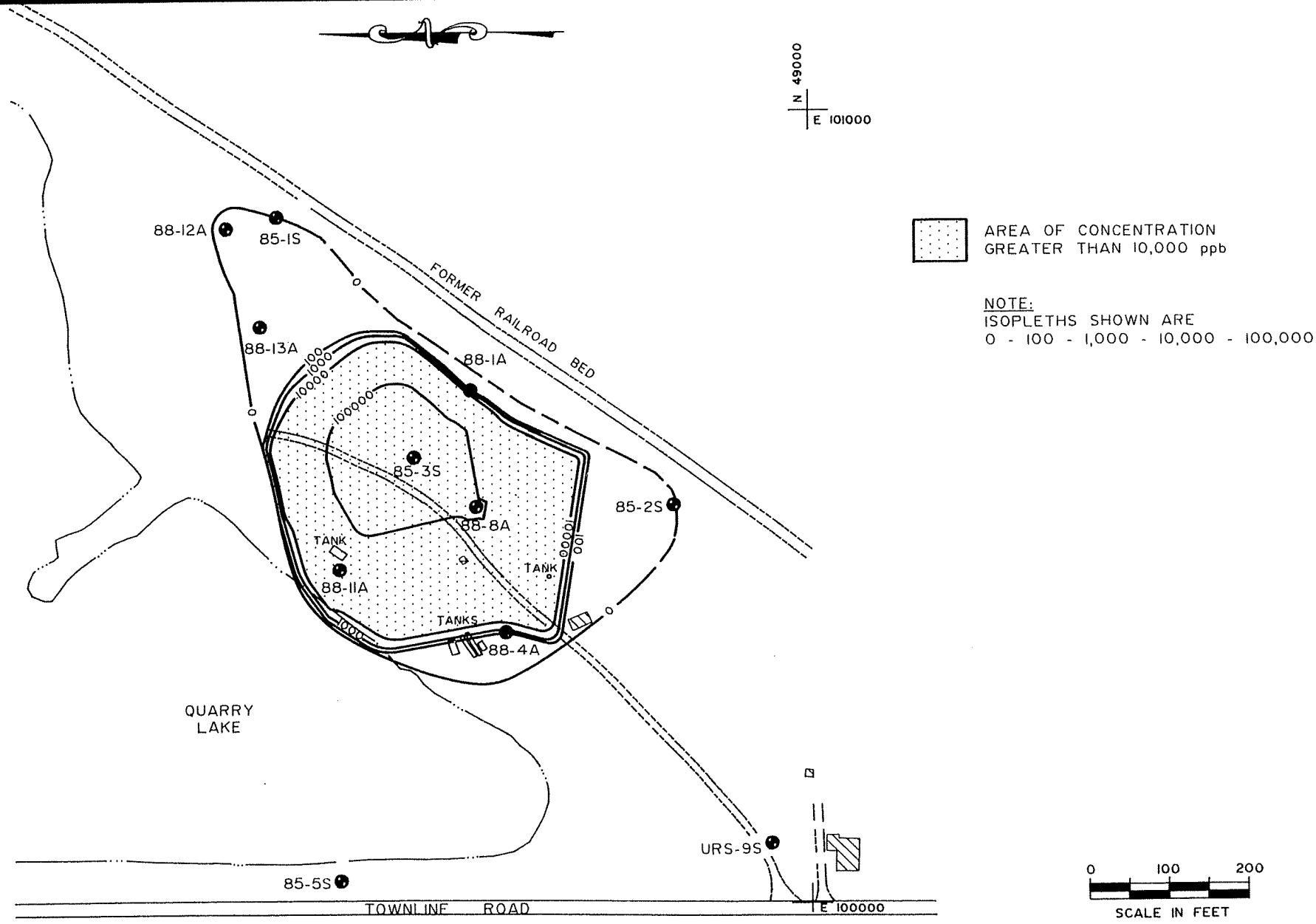
URS CONSULTANTS, INC.

CHROMIUM CONCENTRATIONS IN LAKE BOTTOM SEDIMENTS

FIGURE 4-6

AC-3607

1=100 01/18/91



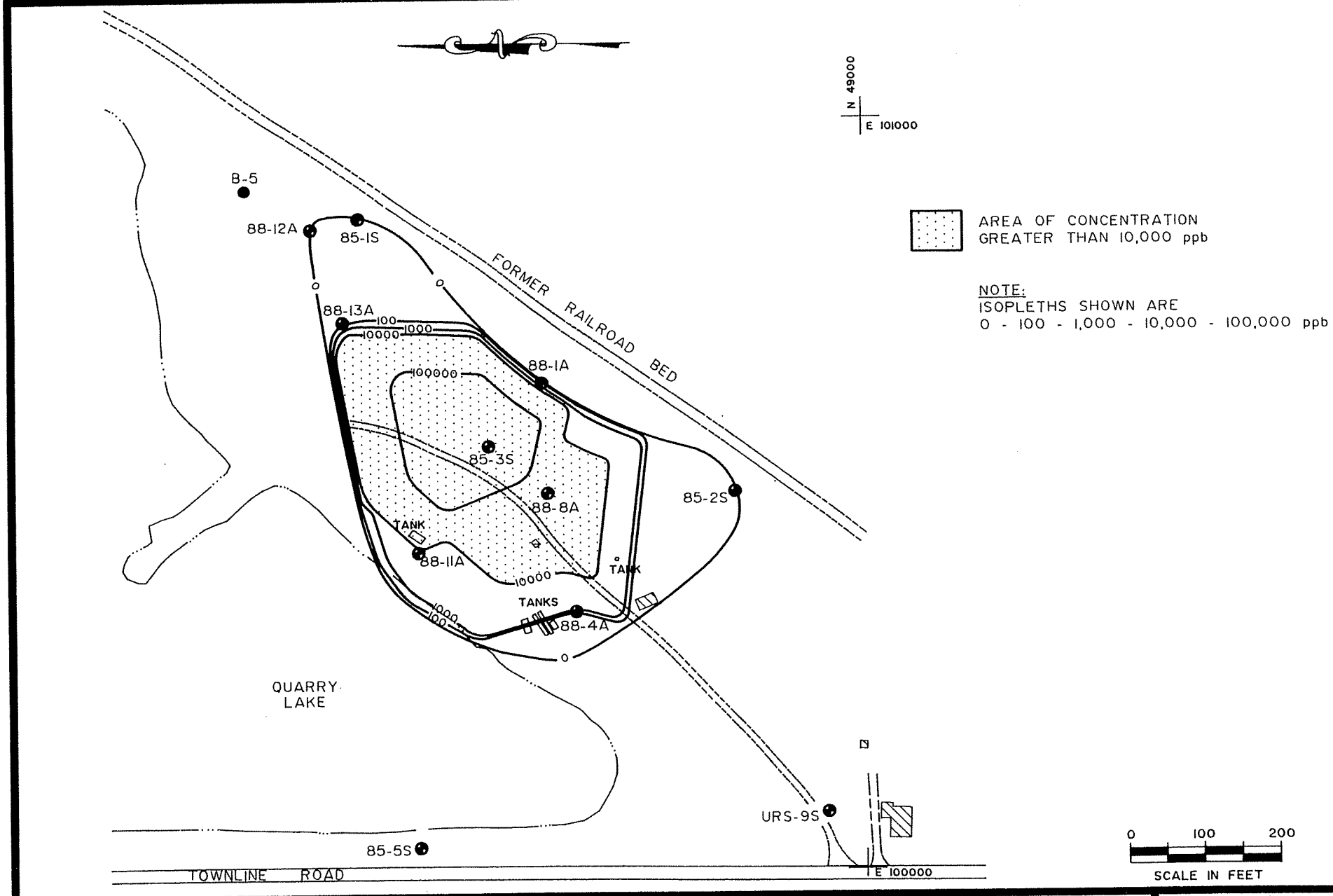
URS CONSULTANTS, INC.

TOTAL CHLORINATED HYDROCARBONS CONCENTRATION IN SHALLOW GROUNDWATER

FIGURE 4-7

AC-3606

1=100 01/18/91

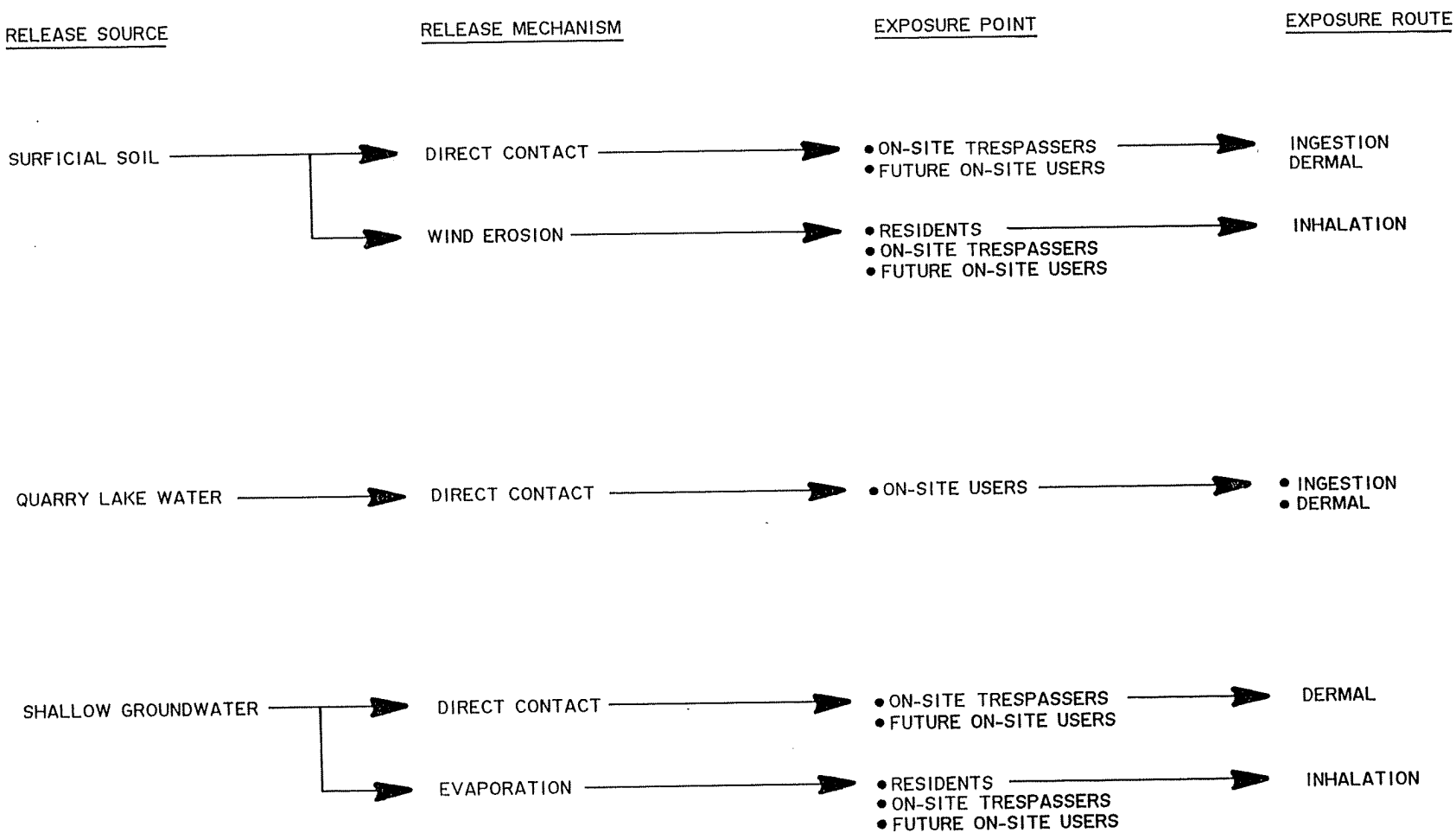


URS CONSULTANTS, INC.

TOTAL BENZENE, TOLUENE, ETHYLBENZENE AND XYLENE CONCENTRATION IN SHALLOW GROUNDWATER

FIGURE 4-8

A-3716



URS CONSULTANTS, INC.

HUMAN EXPOSURE PATHWAYS

FIGURE 7-1

Tables

TABLE 1-1
SUMMARY OF PREVIOUS INVESTIGATIONS AT
THE FRONTIER CHEMICAL - PENDLETON SITE

- July 1978 - Quarry Lake water sampling by Ecology and Environment.
- February 1980 - Quarry Lake sediment/sludge sampling by R.B. MacMullin Associates.
- February 1980 - Bull Creek water sample analyzed by Ecology and Environment.
- June 1981 - Quarry Lake water sampling by Advanced Environmental Systems, Inc.
- June 1982 - Quarry Lake water sampling by Ecology and Environment.
- June 1982 - Subsurface soil and surface water (ditch) sampling by USGS.
- October 1982 - Quarry Lake water sampling by Frontier Chemical Waste Process, Inc.
- November 1982 - Quarry Lake sediment/sludge sampling by Frontier Chemical Waste Process.
- May 1983 - Subsurface soil sampling by USGS.
- June and Fall 1984 - Surface soil sampling by NYSDEC.
- November 1984 - Subsurface soil sampling by Earth Dimensions, Inc.
- December 1984 - Quarry Lake sediment/sludge sampling by SLC Consultants/Contractors Inc.
- July 1985 - Subsurface soil and groundwater sampling by Earth Dimensions, Inc.
- August 1985 - Subsurface soil sampling by NYSDEC/Golder Associates
- August 1985 - Quarry Lake sediment/sludge sampling by Frontier Chemical Waste Process, Inc. with select samples split with NYSDEC.
- May 1986 - Quarry Lake sediment sampling.

TABLE 1-1 (Continued)

- 1988 - Quarry Lake closure report prepared by Glynn Geotechnical Engineering.
- 1988 - Subsurface soil and groundwater sampling by Golder Associates (October 1989 Report).
- 1989 - USEPA and NYSDEC report "Reduction of Toxic Loadings to the Niagara River from Hazardous Waste Sites in the United States" published.

TABLE 2-1

CHRONOLOGY OF FRONTIER CHEMICAL-PENDLETON
RI/FS FIELD INVESTIGATION

ROUND I

- May 1990 - Field Survey (URS)
- June 1990 - Community Well Survey (URS)
- June 11 - 18 1990 - Soil Gas Survey (URS)
- June 1990 - Bull Creek Surface Water and Sediment Sampling (URS)
- June - July 1990 - Soil Boring/Sampling and Groundwater Monitoring Well Installation (URS)
- June - July 1990 - Surface Soil Sampling (URS)
- July 1990 - EM Terrain Conductivity Survey (ECCO)
- July - August 1990 - Ground Penetrating Radar Survey (ECCO)
- July - August 1990 - Quarry Lake Water and Sediment Sampling (URS)
- August 1990 - Trenching and Subsurface Soil Sampling (URS)
- August 1990 - Hydrogeological (Slug) Testing (URS)
- August 1990 - Groundwater Sampling (URS)
- September 1990 - Seismic Refraction Survey (ECCO)

ROUND II

- December 1990 - Environmental Sampling of: Surface Soil; Quarry Lake Water; Bull Creek Water; Ditch Water (Town Line Road); and Creek, Ditch and Pond Sediments (URS)
- February 1991 - Soil Boring/Sampling and Monitoring Well Installation (URS)
- February 1991 - Hydrogeological (Slug) Testing (URS)
- February 1991 - Groundwater Sampling (URS)

TABLE 3-1

Flora Identified On-Site During Field Check
June - July, 1990

Common Name	Scientific Name
Trees, Shrubs	
Green Ash	Fraxinus pennsylvanica
White Ash	Fraxinus americana
Red Oak	Quercus rubra
Red Maple	Acer rubrum
Eastern Cottonwood	Populus deltoides
Black Willow	Salix nigra
Hawthorn spp.	Crataegus spp.
Scarlet Oak	Quercus coccinea
Elm	Ulmus spp.
Ash-leaved Maple	Acer negundo
Silver Maple	Acer saccarinum
White Oak	Quercus alba
Northern Arrowwood	Viburnum recognitum
Dogwood (shrub)	Cornus spp.
Bebb Willow	Salix bebbiana
Buttonbush	Cephalanthus occidentalis
Staghorn Sumac	Rhus typhina
Vines, Herbaceous Species	
Raspberry	Rubus spp.
Virginia creeper	Parthenocissus quinqefolia
Grape	Vitis spp.
Cattails	Typha spp.
Phragmites	Phragmites australis
Purple Loosestrife	Lythrum salicaria
Sedges	Carex spp.
Sensitive Fern	Onoclea sensibilis
Wild Iris	Iris spp.
Bunchberry	Cornus canadensis
Water Plantain	Alisma triviale
Sweet Clover	Melilotus spp.
Cow vetch	Vicia cracca
Ox-eye Daisy	Chrysanthemum leucanthemum
Teasel	Dipsacus fullonum
Goldenrod	Solidago spp.

TABLE 3 - 2

SUMMARY OF GEOTECHNICAL TESTING RESULTS

SAMPLE ID#	DEPTH	GRAIN SIZE DISTRIBUTION				% MOISTURE	TRIAXIAL PERMEABILITY
		% Gr	% Sd	% St	% Clay		
	[FT]	[%]	[%]	[%]	[%]	[%]	[CM/SEC]
URS-5D	6-8	0.0	1.0	10.2	88.8	34.6	
URS-5D	14-16	0.0	0.9	13.0	86.1	42.2	2.98E-08
URS-5D	26-28	1.2	6.4	39.2	53.2	32.0	7.96E-08
URS-5D	33-36	16.0	32.1	39.3	12.6	10.4	
URS-7D	6-8	0.0	2.3	16.2	81.5	33.3	
URS-7D	16-18	0.7	6.3	33.0	60.0	30.6	
URS-7D	24.5-25.5	38.0	38.6	17.8	5.6	7.1	7.16E-07
URS-8I	6-8	0.0	1.2	13.8	85.0	38.3	1.74E-08
URS-8I	10-12	0.0	3.0	21.0	76.0	36.0	
URS-8I	16-18	1.3	6.7	35.3	56.7	29.4	3.39E-08
URS-8I	28-31	49.3	27.9	16.5	6.3	8.8	
URS-9I	12-14	0.0	0.1	13.2	86.7	38.9	2.05E-08
URS-9I	20-22	0.0	2.5	14.6	82.9	41.8	
URS-9I	26-28	0.0	1.2	18.8	80.0	42.0	
URS-9I	32-34	11.8	42.6	23.7	21.9	8.1	
URS-9I	40-42	9.7	27.5	45.2	17.6	16.7	
URS-2D	4-6	0.0	0.4	11.6	88.0	24.0	
URS-2D	10-12	0.0	2.1	17.4	80.5	34.2	
URS-2D	15-17	0.0	1.1	31.1	67.8	37.4	3.75E-08
URS-2D	20-23	30.9	34.0	35.1		9.0	
URS-2D	29-31	5.1	32.6	34.6	27.7	8.0	
URS-14I	6-8	5.7	18.1	32.0	44.2	13.5	2.63E-08
URS-14D	14-16	1.0	8.3	76.0	14.7	12.9	
B-4	6-8	0.0	1.0	20.3	78.7	24.9	1.78E-08
B-5	6-8	0.0	1.5	26.2	72.3	34.4	1.29E-08
B-7	6-8	0.0	0.6	7.5	91.9	34.4	1.03E-08
SG-1*	0-1	0.0	13.0	13.9	73.1	22.6	
SG-2	0-1	0.0	9.1	22.9	68.0	27.3	
SG-3	0-6"	8.0	12.6	24.0	55.4	13.0	
SG-4	0-6"	15.8	33.9	25.6	24.7	13.7	
SG-5	0-6"	0.2	5.7	19.3	74.8		
SG-6	0-6"	0.7	3.6	20.4	75.3		

* - SG Indicates a surficial geotechnical sample unassociated with any boring location

TABLE 3 - 3

SUMMARY OF HYDRAULIC CONDUCTIVITY RESULTS BY IN SITU SLUG TESTING

Hydrogeologic Zone	Well Number	Lithologic Unit	Bouwer and Rice		Hvorslev	Hvorslev**
			Falling Head	Rising Head	Falling Head	Rising Head
SHALLOW WATER BEARING ZONE	88-3A	Fill	-	7.4E-04	-	3.5E-04
	88-4A	Fill	-	-	-	5.7E-06
	88-5A	Fill	-	-	-	7.3E-07
	88-6A	Fill	-	-	-	1.0E-06
	88-7A	Fill	-	9.2E-03	-	4.6E-05
	88-8A	Fill	-	-	-	3.0E-04
	88-9A	Fill	-	-	-	2.0E-04
	88-10A	Fill	-	1.7E-03	-	1.1E-05
	88-11A	Fill	-	1.8E-04	-	1.8E-04
	88-12A	Fill	-	-	-	9.0E-07
	88-14A	Fill	-	-	-	1.6E-06
	85-1S	Weathered Clay	-	-	-	1.2E-06
	85-2S	Weathered Clay	-	1.0E-05	-	4.3E-08
	85-5S	Weathered Clay	-	2.0E-03	-	6.8E-08
	85-7S	Weathered Clay	-	9.0E-05	-	3.3E-06
	88-1A	Weathered Clay	-	-	-	2.6E-06
	88-2A	Weathered Clay	-	-	-	1.4E-06
	88-13A	Weathered Clay	-	-	-	1.1E-06
	URS-8S	Weathered Clay	-	3.4E-05	-	-
	URS-9S	Weathered Clay	-	7.2E-06	-	-
	URS-14S	Weathered Clay	-	4.0E-05	-	-
CONFINING CLAY	88-10B	Clay	-	-	-	1.7E-07
	88-11B	Clay	-	-	-	3.1E-07
LOWER AQUIFER	85-1R	Sandy Silt	-	-	-	5.4E-05
	85-2R	Sandy Silt	2.1E-03	-	-	3.0E-04
	85-5R	Sandy Silt	9.8E-04	-	-	5.2E-05
	85-7R	Sandy Silt	2.0E-03	-	-	1.8E-04
	88-10C	Sandy Silt	-	-	-	4.7E-05
	88-11C	Sandy Silt	-	9.2E-06	-	5.9E-07
	88-12C	Sandy Silt	-	-	-	2.8E-05
	URS-8I	Sandy Silt	6.4E-03	6.4E-03	8.7E-03	-
	URS-9I	Sandy Silt	1.4E-03	1.1E-03	1.7E-03	-
	88-10D	Bedrock	-	6.6E-04	-	4.1E-06
	88-11D	Bedrock	-	-	-	3.5E-04
	88-12D	Bedrock	-	-	-	1.1E-05
	URS-2D	Bedrock	1.1E-03	-	-	-
	URS-5D	Bedrock	1.6E-04	-	-	-
	URS-7D	Bedrock	3.8E-04	1.5E-04	-	-
	URS-9D	Bedrock	-	9.6E-04	-	-
	URS-14D	Bedrock	1.6E-03	-	-	-

- Not analyzed

** Indicates testing and analysis by Golder Associates.

All other testing and analysis by URS personnel (Appendix M).

TABLE 3 - 4

SHALLOW WELL GROUNDWATER ELEVATIONS

MONITOR LOCATION / HORIZON	88-1A s	85-1S s	88-2A s	85-2S s	88-3A s	85-3S s	88-4A s	88-5A s	85-5S s	88-6A s	85-6S s
RISER ELEVATION	584.78	583.36	585.31	584.01	584.82	585.51	584.30	584.75	581.36	583.77	585.69
RISER HEIGHT	3.09	3.21	3.47	2.62	3.02	3.02	3.34	3.02	3.16	3.39	4.86
06/15/90	579.30	578.36	579.87	578.53	579.92	580.67	580.02	580.10	576.68	579.74	580.19
07/06/90	579.11	577.81	579.51	577.53	579.48	580.31	579.70	580.35	575.06	579.27	580.21
07/09/90	..	..	..	..	..	..	..	..	..	..	..
07/10/90	..	..	..	..	..	..	..	..	..	..	..
07/11/90	578.84	577.38	578.99	577.17	579.28	579.77	579.64	580.25	574.88	578.89	580.07
07/18/90	578.70	577.00	578.71	577.18	579.17	579.62	579.90	580.16	574.79	578.61	579.90
07/24/90	578.58	576.78	578.53	577.12	579.31	579.61	580.04	580.21	574.78	578.55	580.02
08/02/90	578.18	574.96	578.19	576.67	578.78	579.11	579.10	579.85	574.56	578.09	579.81
08/09/90	578.08	576.04	578.01	576.61	578.88	579.17	579.26	579.85	576.28	577.79	579.69
08/21/90	577.80	574.90	573.14	573.92	579.61	579.71	577.60	579.61	576.34	577.55	579.58
09/17/90	..	..	..	..	..	..	..	..	575.56	..	..
09/20/90	577.14	574.53	574.68	574.21	579.12	579.40	578.75	579.52	573.85	576.93	579.31
10/16/90	578.72	578.36	575.60	574.97	580.35	580.65	578.82	578.83	573.59	576.83	579.33
12/21/90	579.86	..	578.43	577.97	580.89	..	580.57	577.97	573.86	..	580.15
02/06/91	580.08	579.92	579.31	578.41	580.86	581.73	580.62	578.53	574.12	579.43	576.59
03/06/91	580.56	579.98	579.89	578.79	580.99	581.68	581.05	579.17	576.38	579.90	580.59

MONITOR LOCATION / HORIZON	88-7A s	85-7S s	88-8A s	URS-8S s	88-9A s	URS-9S s	88-10A s	88-11A s	88-12A s	88-13A s	88-14A s	URS-14S s
RISER ELEVATION	585.55	578.67	585.14	580.14	585.17	581.51	585.14	585.15	582.27	581.46	583.85	582.68
RISER HEIGHT	3.39	2.11	3.62	2.14	2.79	1.84	2.61	3.00	3.00	3.26	3.03	2.03
06/15/90	580.66	572.27	580.64	..	580.35	..	..	580.43	578.25	579.17	580.65	..
07/06/90	580.15	572.32	580.04	..	580.17	..	580.40	580.25	..	..	..	..
07/09/90	..	..	..	..	..	573.86	..	..	..	..	..	..
07/10/90	..	..	..	..	..	574.31	..	..	..	..	..	..
07/11/90	579.79	572.17	579.64	..	579.95	574.57	580.14	579.95	577.55	..	580.41	..
07/18/90	579.63	572.54	579.44	..	579.83	577.81	579.97	579.86	577.09	..	580.06	..
07/24/90	579.62	572.23	579.55	..	579.81	577.91	579.92	579.89	576.92	..	579.85	..
08/02/90	579.11	571.97	579.04	571.26	579.57	577.61	579.44	579.55	576.17	578.22	579.15	..
08/09/90	579.17	572.07	578.96	570.04	579.47	574.21	579.58	575.85	576.11	578.18	578.75	..
08/21/90	580.77	571.67	579.66	571.73	579.78	577.44	579.88	579.65	572.67	575.64	579.15	..
09/17/90	..	571.22	..	572.54	..	..	..	..	..	..	..	..
09/20/90	578.57	571.47	579.82	572.94	579.64	577.54	579.71	579.61	574.95	577.68	579.23	..
10/16/90	580.67	571.25	580.75	572.68	580.47	578.03	580.72	580.53	574.96	577.72	578.95	..
12/21/90	581.49	571.87	581.42	572.70	580.16	578.88	581.63	580.73	575.62	578.14	578.95	..
02/06/91	581.31	572.53	581.34	573.54	580.27	578.85	581.44	580.73	577.11	..	578.85	..
03/06/91	581.70	573.22	581.44	573.03	580.53	579.09	581.97	581.17	576.27	579.91	579.39	580.34

Well in recovering condition due to pumping or initial installation

TABLE 3-4(CONTINUED)

GROUNDWATER AND SURFACE WATER ELEVATIONS
FROM WELL POINTS AND STREAM GAUGES

MONITOR LOCATION HORIZON	URS WP-1 S	URS WP-2 S	URS WP-3 S	SG-1 QUARRY LK	SG-2 BULL CK	SG-3 NE POND
RISER ELEVATION	576.00	581.40	581.58	572.17	560.71	552.19
RISER HEIGHT	4.03	3.14	3.23			
07/09/90	567.42	..	..	576.72	..	..
07/10/90	567.90	..	..	576.74	572.13	..
07/11/90	568.48	..	..	576.72	572.16	..
07/13/90	569.61	..	..	576.67	572.08	..
07/16/90	570.80	..	..	576.67	572.16	..
07/18/90	571.60	..	..	576.67	572.07	577.84
07/19/90	572.00	..	..	..	572.56	..
07/20/90	572.22	571.72	572.88	576.67	572.66	577.86
07/23/90	573.12	571.98	573.48	576.67	572.43	577.84
07/24/90	573.30	572.08	573.70	576.67	572.49	577.84
07/27/90	573.80	572.24	574.13	576.61	572.16	577.79
07/30/90	..	..	..	576.58	..	..
08/01/90	574.16	575.10	574.72	576.54	572.06	577.74
08/02/90	574.20	577.61	574.69	576.54	572.06	577.70
08/06/90	574.10	577.38	574.85	576.51	572.03	577.69
08/09/90	574.30	577.24	575.08	576.49	572.03	577.66
08/14/90	574.28	..	..	..	572.15	..
08/21/90	574.14	576.72	575.21	576.51	572.10	577.72
09/17/90	573.78	575.43	574.58	576.34	572.24	577.60
09/20/90	573.83	575.22	574.52	576.32	572.08	577.59
10/16/90	573.48	574.52	574.01	577.20	572.68	578.55
12/21/90	573.94	573.66	575.64	..	..	578.34
02/06/91	..	574.20	576.78	577.03	575.21	578.39
03/06/91	574.85	574.75	577.34	577.22	575.30	578.41

Well point in recovering condition due to initial installation

TABLE 3-4 (CONTINUED)

DEEP WELL GROUNDWATER ELEVATIONS

MONITOR LOCATION HORIZON	URS-2D D	URS-5D D	URS-7D D	URS-9D D	URS-14D D	88-10D D	88-11D D	88-12D D
RISER ELEVATION	583.02	580.60	579.35	580.80	582.72	585.32	584.97	582.83
RISER HEIGHT	1.88	2.70	2.95	1.90	2.01	2.82	2.84	2.90
06/15/90	..	..	..	..	..	..	574.95	575.45
07/06/90	..	..	..	574.79	..	573.84	574.91	575.23
07/09/90	..	..	..	574.62	..	..	..	..
07/10/90	..	..	..	574.68	..	..	..	..
07/11/90	..	..	..	574.50	..	574.62	574.67	575.03
07/18/90	574.52	..	..	573.90	..	574.53	574.53	574.89
07/24/90	574.50	574.28	574.63	574.40	..	574.55	574.59	574.84
08/02/90	574.30	574.00	574.35	574.10	..	574.12	574.27	573.83
08/09/90	573.92	573.82	574.27	573.90	..	573.98	574.05	574.25
08/21/90	573.88	573.80	574.02	573.00	..	574.00	574.14	574.20
09/17/90	..	573.15	573.42	..	..	..	..	..
09/20/90	573.40	573.34	573.50	573.35	..	573.63	573.61	573.69
10/16/90	573.36	573.20	573.23	573.25	..	573.41	573.42	573.63
12/21/90	574.09	573.46	573.45	573.84	..	573.86	573.87	574.37
02/06/91	574.26	573.70	573.75	574.10	..	574.10	574.11	574.59
03/06/91	574.72	574.22	574.18	574.58	574.60	574.54	574.55	575.09

Well in recovering condition due to pumping

TABLE 3-4(CONTINUED)

INTERMEDIATE WELL GROUNDWATER ELEVATIONS

MONITOR LOCATION	85-1R	85-2R	85-5R	85-7R	URS-8I	URS-9I	88-10B	88-10C	88-11B	88-11C	88-12C	URS-14I
HORIZON	I	I	I	I	I	I	I	I	I	I	I	I
RISER ELEVATION	583.71	584.49	580.84	577.90	579.30	581.68	585.26	584.66	585.08	584.87	582.93	582.76
RISER HEIGHT	3.44	2.89	2.17	1.28	1.32	1.78	2.72	2.03	3.01	2.84	2.64	2.06
06/15/90	..	575.29	575.74	574.68	..	..	578.20	574.54	..	575.29	575.67	..
07/06/90	575.01	574.89	577.44	574.70	..	574.92	578.32	574.46	..	..	575.35	..
07/09/90	..	..	..	..	..	574.68	..	..	..	..	..	..
07/10/90	..	..	..	..	..	574.72	..	..	..	..	..	..
07/11/90	574.81	574.65	576.08	574.20	..	574.56	578.06	574.24	576.46	574.95	575.03	..
07/18/90	574.63	574.55	575.94	575.90	..	574.48	578.00	574.49	..	..	574.74	..
07/24/90	574.63	574.49	575.84	574.54	..	574.46	577.97	574.10	576.46	574.87	574.61	..
08/02/90	574.23	574.15	575.74	574.20	577.90	574.18	577.72	573.56	576.28	574.51	573.33	..
08/09/90	574.05	573.91	573.86	573.10	577.62	573.88	577.82	573.54	576.22	574.37	573.75	..
08/21/90	573.79	573.64	573.81	574.06	577.46	574.72	577.72	573.56	560.77	574.36	573.58	..
09/17/90	..	..	573.25	573.45	576.70	..	..	..	..	..	..	..
09/20/90	573.54	573.45	575.32	573.52	576.58	575.36	577.54	573.11	571.02	574.00	572.85	..
10/16/90	573.40	573.39	575.02	573.22	576.41	573.27	577.30	572.91	575.54	573.85	572.47	..
12/21/90	574.08	574.19	575.74	573.44	577.50	..	577.23	573.46	..	574.22	574.47	..
02/06/91	574.37	574.45	576.08	573.76	578.02	..	577.52	573.72	..	574.41	..	..
03/06/91	574.83	574.92	574.01	574.15	578.65	574.58	565.67	574.16	566.04	574.77	..	575.11

Well in recovering condition due to pumping

Table 3 - 5

FRONTIER CHEMICAL - VERTICAL HYDRAULIC GRADIENTS

WELL CLUSTER	WELL	SCREENED IN AQUIFER	ELEV. OF SCREEN BOTTOM	ELEV. OF SCREEN TOP	DATE	ELEV. OF WATER TABLE	ELEV. OF SATURATED SCREEN CENTER	WATER TABLE ELEV. DIFFERENCE	SCREEN CENTER ELEV. DIFFERENCE	HYDRAULIC GRADIENT
			[FT]	[FT]		[FT]	[FT]	[FT]	[FT]	[FT/FT]
URS-8	URS-8S	SHALLOW	568.50	573.50	09/20/90	572.94	570.72	-3.64	21.34	-0.171
	URS-8I	INTER.	546.88	551.88		576.58	549.38			
7	85-7S	SHALLOW	566.56	568.56	09/20/90	571.47	567.56	-2.05	16.26	-0.126
	85-7R	INTER.	550.30	552.30		573.52	551.30	0.02	10.30	0.002
	URS-7D	DEEP	538.50	543.50		573.50	541.00			
5	85-5S	SHALLOW	566.20	568.20	08/21/90	576.34	567.20	2.53	22.73	0.111
	85-5R	INTER.	543.47	545.47		573.81	544.47	-0.07	11.77	-0.006
	URS-5D	DEEP	530.20	535.20		573.88	532.70			
2	85-2S	SHALLOW	569.39	571.39	07/06/90	577.18	570.39	2.63	22.99	0.114
	85-2R	INTER.	546.40	548.40		574.55	547.40	0.03	10.66	0.003
	URS-2D	DEEP	534.24	539.24		574.52	536.74			
12	88-12A	SHALLOW	569.27	574.27	08/02/90	576.17	571.77	2.84	18.48	0.154
	88-12C	INTER.	552.29	554.29		573.33	553.29	-0.50	22.19	-0.023
	88-12D	DEEP	528.60	533.60		573.83	531.10			
11	88-11A	SHALLOW	572.15	577.15	06/15/90	580.43	574.65	5.14	29.15	0.176
	88-11C	INTER.	543.00	548.00		575.29	545.50	0.34	14.90	0.023
	88-11D	DEEP	528.10	533.10		574.95	530.60			
10	88-10A	SHALLOW	571.50	576.50	09/20/90	579.71	574.00	6.60	27.90	0.237
	88-10C	INTER.	543.60	548.60		573.11	546.10	-0.52	18.50	-0.028
	88-10D	DEEP	525.10	530.10		573.63	527.60			
URS-9	URS-9S	SHALLOW	567.17	572.17	09/20/90	577.54	569.67	2.18	31.87	0.068
	URS-9I	INTER.	535.30	540.30		575.36	537.80	2.01	9.80	0.205
	URS-9D	DEEP	525.50	530.50		573.35	528.00			

NOTE : - UPWARD FLOW
+ DOWNWARD FLOW

TABLE 4-1

ANALYTICAL RESULTS FROM USGS TEST BORINGS

Parameter	Boring #1 3 - 3.5 ft.	Boring #3 3.5-4 ft.
Cadmium	--	1,000
Chromium	5,000	10,000
Copper	74,000	150,000
Iron	6,000,000	9,500,000
Nickel	--	20,000
Zinc	26,000	39,000

-- Not Analyzed
All metals reported as part per billion.

TABLE 4-2

SUMMARY OF DETECTABLE ANALYTES
FROM THREE SUBSURFACE SAMPLES
COLLECTED BY NYSDEC - 1985

	Sample I.D. (ppm)		
Compound	13HS-S (R-985-054-01)	15HS-S (R-985-054-02)	16HS-S (R-985-054-03)
Aniline	.42	ND	--
Benzene	.038	.027	--
Carbon Disulfide	.019	.071	--
Chlorobenzene	.0088	ND	--
Chloroform	.0023	.0028	--
1,4-Dichlorobenzene	.015	ND	--
1,1-Dichloroethane	.0069	ND	--
Trans-1,2-Dichloroethylene	.014	.0028	--
Methylene Chloride	.016	.016	--
Toluene	.014	BDL	--
Trichloroethylene	.061	.041	--
Vinyl Chloride	.015	ND	--
M + P-Xylene	.015	ND	--
O-Xylene	.078	ND	--
Total Cyanide (Dry)	174	9.8	--
Total Arsenic (Dry)	21	22	--
Total Cadmium (Dry)	213	570	2.127
Total Chromium (Dry)	1,980	7,350	--
Total Copper (Dry)	395	113	--
Total Nickel (Dry)	533	56	--
Total Zinc (Dry)	414	335	--
EP Toxicity Barium	.190	.25	.22
EP Toxicity Cadmium	.967	1.135	2.127
EP Toxicity Chromium	.011	.013	.146
EP Toxicity Lead	0.050	.01	.03

-- Not Analyzed
ND - Not Detected
BDL - Below Detective Limit

TABLE 4-3

SUMMARY OF DETECTABLE ANALYTES FROM
TEST PIT SAMPLES
GOLDER ASSOCIATES - 1988 SAMPLES

	Sample I.D. - (ppb)			
Parameter	TP 88-2	TP 88-3	TP 88-4	TP 88-5
Methylene Chloride	15,520	2,840	3,170	5,800
Chloroform	2,310	200	90	120
Trichloroethene	620	7,120	600	765
Benzene	1,540	<DL	<DL	500
1,1,2,2-Tetrachloroethane	580	<DL	690	6,320
Tetrachloroethene	730	<DL	855	7,320
Ethyl Benzene	1,245	<DL	<DL	<DL
1,2-Dichlorobenzene	<DL	<DL	1,340	<DL
1,3-Dichlorobenzene	48,430	<DL	2,800	<DL
Total Xylenes	2,880	910	1,000	<DL
1,1-Dichloroethane	<DL	815	<DL	455
Trans-1,2-Dichloroethane	<DL	1,620	530	805
1,1,1-Trichloroethane	<DL	4,365	<DL	<DL
Toluene	<DL	1,680	1,280	5,900
Chlorotoluene	--	2,200	1,660	--

-- Not Analyzed

TABLE 4-4

SUMMARY OF DETECTED ANALYTES IN SHALLOW SURFACE SOIL
PREVIOUS INVESTIGATIONS - 1984
VERSAR, INC.
for
NYSDEC

Sample Desingation/ Contaminants Detected	R-984-020-01 (ppb)	R-984-020-02 (ppb)
Barium (E.P. Toxicity)	6,040	2,840
Cadmium (E.P. Toxicity)	--	448
B-BHC	25	90
Aldrin	--	20
Heptachlorepoxide	--	20
Methylene Chloride	35	20
Acetone	390	--
4-Methyl-2 Pentanone	52	--
Toluene	36	--
Styrene	15	--
Carbon Disulfide	--	18

-- Not Analyzed

TABLE 4-5
SUMMARY OF DETECTED ANALYTES FROM
SHALLOW PROBE SOIL SAMPLES
NEAR THE FORMER PLANT PROCESSING AREA - 1984

Sample ID/ Concentrations Detected	(ppb) R-984-027-01	(ppb) R-984-027-02	(ppb) R-984-027-03
1,24-Trichlorobenzene	14,900	8,600	46,900
Bis(2-ethylhexyl) Phthalate	--	5,600	16,700
Phenol	--	--	11,700
1,4-Dichlorobenzene	--	--	21,800
2-Methylnaphthalene	--	--	9,400
Carbon Disulfide	7,100	--	--
Chloroform	13,000	--	--
Toluene	2,900	47,000	290,000
Total Xylenes	--	--	32,000
Ag	<400	<400	<400
Be	1,100	670	490
Cd	11,500	44,500	8,600
Cr	778,000	880,000	272,000
Cu	273,000	91,800	107,000
Ni	24,000	37,100	28,000
Pb	18,300	65,200	15,600
Zn	115,000	146,000	119,000
As	5,700	5,500	3,400
Hg	<100	180	<100

-- Not Analyzed

TABLE 4-6

ORGANIC COMPOUNDS DETECTED IN SUBSURFACE FILL MATERIALS
(15 Samples Within Known Area of Fill)

Compound	Maximum Concentration (ppb)	Location of Maximum Detection	Total No. of Detections
Vinyl Chloride	130	B-9	2
Methylene Chloride	810	T-7	1
Carbon Disulfide	6	B-4	3
1,1 Dichloroethene	160	B-10	2
1,1 Dichloroethane	5,700	T-7	8
1,2 Dichloroethene (total)	8,900	B-3	11
1,2 Dichloroethane	68	B-4	2
2-Butanone	5	T-3	1
1,1,1-Trichloroethane	51,000	T-5	10
Trichloroethene	33,000	T-7	12
Benzene	15,000	B-3	11
4-Methyl-2-Pentanone	99,000	B-3	5
Tetrachloroethene	160,000	T-5	12
Toluene	1,600,000	T-5	10
Chlorobenzene	7,100	B-2	2
Ethylbenzene	42,000	B-3	10
Total Xylenes	120,000	B-3	11
Phenol	13,000	B-3	4
1,4-Dichlorobenzene	18,000	T-7	3
1,2-Dichlorobenzene	120,000	T-7	7
4-Methylphenol	13,000	B-3	3
Nitrobenzene	120,000	T-5	1
Isophorone	1,900	T-4	3
2-4-Dimethylphenol	2,100	B-3	1
Benzoic Acid	320	B-10	1
1,2,4-Trichlorobenzene	89,000	B-8	7

TABLE 4-6 (Continued)

Compound	Maximum Concentration (ppb)	Location of Maximum Detection	Total No. of Detections
Naphthalene	7,700	B-8	9
2-Methylnaphthalene	6,100	B-8	7
Acenapthylene	480	B-1	2
Acenapthene	190	B-1	1
Dibenzofuran	330	B-1	3
Diethylphthalate	490	T-8	5
Fluorene	500	B-1	3
n-Nitrosodiphenylamine	3,700	T-4	2
Phenanthrene	4,600	B-1	11
Anthracene	780	B-1	4
Di-n-butylphthalate	2,700	B-3	10
Fluoranthene	5,500	B-1	9
Pyrene	4,500	B-1	14
Butylbenzylphthalate	2,300	B-8	2
Benzo(a)anthracene	1,600	B-2	3
Chrysene	2,400	B-1	7
bis(2-Ethylhexyl)phthalate	95,000	B-8	6
di-n-octylphthalate	450	T-4	2
Benzo(b)fluoranthene	2,200	B-1	7
Benzo(k)fluoranthene	460	B-1	4
Benzo(a)pyrene	2,100	B-1	5
Ideno(1,2,3-cd)pyrene	2,000	B-1	4
Dibenz(a,h)anthracene	880	B-1	3
Benzo(g,h,i)perylene	1,900	B-1	4
Heptachlor	1.6	B-4	1
Aldrin	11	URS-2D	2
gamma-Chlordane	25	B-1	1
Aroclor-1242	3,300	B-2	1

TABLE 4-6 (Continued)

Compound	Maximum Concentration (ppb)	Location of Maximum Detection	Total No. of Detections
Aroclor-1254	9,200	B-3	3
Aroclor-1260	6,200	T-8	9
Total Phenols	94,200	B-3	15

TABLE 4-7

ORGANIC COMPOUNDS DETECTED IN
SUBSURFACE SOIL SAMPLES
(7 Samples Outside Area of Known Fill)

Compound	Maximum Concentration (ppb)	Location of Maximum Detection	Total No. of Detections
Toluene	3	B-5	1
2-Butanone	2	URS-8I	1
4-Methyl-2 Pentanone	1	URS-7D	1
2-Hexanone	1	URS-7D	1
Fluoranthene	46	B-11	4
Pyrene	36	B-11	4
Total Phenols	772	URS-7D	3
beta-BHC	10	B-12	1
1,2-Dichloroethene (total)	7	B-12	1
Trichloroethene	12	B-12	1
Diethylphthalate	64	B-11	2
Phenol	720	B-12	1
Pentachlorophenol	2,200	B-11	1
Phenanthrene	20	B-11	1
Di-n-butylphthalate	140	B-11	2
Chrysene	49	B-12	1

TABLE 4-8
COMPARISON OF METALS CONCENTRATIONS BETWEEN SUBSURFACE SOIL AND FILL MATERIALS

	Conc. in Fill (15)++			Conc. in Soil (7)++		
Analyte	Min	Max	Mean+	Min	Max	Mean+
Aluminum	11,200	24,000	18,840	20,900	28,500	25,614
Antimony	ND	7.8	6.1	ND	5.1	4.6
Arsenic*	2.5	36.0	8.3	ND	4.1	3.9
Barium	88.9	218	149	126	276	183
Beryllium	0.79	2.6	1.11	0.86	1.9	1.26
Cadmium *	0.69	93.3	22.9	ND	0.49	0.47
Calcium	16,400	182,000	63,767	44,100	99,400	67,043
Chromium *	28.8	941	335	28.6	35	30.9
Cobalt	3.6	21.7	13.4	11.4	17.8	14.4
Copper *	29.0	372	110	20.2	28.2	25.2
Iron	11,500	42,500	27,613	25,400	38,200	31,071
Lead *	29.6	120	67.5	8	16	11.1
Magnesium	4,690	32,500	13,063	13,400	17,500	14,657
Manganese	217	1,150	602	453	697	548
Mercury *	ND	1.1	0.78	ND	ND	0.1
Nickel	13.6	119	48.2	27.1	37.2	31.7
Potassium	1520	4840	3163	3,930	6,290	4,714
Selenium	ND	1.2	0.56	ND	ND	0.5
Silver	ND	ND	1	ND	ND	1
Sodium	329	1,390	725	409	567	509
Thallium	ND	0.64	0.55	ND	0.27	0.67
Vanadium	15	75	39.6	35.5	52	41.7
Zinc	80.2	282	157.5	57.9	81.4	69.7
Cyanide	ND	17.8	4.9	ND	ND	2

++ All values given in ppm (mg/kg)

Lead * Indicates maximum concentration found in fill is at least one order of magnitude greater than the mean concentration of soil samples.
+ One-half the contract required detection limit was used for calculation of the arithmetic mean for non detected analytes

TABLE 4-9

ORGANIC COMPOUNDS DETECTED IN SURFACE SOILS OR
LEACHATE SOAKED SOILS FROM KNOWN AREA OF FILL
(6 Samples Within Area of Known Fill)

Compound	Maximum Concentration (ppb)	Location of Maximum Concentration	Total No. of Detections*
Acetone	12	SPS-8	1
Carbon Disulfide	19	SPS-2	1
1,2-Dichloroethene (Total)	5,600	SPS-6	1
2-Butanone	10	SPS-7	3
Trichloroethene	570	SPS-6	1
Benzene	380	SPS-6	2
2-Hexanone	1	SPS-8	1
Tetrachloroethene	1,100	SPS-6	1
Toluene	6,100	SPS-6	1
Ethylbenzene	530	SPS-6	1
Total Xylenes	4,100	SPS-6	1
Phenol	220	SPS-7	1
1,3-Dichlorobenzene	99	SPS-5	1
1,4-Dichlorobenzene	410	SPS-5	3
1,2-Dichlorobenzene	4,900	SPS-5	5
Nitrobenzene	230	SPS-5	1
Isophorone	41	SPS-2	1
2-4, Dimethylphenol	82	SPS-5	1
1,2,4-Trichlorobenzene	1,900	SPS-5	5
Naphthalene	190	SPS-5	4
2-Methylnaphthalene	240	SPS-5	4
Dimethylphthalate	7	SPS-7	1
Acenapthylene	130	SPS-7	2
Acenaphthene	140	SPS-7	2
Dibenzofuran	120	SPS-7	1
Flourene	250	SPS-7	2

TABLE 4-9 (Continued)

n-Nitrosodiphenylamine	670	SPS-5	3
Phenanthrene	1700	SPS-7	5
Anthracene	270	SPS-7	2
Flouranthene	2,000	SPS-7	4
Pyrene	2,400	SPS-7	4
Benzo(a)anthracene	1,100	SPS-7	2
Chrysene	1,300	SPS-7	5
bis(2-Ethylhexyl)phthalate	18,000	SPS-7	2
Di-n-octylphthalate	370	SPS-7	1
Benzo(b)fluoranthene	1,200	SPS-7	4
Benzo(k)fluoranthene	1,500	SPS-7	4
Benzo(a)pyrene	1,200	SPS-7	4
Ideno(1,2,3-cd)pyrene	240	SPS-7	2
Benzo(g,h,i)perylene	260	SPS-7	2
Aldrin	12	SPS-5	2
Aroclor-1254	11,000	SPS-7	2
Aroclor-1260	2,000	SPS-5	3
Total Phenols	11,600	SPS-8	6

* Sample SPS-5 was rejected for volatiles analysis. Therefore only 5 hits for the volatile compounds given are possible.

TABLE 4-10

ORGANIC COMPOUNDS DETECTED IN SURFACE SOILS
TAKEN OUTSIDE THE KNOWN AREA OF FILL
(3 Samples Taken Outside the Filled Area)

Compound	Maximum Concentration (ppb)	Location of Maximum Concentration	Total No. of Detections
Benzoic Acid	69	SPS-3	1
Pentachlorophenol	110	SPS-1	1
Fluoranthene	53	SPS-3	1
Pyrene	44	SPS-3	1
Benzo(b)fluoranthene	26	SPS-3	1

* A fourth sample outside the filled area SPS-11, was tested for Pest/PCBs. Aldrin (200 ppb) and Aroclor 1260 (12,000 ppb) were detected.

TABLE 4-11
COMPARISON OF METALS CONCENTRATIONS BETWEEN SURFACE SOIL SAMPLES WITHIN AND OUTSIDE THE AREA OF KNOWN FILL

	Conc. in Fill (6)[1]			Conc. Outside Filled Area (3)[1]			Sub-surface Soil
Analyte	Min	Max	Mean+	Min	Max	Mean+	Mean++
Aluminum	19,400	29,200	21,967	29,700	30,900	30,333	25,614
Antimony	ND	ND	6	ND	ND	6	4.6
Arsenic	1.7	8.9	5.8	0.33	5.0	3.0	3.9
Barium	129	458	205	146	155	151	183
Beryllium	0.78	1.6	1.0	1.1	1.3	1.2	1.26
Cadmium *	1.2	178	44.0	0.46	4.5	1.8	0.47
Calcium *	52,000	79,400	60,767	3,480	3,850	3,610	67,043
Chromium *	6,300	37	1,203	35.2	60.3	44.6	30.9
Cobalt	11.4	19.2	15.3	12.6	15.3	13.8	14.4
Copper	38.8	298	124.0	18	76.1	38.4	25.2
Iron	29,100	63,200	40,000	33,000	36,200	34,100	31,071
Lead	9.4	74.5	33.5	14.2	24.8	20.3	11.1
Magnesium	11,600	15,400	13,183	6,080	10,800	7,867	14,657
Manganese	551	754	656	195	377	281	548
Mercury	ND	0.19	0.12	ND	0.13	0.11	0.1
Nickel	30.6	58.1	41.8	29.2	53.3	40.2	31.7
Potassium	3,690	4,860	4,397	3,220	4,520	3,777	4,714
Selenium	ND	0.71	0.52	ND	0.58	0.53	0.5
Silver	ND	ND	1	ND	ND	1	1
Sodium	429	1,150	683	277	392	328	509
Thallium	ND	0.61	0.85	ND	ND	1	0.67
Vanadium	35.7	49	43.2	43.1	48	45.1	41.7
Zinc	65.7	283	84.8	103	164	140	69.7
Cyanide	ND	9.8	3.72	ND	0.75	1.58	2

[1] All values given in ppm (mg/kg)

+ One-half the contract required detection limit was used for calculation of the arithmetic mean for non detected analytes

++ Taken from Table 4-8

Cadmium * Indicates maximum concentration is at least one order of magnitude greater than the mean concentration of background samples

TABLE 4-12

SUMMARY OF DETECTABLE ANALYTES IN QUARRY LAKE WATER
SAMPLED DURING PREVIOUS INVESTIGATIONS

Parameter (mg/l)	July 1978 Ecology & Environment	June 1981 Advanced Environmental Systems, Inc.	June 1982 Ecology & Environment	October 1982 Frontier Chemical
pH	2.8	6.58	6.9	7.1
Total Dissolved Solids	3,624	2,880	2,223	N/A
Total Suspended Solids	2	N/A	N/A	N/A
Total Halogenated Organics as Lindane	N/A	0.070	0.003	<0.0001
BOD_5	< 2	N/A	N/A	N/A
Ammonia	30.2	22.4	<0.060	12
Phenol	0.021	N/A	N/A	N/A
Arsenic	N/A	0.1	<0.025	<0.02
Barium	N/A	<0.2	<0.20	<0.50
Boron	N/A	<1.0	0.706	<0.10
Cadmium	0.93	0.110	0.042	0.02
Chromium	2.09	<0.075	0.012	<0.01
Copper	9.35	0.280	<0.050	<0.02
Iron	60.6	<0.050	N/A	N/A
Lead	0.027	<0.250	<0.010	<0.50
Manganese	N/A	3.0	0.079	<0.10
Mercury	N/A	<0.001	<0.0004	<0.01
Nickel	3.17	<0.10	0.409	<0.10
Selenium	N/A	0.140	<0.050	<0.02
Silver	N/A	<0.005	<0.001	N/A
Zinc	1.31	0.220	<0.050	<0.03

NOTES: < Denotes values reported as less than the working detection limit

N/A = Not Analyzed

TABLE 4-13

SUMMARY OF QUARRY LAKE SEDIMENT/SLUDGE SAMPLES
AUGUST 1985 INVESTIGATIONS

Compound	Class	Frontier No. of Detections Max = 4	NYSDEC No. of Detections Max = 2	Max. Conc. ppb. Front/NYSDEC
Chloroform	VOC	4	2	5.3/2.8
Ethyl Benzene	VOC	1	1	1.4/BDL
Di-n-butylphthalate	SEMI	3	0	.002/0
Aniline	SEMI	--	1	--/.42
Benzene	VOC	0	2	0/38.
Carbon Disulfide	VOC	--	2	--/71.
Chlorobenzene	VOC	--	1	--/8.8
1,4-Dichlorobenzene	VOC	--	1	--/15.
1,1-Dichloroethane	VOC	0	1	0/6.9
Trans-1,2-Dichloroethylene	VOC	--	2	--/2.8
Methylene Chloride	VOC	0	2	0/1.6

-- Not Analyzed

Compound	Frontier No. of Detections Max = 20	NYSDEC No. of Detections Max = 3	Max. Conc. (ppM) Front/NYSDEC
THO (ppb)	20	--	763/--
Barium	20	3	30,600/250
Cadmium	14	3	2,970/2,127
Total Chromium	1	3	5,050/146
Copper	15	3	280/50
Manganese	20	--	13,300/--
Nickel	20	--	5,120/--
Zinc	20	--	1,750/--

-- Not Analyzed

TABLE 4-14
ORGANIC COMPOUNDS DETECTED IN LAKE SEDIMENT
(17 TOTAL SAMPLES)

Compound	Maximum Concentration (ppb)	Location of Maximum Concentration	Total No. of Detections*		
			East Basin	West Basin	Total
Carbon Disulfide	2	LS-14/LS-17	3	0	3
1,1-Dichloroethane	2	LS-5	1	1	2
1,2-Dichloroethene (Total)	36	LS-14	3	5	8
2-Butanone	8	LS-16	2	0	2
Trichloroethene	20	LS-5	0	4	4
Benzene	1	LS-5	0	1	1
4-Methyl-2-Pentanone	0.8	LS-4	0	1	1
2-Hexanone	1	LS-4	0	1	1
Tetrachloroethene	4	LS-7	0	3	3
Total Xylenes	2	LS-5	0	1	1
1,2-Dichlorobenzene	50	LS-5	0	2	2
Benzoic Acid	50	LS-6	0	2	2
1,2,4-Trichlorobenzene	100	LS-6	0	2	2
2-Methylnaphthalene	11	LS-6	0	2	2
Acenaphthene	9	LS-2	0	1	1
Dibenzofuran	5	LS-2	0	1	1
Flourene	11	LS-2	0	1	1
Phenanthrene	86	LS-2	0	2	2
Anthracene	20	LS-2	0	1	1
Di-n-butylphthalate	87	LS-17	5	1	6
Fluoranthene	120	LS-2	2	4	6
Pyrene	97	LS-2	1	5	6
Butylbenzylphthalate	17	LS-5	0	6	6
Di-n-octylphthalate	57	LS-12	1	5	6
Benzo(b)fluoranthene	110	LS-14	1	3	4
Benzo(k)fluoranthene	49	LS-2	0	2	2
Benzo(a)pyrene	30	LS-6	0	2	2
Ideno(1,2,3-cd)pyrene	18	LS-6	0	1	1
Aroclor-1254	300	LS-5	0	2	2
Total Phenols	1.06	LS-6	3	7	10

TABLE 4-15

COMPARISON OF METALS CONCENTRATIONS BETWEEN
LAKE SEDIMENTS AND BACKGROUND SURFACE AND SUBSURFACE SOILS

Analyte	Conc. in Lake Seds (17)^			Mean Conc. Subsurface Soil+	Mean Conc. in Backgrnd. Surface Soils+
	Min.	Max.	Mean+		
Aluminum	16,400	31,300	23,424	25,614	30,333
Antimony	ND	ND	6	4.6	6
Arsenic	2	5.5	3.6	3.9	3.0
Barium	96.5	206	149	183	151
Beryllium	ND	1.4	0.99	1.26	1.2
Cadmium*	ND	86.9	19.9	0.47	1.8
Calcium	24,900	61,300	43,365	67,043	3,610
Chromium*	27.4	1,100	230	30.9	44.6
Cobalt	9.9	24.1	16.6	14.4	13.8
Copper	19.9	253	82.0	25.2	38.4
Iron	22,000	53,500	34,171	31,071	34,100
Lead	ND	40.4	16.7	11.1	20.3
Magnesium	7,480	17,200	13,931	14,657	7,867
Manganese	391	746	567	548	281
Mercury	ND	ND	0.1	0.1	0.11
Nickel	24.9	93.2	50.0	31.7	40.2
Potassium	2,630	6,280	4,869	4,714	3,777
Selenium	ND	ND	0.5	0.5	0.53
Silver	ND	ND	1	1	1
Sodium	360	705	482	509	328
Thallium	ND	0.31	0.48	0.67	1
Vanadium	31	76.7	48.7	41.7	45.1
Zinc	51.9	194	104	69.7	140
Cyanide*	ND	22.9	3.6	2	1.58

^ All values given in ppm (mg/kg)

Cadmium* Indicates maximum concentration found in lake sediments is at least one order of magnitude greater than either the mean concentration in surface or subsurface soil

+ One-half the contract required detection limit was used for calculation of the arithmetic mean for samples with non-detected analytes

Table 4-16
Summary of Detectable Analytes in Surface Water Samples, USGS 1982

Parameter/Concentration	USGS-4 Surface Water	USGS-5 Surface Water
pH	7.2	7.4
Specific Conductance (umho/cm)	2,020	1,970
Temperature °C	26.0	20.0
Cadmium (ppb)	2	4
Copper (ppb)	24	670
Iron (ppb)	34,000	200,000
Nickel (ppb)	38	1,000
Zinc (ppb)	180	3,600

TABLE 4-17

SUMMARY OF BULL CREEK MACROINVERTIBRATE DATA

SUMMARY OF BULL CREEK MACROINVERTEBRATE DATA				
	UP	OS	DI	DII
Number of Individuals	606	412	1,277	253
Species Richness	14	12	15	13
Equitability	0.46	0.58	0.33	0.69
Diversity	2.27	2.40	2.02	2.71
Biotic Index	6.0	6.2	6.1	6.4

SIMILARITY INDEX FOR BULL CREEK SITES				
	UP	OS	DI	DII
UP	-			
OS	.79	-		
DI	.48	.55	-	
DII	.44	.37	.57	-

TABLE 4-18

SUMMARY OF DETECTABLE ANALYTES FOUND IN
GROUNDWATER SAMPLES FROM PREVIOUS INVESTIGATIONS

Compound	Class	No. of Detections-1985 Max. = 10	No. of Detections-1988 Max. = 32	Max. Conc. ppb (1985/1988)
Bromodichloromethane	VOC	--	1	--/12
Dibromochloromethane	VOC	--	1	--/720
Acetone	VOC	--	25	--/30,000
Vinyl Chloride	VOC	--	7	--/8,000
1,1-Dichloroethene	VOC	--	6	--/320
1,1-Dichloroethane	VOC	--	12	--/1,500
1,1,1-Trichloroethane	VOC	--	11	--/6,200
Tetrachloroethene	VOC	--	12	--/8,000
Bromoform	VOC	--	1	--/8,000
Chloroform	VOC	--	10	--/3,000
2-Butanone (or Mek)	VOC	--	8	--/14,000
Benzene	VOC	--	10	--/10,000
Chlorobenzene	VOC	--	1	--/100
Ethylbenzene	VOC	--	10	--/2,000
4-Methyl-2-Pentanone	VOC	--	8	--/29,000
Total Xylenes	VOC	--	10	--/11,000
1,2-Dichloroethane	VOC	1	7	39,000/71,000
Trans-1,2-Dichloroethylene	VOC	1	10	1,400/29,000
Methylene Chloride	VOC	1	11	2,700/71,000
Toluene	VOC	3	12	34/210,000
Trichlorethylene	VOC	1	13	380/49,000
Phenol	SEMI	--	8	--/17,000
2,4-Dinitrophenol	SEMI	1	1	42/200
2-Methylphenol	SEMI	--	8	--/770
4-Methylphenol	SEMI	--	8	--/2,800
1,2-Dichlorobenzene	SEMI	--	2	--/130
1,2,4-Trichlorobenzene	SEMI	--	1	--/270

TABLE 4-18 (Cont'd.)

Compound	Class	No. of Detections-1985 Max. = 10	No. of Detections-1988 Max. = 32	Max. Conc. ppb (1985/1988)
2,4-Dimethylphenol	SEMI	--	6	--/350
Hexachlorobenzene	SEMI	10	0	.0039/0
Nitrobenzene	SEMI	--	3	--/2,000
4-Chloroaniline	SEMI	--	1	--/300
Benzyl Alcohol	SEMI	--	1	--/180
N-Nitrosodi-h-propylamine	SEMI	1	--	270/--
Bis(2-ethylhexyl) Phthalate	SEMI	--	3	--/280
Bromide	MISC	7	--	13,000/--
Chloride	MISC	10	--	850,000/--
Fluoride	MISC	10	--	5,000/--
Nitrate-N	MISC	0	--	0/--
Nitrite-N	MISC	2	--	3,000/--
D-Phosphate-P	MISC	0	--	0/--
Sulfate	MISC	10	--	5,400,000/--
alpha-Benzenehexachloride	PST	10	--	.032/--
gamma-Benzenehexachloride	PST	9	--	.086/--
alpha-Chlordane	PST	4	--	.0004/--
gamma-Chlordane	PST	4	--	.016/--
Oxychlordane	PST	4	--	.0004/--
Heptachlor Epoxide	PST	9	--	.0022/--
alpha-Endosulfan	PST	9	--	.0007/--
beta-Endosulfan	PST	1	--	.0009/--
Endrin	PST	3	--	.0039/--
Dieldrin	PST	5	--	.0004/--
P,P'-DDD	PST	2	--	.0012/--
Aluminum	MCP	10	--	101,000/--
Antimony	MCP	--	31	--/550
Arsenic	MCP	--	28	--/550

TABLE 4-18 (Cont'd.)

Compound	Class	No. of Detections-1985 Max. = 10	No. of Detections-1988 Max. = 32	Max. Conc. ppb (1985/1988)
Barium	MCP	10	--	780/--
Beryllium	MCP	1	4	10/127
Cadmium	MCP	8	5	80/610
Calcium	MCP	10	--	800,000/--
Chromium	MCP	8	13	360,000/318,000
Cobalt	MCP	8	--	160/--
Copper	MCP	10	20	280/850
Iron	MCP	10	--	109,000/--
Lead	MCP	9	5	600/680
Magnesium	MCP	10	--	1,070,000/--
Manganese	MCP	10	--	2,400/--
Mercury	MCP	--	27	--/1.4
Molybdenum	MCP	9	--	320/--
Nickel	MCP	8	27	530/7,960
Potassium	MCP	10	--	113,000/--
Selenium	MCP	--	28	--/285
Silver	MCP	8	0	80/0
Sodium	MCP	10	--	2,200,000/--
Strontium	MCP	10	--	11,200/--
Thallium	MCP	--	20	--/162
Vanadium	MCP	10	--	310/--
Zinc	MCP	10	29	650/1,670
Total Phenols	MCP	8	24	94,000/21,200
Cyanide	MCP	2	14	1,620/41,000

-- Not Analyzed

TABLE 4-19

SUMMARY OF DETECTABLE ANALYTES FOUND IN
GROUNDWATER SAMPLES FROM RECRA - 1985

Compound	Well # (ppb)			
	2R	5R	7R	3S
2,4-Dinitrophenol	ND	ND	ND	6,900
Phenol	ND	ND	ND	230,000
Diethylphthalate	BDL	ND	ND	ND
Benzene	ND	ND	ND	3,000
Chloroform	ND	ND	ND	670
1,2-Dichloroethane	ND	ND	ND	260,000
1,1-Dichloroethylene	ND	ND	ND	140
Trans-1,2-Dichloroethylene	ND	ND	ND	1,500
Ethylbenzene	ND	ND	ND	BDL
Methylene Chloride	ND	ND	ND	4,600
Tetrachloroethylene	ND	ND	ND	BDL
Toluene	ND	ND	ND	110,000
1,1,2-Trichloroethane	ND	ND	ND	340
Trichloroethylene	ND	ND	ND	1,100
Vinyl Chloride	ND	ND	ND	710
Total Recoverable Phenolics	14	<10	<10	25,700
Total Cyanide	<10	<10	<10	1,800
Total Arsenic	75	<5	<5	100
Total Cadmium	<5	<5	<5	25
Total Chromium	158	<5	<5	421,000
Total Copper	184	22	19	409
Total Lead	67	<5	<5	119
Total Mercury	<.5	<.5	<.5	.8
Total Nickel	175	6	5	988
Total Zinc	505	89	86	946

ND - Not Detected

TABLE 4-20

ORGANIC COMPOUNDS DETECTED IN SHALLOW GROUNDWATER SAMPLES
(SAMPLES WITHIN KNOWN AREA OF FILL)

Compound	Maximum Concentration (ppb)	Sample Location of Maximum Concentration	Total No. of Detections First Round/ Second Round
Tetrachloroethene	5300	88-10A	2/2
Methylene Chloride	10,000	88-8A	2/0
Acetone	35,000	88-8A	3/0
Chloroform	1,900	85-3S	2/0
1,2-Dichloroethane	230,000	85-3S	4/2
1,1,1-Trichloroethane	3,800	88-10A	5/2
Trichloroethene	36,000	88-8A	6/3
4-Methyl-2-Pentanone	12,000	88-10A	2/1
Toluene	260,000	85-3S	4/2
1,1-Dichloroethane	1,200	88-8A	5/0
1,2-Dichlorethene (Total)	41,000	88-11A	6/2
2-Butanone	140	88-2A	1/3
Benzene	9,900	88-8A	3/2
Chlorobenzene	150	88-4A	1/0
Vinyl Chloride	2,400	88-8A	1/0
Total Xylenes	3,200	88-10A	2/2
Ethylbenzene	480	88-10A	1/2
Phenol	15,000	85-3S	2/*
Bis(2-Chloroethyl) ether	82	85-3S	2/*
Benzyl Alcohol	170	85-3S	1/*
2-Methylphenol	780	85-3S	2/*
4-Methylphenol	3,300	85-3S	2/*
2,4-Dimethyl-phenol	44	88-8A	2/*
Benzoic Acid	980	85-3S	1/*

TABLE 4-20 (Cont'd)

Compound	Maximum Concentration (ppb)	Sample Location of Maximum Concentration	Total No. of Detections First Round Second Round
Bis(2-chloro-thoxy) methane	110	85-3S	2/*
Nitrobenzene	210	88-4A	1/*
4-Chloroaniline	8	88-4A	1/*
Isophorone	28	88-8A	1/*
Naphthalene	130	88-8A	1/*
2-Methylnapthalene	6	88-8A	1/*
1,4-Dichlorobenzene	0.7	88-13A	1/*
1,2-Dichlorbenzene	1	88-13A	1/*
1,2,4-Trichlorobenzene	0.4	88-13A	1/*
Bis(2-ethylhexyl) phthalate	38	85-3S	2/*
Di-n-butylphthalate	3	88-8A	3/*
Fluoroanthene	0.6	88-4A	1/*
Pyrene	0.8	88-4A	1/*
Butylbenzylphthalate	2	88-4A	1/*
Phenanthrene	1	88-8A	1/*
Total Phenols++	42.6	85-3S	5/3

++ Total Phenols were present in 3 of 5 GW collected outside the known fill area withm a maximum concentration of 0.079 (ug/l) ppm.

* Only TCL volatiles, total phenols, and metals were analyzed in second round samples from the known area of fill.

TABLE 4-21

COMPARISON OF METAL CONCENTRATIONS BETWEEN SHALLOW GROUNDWATER COLLECTED FROM MONITORING WELLS LOCATED INSIDE AND OUTSIDE THE KNOWN LIMITS OF FILL

	Concentration (ppb) in Fill 9 samples			Conc. (ppb) Outside Fill (5 samples)	ARAR Comparison	
Analyte	Min.	Max.	Mean+	Mean+	ARAR Value[b] (ppb)	No. of Samples Exceeding ARAR
Aluminum	ND	6,730	1,256	890	--	--
Anitmony*	ND	79	41	59	3	11
Arsenic*	ND	32.6	7.9	4.1	25	1
Barium*	11.5	217	51	16	1,000	0
Beryllium	ND	ND	ND	ND	3	0
Cadmium*	ND	12	4	ND	10	1
Calcium	202,000	516,000	424,222	367,040	--	--
Chromium*	ND	148,000	17,417	9.7	50	5
Cobalt	ND	9.7	9.9	23.1	--	--
Copper	ND	82.5	19	12	200	0
Iron*	106	22,200	5,495	1,409	300	13
Lead	ND	8.9	4	2.6	25	0
Magnesium*	1,690	495,000	157,754	665,800	35,000	12
Manganese*	13.6	1,190	364	424	300	7
Mercury	ND	ND	ND	ND	2	0
Nickel	ND	258	78	996	--	--
Potassium*	2,370	63,200	20,290	4,158	--	--
Selenium*	ND	2.9	2.4	ND	10	0
Silver	ND	ND	ND	ND	50	0
Sodium*	54,000	1,450,000	288,233	247,040	20,000	14
Thallium	ND	ND	ND	ND	4	0
Vanadium	ND	187	63	35	--	--
Zinc	ND	74.8	35	14	300	0
Cyanide*	ND	1,040	190	ND	100	2

+ - One half of the contract required detection limit was used for calculation of the arithmetic mean for non-detected analytes and the higher value was used for wells sampled twice.

b - These values were obtained from New York State DEC Water Quality Standards and Guidelines.

TABLE 4-22

ORGANIC COMPOUNDS DETECTED IN
INTERMEDIATE GROUNDWATER SAMPLES

Compound	Maximum Concentration (ppb)	Sample Location of Maximum Concentration	Total No. of Detections*
Benzene	15	85-5R	7
Chloroform	11	85-2R	1
Bromodichloromethane	5	85-2R	1
4-Methyl-2-pentanone	3	88-10C	2
1,1,2,2-Tetrachloroethane	2	85-5R	1
1,1-Dichloroethane	10	88-11B	4
1,2-Dichloroethene (total)	110	88-11B	4
1,1,1-Trichloroethane	7	88-11B	3
Trichloroethene	32	88-11B	2
Tetrachlorethene	150	88-11B	5
Toluene	3	88-10B	8
Di-n-butylphthalate	0.4	88-11C	1
1,2-Dichloroethane	2	88-10C	1
Total Xylenes	3	88-10B	1
Total Phenols	0.011	85-1R/85-2R	3

* - Total number of samples = 20 in two rounds of sampling

TABLE 4-23

COMPARISON OF INTERMEDIATE GROUNDWATER
METAL CONCENTRATIONS VS. ARAR VALUES

Analyte	Concentration (ppb) 12 Samples			ARAR Value[b] (ppb)	No. of Samples Exceeding ARAR
	Min.	Max.	Mean+		
Aluminum	131	26,700	3,458	--	--
Antimony*	ND	60.1	37	3	9
Arsenic	ND	13.2	4.9	25	0
Barium	9.3	218	77	1,000	0
Beryllium	ND	3	2.4	3	0
Cadmium	ND	1.8	2.3	10	0
Calcium	59,900	392,000	218,850	--	--
Chromium*	ND	92	606	50	3
Cobalt	ND	16.1	21	--	--
Copper	ND	65.5	19.6	200	0
Iron*	1,170	46,600	9,174	300	12
Lead*	ND	31.7	5.3	25	1
Magnesium*	4,460	293,000	120,500	35,000	9
Manganese*	7.3	1,140	227	300	4
Mercury	ND	ND	ND	2	0
Nickel	6.2	635	81.4	--	--
Potassium	2,520	60,700	11,074	--	--
Selenium	ND	1.3	2.4	10	--
Silver	ND	ND	ND	50	0
Sodium*	28,600	256,000	90,217	20,000	12
Thallium	ND	ND	ND	4	0
Vanadium	ND	140	37	--	--
Zinc	ND	201	51.4	300	0
Cyanide	ND	12.6	5.6	100	0

b - These values were obtained form NYSDEC Water Quality Standards and Guidelines.

\+ - One-half the contract required detection limit was used for calculation of the arithmetic mean for non-detected analytes, and the higher value was used for wells sampled twice.

Iron* - Indicates maximum concentration exceeds the ARAR value.

ND - Not Detected

TABLE 4-24

ORGANIC COMPOUNDS DETECTED IN DEEP GROUNDWATER SAMPLES

Compound	Maximum Concentration (ppb)	Location of Sample of Maximum Concentration	Total No. of Detections*
Acetone	250	URS-5D	2
Carbon Disulfide	12	88-11D	3
Chloroform	8	URS-9D, 88-10D	2
Bromodichloro-methane	4	URS-9D	1
Trichloroethene	49	88-10D	4
Dibromochloro-methane	1	URS-9D	1
Benzene	12	88-10D	5
Tetrachloroethene	28	88-11D	3
Toluene	13	88-12D	5
1,2-Dichloroethene (Total)	11	88-10D	2
2-Butanone	6	URS-9D	1
Styrene	2	88-11D	1
Total Xylenes	0.5	URS-5D	1
Total Phenols	32	88-10D	10

* - Total number of samples = 14 in two rounds of sampling

TABLE 4-25

COMPARISON OF DEEP (BEDROCK) GROUNDWATER METAL CONCENTRATIONS VS. ARAR VALUES

Analyte	Concentration (ppb) 8 Samples			ARAR Value[b] (ppb)	No. of Samples Exceeding ARAR
	Min.	Max.	Mean+		
Aluminum	ND	611	252.6	--	--
Antimony*	ND	56.1	34.9	3	7
Arsenic	ND	2	1.8	25	0
Barium	2.9	224	64.3	1,000	0
Beryllium	ND	ND	ND	3	0
Cadmium	ND	ND	ND	10	0
Calcium	56,400	623,000	297,050	--	--
Chromium	ND	36.9	13	50	0
Cobalt	ND	ND	ND	--	--
Copper	ND	11.2	11.4	200	0
Iron*	127	1,380	532	300	6
Lead	ND	2.7	2.0	25	0
Magnesium*	23,800	199,000	88,888	35,000	6
Manganese*	8.8	696	127	300	1
Mercury	ND	ND	ND	2	0
Nickel	7.6	43.4	19.9	--	--
Potassium	3,950	22,700	9,216	--	--
Selenium	ND	ND	ND	10	0
Silver	ND	ND	ND	50	0
Sodium	32,500	474,000	124,338	20,000	8
Thallium	ND	ND	ND	4	0
Vanadium	3.8	51.6	20.9	--	--
Zinc	12.2	50.5	23.8	300	0
Cyanide	ND	ND	ND	100	ND

b - These values were obtained form NYSDEC Water Quality Standards and Guidelines.

\+ - One-half the contract required detection limit was used for calculation of the arithmetic mean for non-detected analytes, and the higher value was used for wells sampled twice.

Iron* - Indicates maximum concentration exceeds the ARAR value.

ND - Not Detected

TABLE 6-1

ARARs AND TBCs FOR THE FRONTIER CHEMICAL SITE

ITEM	CITATION	DESCRIPTION	ARAR or TBC
Federal Groundwater Standards			
Safe Drinking Water Act			
Primary Drinking Water Standards	40 CFR 141	Water standards for public water supplies	ARAR
Secondary Drinking Water	40 CFR 143	Water standards for public water supplies	TBC
Clean Water Act		Water quality standards for drinking water	TBC
RCRA	40 CFR 264	Groundwater monitoring requirements	TBC
New York State Groundwater Standards			
NYSDEC Groundwater Quality Standards	TOGS 1.1.1 September, 1990	Groundwater standards and guidelines for NYS groundwater	ARAR
	6NYCRR Part 703.5	Groundwater standards	ARAR
NYSDOH MCLs, Public Water Supplies	10 NYCRR Subpart 5-1	Water standards for drinking water Maximum Contaminant Levels	ARAR
NYSDOH Standards, Sources of Water Supplies	10 NYCRR 170	Water standards for water supply sources	ARAR
Standards for Owners and Operators of Hazardous Waste TSD Facilities	6 NYCRR Parts 360 and 373	Site closure and groundwater monitoring	ARAR

Table 6-1 (Cont'd.)

ARARs AND TBCs FOR THE FRONTIER CHEMICAL SITE

ITEM	CITATION	DESCRIPTION	ARAR or TBC
Federal Surface Water Standards			
Clean Water Act		Water quality standards for fish and drinking water	TBC
Regulation of Activities Affecting Water of the US	33 CFR 320-329	Corps of Engineers Regulations for wetlands and navigable waters	ARAR
Executive Order on Protection of Wetlands	Order #11990 40 CFR 6 Appendix A	Required for consideration during remedial actions that may impact wetlands	ARAR
Executive Order on Floodplain Management	Order #11988 40 CFR 6 Appendix A	Required for consideration of remedial actions that impact floodplains	TBC
Fish and Wildlife			
Coordination Act Improvement Act Conservation Act	16 USC 661 16 USC 742 16 USC 2901	Regulates remedial actions that may affect wetlands	ARAR

Table 6-1 (Cont'd.)

ARARs AND TBCs FOR THE FRONTIER CHEMICAL SITE

ITEM	CITATION	DESCRIPTION	ARAR or TBC
New York State Surface Water Standards			
NYSDEC Surface Water Quality Standards	6 NYCRR 701	Standards and guidelines for surface water quality	ARAR
Use and Protection of Waters	6 NYCRR 608	Permit requirements for constructing docks or dams and excavation or placement of fill	TBC
Use and Protection of Freshwater Wetlands	6 NYCRR 662-665	Permit requirements for disturbance to freshwater wetlands	ARAR
SPDES		Discharge of treatment system effluent	TBC
Health-based standards for surface water		Health Risk Assessment performed during RI	ARAR
Federal Soil Standards			
Toxic Substance Controls Act	40 CFR 761	Regulates PCB clean-up levels	ARAR
Toxicity Characteristic Rule	Toxicity Characteristic Rule 40 CFR 261	Regulations for Classifications of Hazardous Waste	ARAR
Health-Based Standards for surficial soil		Health Risk Assessment performed during RI	ARAR
RCRA	40 CFR 264	For treatment, storage, disposal of RCRA wastes	TBC

Table 6-1 (Cont'd.)

ARARs AND TBCs FOR THE FRONTIER CHEMICAL SITE

ITEM	CITATION	DESCRIPTION	ARAR or TBC
New York Soil Standards			
Method of partition coefficients and toxicity data for subsurface soil		Using NYS Class GA groundwater standards and the partition coefficient method to calculate the equilibrium concentration of a compound in soil	TBC
Standards for Owners and Operators of Hazardous Waste TSD Facilities	6 NYCRR Parts 360 and 373	Site closure	ARAR
Federal Sediment Standards			
Clean Water Act	40 CFR 230.10 CWA Section 404	Provides protection of wetlands and other aquatic habitats; discusses disposal of dredged material	ARAR
Army Corps of Engineers		Evaluates permit applications for above	TBC
USEPA		Evaluates permit applications for above	TBC
New York State Sediment Standards			
NYSDEC Division of Fish & Wildlife Sediment Criteria		Sediment criteria formula may be appropriate for developing cleanup levels	ARAR

Table 6-1 (Cont'd.)

ARARs AND TBCs FOR THE FRONTIER CHEMICAL SITE

ITEM	CITATION	DESCRIPTION	ARAR or TBC
Federal Air Standards			TBC
Clean Air Act National Ambient Air Quality Standards	40 CFR 50	Air Standards	TBC
National Emissions Standards for Hazardous Air Pollutants	40 CFR 61	For asbestos and wet dust, beryllium, vinyl chloride, benzene, etc. Includes standards for tank storage.	ARAR
New York State Air Standards			
Division of Air	6 NYCRR Part 200, 201, 211, 212, 257	Division of air general provisions permits and certificates and air quality standard	TBC
Division of Air	Air Guide 1	Guidelines for control of toxic ambient air contaminants	TBC
Health-based standards for air		Health Risk Assessment performed by RI	ARAR

Table 6-1 (Cont'd.)

ARARs AND TBCs FOR THE FRONTIER CHEMICAL SITE

ITEM	CITATION	DESCRIPTION	ARAR or TBC
Additional Federal Considerations			
OSHA	29 CFR 1904 1910 1226	Worker safety at hazardous waste sites	ARAR
Standards applicable to generators of hazardous waste	40 CFR 262	Waste excavation, removal, treatment and disposal	TBC
Standard applicable to transporters of hazardous waste	40 CFR 263	For transporters of hazardous waste	TBC
Land disposal restrictions	40 CFR 268	Treatment standards for final deposition of hazardous wastes	TBC
Additional New York State Considerations			
Waste Transporter Permits	6 NYCRR Part	For transporters of hazardous waste	TBC
Hazardous Waste Manifest System	6 NYCRR Part 372	For generators transporters and facilities	TBC
Hazardous Waste TSD facilities	6 NYCRR Part 373	For treatment, storage, and disposal facilities	TBC

TABLE 6-2

Chemical Specific ARARs Versus Maximum Contaminant Concentrations

Frontier Chemical

Parameter	Class	Groundwater			Class C Surface Water--Stream			Class D Surface Water--Lake			Soil, Waste		
		Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source
Chloromethane	VOC		5	A									
Bromomethane	VOC		5	C									
Vinyl Chloride	VOC	2,400	2	A		530	B		530	B		200	TCLP
Chloroethane	VOC		5	C									
Methylene Chloride	VOC	10,000	5	A									
Acetone	VOC	35,000	50	D									
Carbon Disulfide	VOC		50	D									
1,1-Dichloroethene	VOC		5	A		11,000	B		11,000	B		700	TCLP
1,1-Dichloroethane	VOC	1,200	5	A									
1,2-Dichloroethene (total)	VOC	41,000	5	A (1)				4					
Chloroform	VOC	1,900	100	A (2)		1,200	B		1,200	B		6000	TCLP
1,2-Dichloroethane	VOC	230,000	5	A		20,000	B		20,000	B		500	TCLP
2-Butanone (or MEK)	VOC	140	50	D								200000	TCLP
1,1,1-Trichloroethane	VOC	3,800	5	A									
Carbon Tetrachloride	VOC		5	A		35,000	B		35,000	B		500	TCLP
Vinyl Acetate	VOC		50	D									
Bromodichloromethane	VOC	5.0	50	A									
1,2-Dichloropropane	VOC		5	A									
Cis-1,3-dichloropropene	VOC		5	C		200	B		200	B			
Trichloroethene	VOC	36,000	5	A		11	A		11	A			
Dibromochloromethane	VOC		50	A									
1,1,2-Trichloroethane	VOC		5	A		9,400	B		9,400	B			
Benzene	VOC	9,900	ND	A (3)		6	A		6	A,B		500	TCLP

TABLE 6-2

Chemical Specific ARARs Versus Maximum Contaminant Concentrations

Frontier Chemical

Parameter	Class	Groundwater			Class C Surface Water--Stream			Class D Surface Water--Lake			Soil, Waste		
		Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source
Trans-1,3-dichloropropene	VOC		5	C		200	B		200	B			
Bromoform	VOC		50	A									
4-Methyl-2-pentanone	VOC	12,000	50	D									
2-Hexanone	VOC		50	A									
Tetrachloroethene	VOC	5300	5	A		1	A		1	A	0.0011	700	TCLP
1,1,2,2-Tetrachloroethane	VOC	2.0	5	A		2,400	B		2,400	B			
Toluene	VOC	260,000	5	A		17,000	B	4	17,000	B			
Chlorobenzene	VOC	150	5	A		5	A		50	A		100000	TCLP
Ethylbenzene	VOC	480	5	A		32,000	B		32,000	B			
Styrene	VOC		5	A									
Total Xylenes	VOC	3,200	5	A (4)									
Phenol	SEMI	15,000	1	A (P)		5	A (UP)		5	A (UP)			
Bis(2-chloroethyl)ether	SEMI	82	1	A									
2-Chlorophenol	SEMI		1	(P)		1	A (CP)		1	A (CP)			
1,3-Dichlorobenzene	SEMI		5	A		5	A (5)		50	A (5)			
1,4-Dichlorobenzene	SEMI	0.7	4.7	A (6)		5	A (5)		50	A (5)		7500	TCLP
Benzyl Alcohol	SEMI	170	50	D									
1,2-Dichlorobenzene	SEMI	1.0	4.7	A (6)		5	A (5)		50	A (5)			
2-Methylphenol	SEMI	780	1	(P)		5	A (UP)		5	A (UP)		200,000	TCLP
Bis(2-chloroisopropyl) ether	SEMI		5	POC									
4-Methylphenol	SEMI	3,300	1	(P)		5	A		5	A		200,000	TCLP
N-Nitroso-di-n-propylamine	SEMI		50	D									
Hexachloroethane	SEMI		5	C		540	B		540	B		3000	TCLP

TABLE 6-2

Chemical Specific ARARs Versus Maximum Contaminant Concentrations

Frontier Chemical

Parameter	Class	Groundwater			Class C Surface Water--Stream			Class D Surface Water--Lake			Soil, Waste		
		Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source
Nitrobenzene	SEMI	210	5	A		27,000	B		27,000	B		2000	TCLP
Isophorone	SEMI	28	50	A		117,000	B		117000	B			
2-Nitrophenol	SEMI		1	(P)		5	A (UP)		5	A (UP)			
2,4-Dimethylphenol	SEMI	44	1	(P)		5	A (UP)		5	A (UP)			
Benzoic Acid	SEMI	980	50	D	0.7								
Bis(2-chloroethoxy) methane	SEMI	110	5	C									
2,4-Dichlorophenol	SEMI		1	A (P)		1	A (CP)		1	A (CP)			
1,2,4-Trichlorobenzene	SEMI	0.4	5	A		5	A (7)		50	A (7)			
Naphthalene	SEMI	130	10	A									
4-Chloroaniline	SEMI	8	5	C									
Hexachlorobutadiene	SEMI		5	A		1	A		9.3	B		500	TCLP
4-Chloro-3-methylphenol	SEMI		1	(P)		1	A (CP)		1	A (CP)			
2-Methylnaphthalene	SEMI	6	5	POC									
Hexachlorocyclopentadiene	SEMI		5	A		0.45	A		4.5	A			
2,4,6-Trichlorophenol	SEMI		1	(P)		1	A (CP)		1	A (CP)		2000	TCLP
2,4,5-Trichlorophenol	SEMI		1	(P)		1	A (CP)		1	A (CP)		400000	TCLP
2-Chloronaphthalene	SEMI		5	A		1,600	B		1,600	B			
2-Nitroaniline	SEMI		5	C									
Dimethyl Phthalate	SEMI		50	A		3	B		3	B			
Acenaphthylene	SEMI		50	D	1.0								
2,6-Dinitrotoluene	SEMI		5	A									
3-Nitroaniline	SEMI		5	C									
Acenaphthene	SEMI		20	A		500	B		500	B			

TABLE 6-2

Chemical Specific ARARs Versus Maximum Contaminant Concentrations

Frontier Chemical

Parameter	Class	Groundwater			Class C Surface Water--Stream			Class D Surface Water--Lake			Soil, Waste		
		Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source
2,4-Dinitrophenol	SEMI		1	(P)		5	A (UP)		5	A (UP)			
4-Nitrophenol	SEMI		1	(P)	9.0	5	A (UP)		5	A (UP)			
Dibenzofuran	SEMI		50	D									
2,4-Dinitrotoluene	SEMI		5	C								130	TCLP
Diethylphthalate	SEMI		50	A		3	B		3	B			
4-Chlorophenyl-phenylether	SEMI		5	POC									
Fluorene	SEMI		50	A									
4-Nitroaniline	SEMI		5	C	4.0								
4,6-Dinitro-2-methylphenol	SEMI		1	(P)		5	A (UP)		5	A (UP)			
N-nitrosodiphenylamine (1)	SEMI		50	A									
4-Bromophenyl Phenyl Ether	SEMI		5	C									
Hexachlorobenzene	SEMI		0.35	A								130	TCLP
Pentachlorophenol	SEMI		1	A (P)	6.0	0.4	A		1	A (CP)		100000	TCLP
Phenanthrene	SEMI	1.0	50	A	170								
Anthracene	SEMI		50	A	27								
Di-n-butylphthalate	SEMI	3.0	50	A		3	B	0.4	3	B			
Fluoranthene	SEMI	0.6	50	A	5.0	3,900	B		3,900	B			
Pyrene	SEMI	0.8	50	A	4.0								
Butylbenzylphthalate	SEMI	2.0	50	A	21	3	B		3	B			
3,3'-Dichlorobenzidine	SEMI		5	C									
Benzo(a)anthracene	SEMI		0.002	A	13								
Chrysene	SEMI		0.002	A	16								
bis(2-ethyl hexyl)phthalate	SEMI	38	50	A		0.6	A		3	B			

TABLE 6-2

Chemical Specific ARARs Versus Maximum Contaminant Concentrations

Frontier Chemical

Parameter	Class	Groundwater			Class C Surface Water--Stream			Class D Surface Water--Lake			Soil, Waste		
		Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source
Di-n-octyl Phthalate	SEMI		50	A	26	3	B		3	B			
Benzo(b)fluoranthene	SEMI		0.002	A	25								
Benzo(k)fluoranthene	SEMI		0.002	A	22								
Benzo(a)pyrene	SEMI		ND	A	16	0.0012	A		0.0012	A			
Indeno(1,2,3-cd)Pyrene	SEMI		0.002	A	17								
Dibenz(a,h)anthracene	SEMI		50	D	15								
Benzo(g,h,i)perylene	SEMI		50	D	16								
Pyridine	SEMI		50	A								5000	TCLP
alpha-BHC	PST		ND	A		0.01	A		2	A			
beta-BHC	PST		ND	A		0.01	A		2	A			
delta-BHC	PST		ND	A		0.01	A		2	A			
gamma-BHC (Lindane)	PST		ND	A		0.01	A		2	A		400	TCLP
Heptachlor	PST		ND	A		0.001	B		.001	A		8	TCLP
Aldrin	PST		ND	A		0.001	A		.001	A			
Heptachlor Epoxide	PST		ND	A		0.001	A		.001	A			
Endosulfan I	PST		5	POC									
Dieldrin	PST		ND	A		0.001	A		0.001	A			
4,4'-DDE	PST		ND	A		0.001	A		0.001	A			
Endrin	PST		ND	A		0.002	A		0.002	A		20	TCLP
Endosulfan II	PST		5	POC									
4,4'-DDD	PST		ND	A		0.001	A		0.001	A			
Endosulfan Sulfate	PST		5	POC									
4,4'-DDT	PST		ND	A		0.001	A		0.001	A			

TABLE 6-2

Chemical Specific ARARs Versus Maximum Contaminant Concentrations

Frontier Chemical

Parameter	Class	Groundwater			Class C Surface Water--Stream			Class D Surface Water--Lake			Soil, Waste		
		Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source
Methoxychlor	PST		35	A		0.03	A		0.03	A		100000	TCLP
Endrin Ketone	PST		5	POC									
alpha-Chlordane	PST		0.1	A								30(10)	TCLP
gamma-Chlordane	PST		0.1	A								30(10)	TCLP
Toxaphene	PST		ND	A		.0002	B		.0002	B		500	TCLP
Aroclor-1016	PCB		0.1 (9)	A		.001 (9)	A		.001	A			
Aroclor-1221	PCB		0.1 (9)	A		.001 (9)	A		.001	A			
Aroclor-1232	PCB		0.1 (9)	A		.001 (9)	A		.001	A			
Aroclor-1242	PCB		0.1 (9)	A		.001 (9)	A		.001	A			
Aroclor-1248	PCB		0.1 (9)	A		.001 (9)	A		.001	A			
Aroclor-1254	PCB		0.1 (9)	A		.001 (9)	A		.001	A			
Aroclor-1260	PCB		0.1 (9)	A		.001 (9)	A		.001	A			
Aluminum	TAL	26,700			6030 N*	100.0	A (10)	1270					
Antimony	TAL	70	3	A		1,600	B		1,600	B			
Arsenic	TAL	32.6	25	A	2.9	190.0	A (11)		360	A (AR)	30.1*	5000	TCLP
Barium	TAL	218	1000	A	91.8			40.2			544*	100000	TCLP
Beryllium	TAL	3	3	A		5.3	B		5.3	B			
Cadmium	TAL	12	10	A	1.1	(CALC)	A	3.1	(CALC)	A	790	1000	TCLP
Calcium	TAL	623,000			85,600			127,000					
Chromium	TAL	148,000	50	A	9.1	(CALC)	A	5.8	(CALC)	A	42.3*	5000	TCLP
Cobalt	TAL	16.1				5.0	A		110	A			
Copper	TAL	82.5	200	A	24.9	(CALC)	A	11.3	(CALC)	A			
Iron	TAL	46,600	300 (12)	A	7180	300	A	1510	300	A			

TABLE 6-2

Chemical Specific ARARs Versus Maximum Contaminant Concentrations

Frontier Chemical

Parameter	Class	Groundwater			Class C Surface Water--Stream			Class D Surface Water--Lake			Soil, Waste		
		Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source
Lead	TAL	31.7	25	A	7.1 W	(CALC)	A	1.8 W	(CALC)	A	78*	5000	TCLP
Magnesium	TAL	495,000	35000	A	33,300			27,700					
Manganese	TAL	1190	300 (12)	A	146			53					
Mercury	TAL	ND	2	A		0.012	B		.012	B		200	TCLP
Nickel	TAL	635			9.4	(CALC)	A	21.6	(CALC)	A			
Potassium	TAL	63,200			4560			3020					
Selenium	TAL	2.9	10	A		1.0	A		35	B	0.05	1000	TCLP
Silver	TAL	ND	50	A		0.1	A	3.1	(CALC)	A		5000	TCLP
Sodium	TAL	1,450,000	20000	A	32,800			26,300					
Thallium	TAL	ND	4	A		8	A		20	A			
Vanadium	TAL	187			12.5	14.0	A	11.7	190	A			
Zinc	TAL	201	300	A	300	30	A	19.2	(CALC)	A			
Total Cyanide	TAL	1,040	100	A		5.2	B		5.2	B			
Total Phenols	MISC	42.6	1	A	0.021	5, 1	A (13)	0.021	5, 1	A (13)			
Ammonia-Nitrogen	MISC		2000	A	0.182	(CALC)	A		(CALC)	A			
Total Kjeldahl Nitrogen	MISC				0.794								
Moisture	MISC												
TOC	MISC				5.62								
Bicarbonate, as CaCO3	MISC				225								
BOD	MISC				4								
COD	MISC				16.8								
Hardness, as CaCO3	MISC				326								
Alkalinity, as CaCO3	MISC				225								

TABLE 6-2

Chemical Specific ARARs Versus Maximum Contaminant Concentrations

Frontier Chemical

Parameter	Class	Groundwater			Class C Surface Water--Stream			Class D Surface Water--Lake			Soil, Waste		
		Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source	Max Conc (µg/L)	ARAR Value (µg/L)	Source
Acidity, as CaCO3	MISC				37.4								
NO3-N	MISC		10,000	A	437	100/20	A (14)						
NO2-N	MISC		10,000	A									
Total Phosphorus	MISC				.159								
Oil & Grease	MISC												
TSS	MISC				315								
TDS	MISC				558	500,000	A						
Sulfate	MISC		250,000	A	122								
Sulfide	MISC		50	A	1.5	2	A						
pH	MISC					6.5-8.5	A						
Specific Conductance	MISC												
Temp	MISC												

NOTES:

*Phase I investigation analyses used EP Toxicity before TCLP went into effect.

(1) Applies to trans- and cis- isomers individually.
(2) Proposed standard for chloroform is 7 ppb.
(3) Proposed standard for benzene is 0.7 ppb.
(4) Applies to each isomer (1,2-, 1,3-, 1,4-) individually.
(5) Applies to total dichlorobenzenes.
(6) Applies to the sum of 1,4- and 1,2-Dichlorobenzene.
(7) Applies to total trichlorobenzenes.
(8) Applies to Chlordane.
(9) Standard applies to total PCBs.
(10) Applies to acid-soluble form.
(11) Applies to dissolved form.
(12) Standard for sum of iron and manganese is 500 ppb.
(13) Standard is 1.0 ppb for total chlorinated phenols and 5.0 for total unchlorinated phenols.
(14) Standard is 100 μg/L for warm water fisheries and 20 μg/L for cold water fisheries.

(P) Phenolic Compound. Standard applies to total phenols.
(UP) Unchlorinated phenolic compound. Standard is for total unchlorinated phenols.
(CP) Chlorinated phenolic compound. Standard is for total chlorinated phenols.
(CALC) Calculated value.

STANDARDS
A - New York State DEC Water Quality Standards and Guidelines
B - Clean Water Act Guidelines
C - Chapter I - New York State Sanitary Code, Subpart 5-1, Principle Organic Contaminant--listed
D - Chapter I - New York State Sanitary Code, Subpart 5-1, Unspecified Organic Contaminants
TCLP - EPA Toxicity Characteristic Rule
POC - NYSDOH Principle Organic Contaminant--unlisted.

ABBREVIATIONS:
VOC - Volatile Organic Compound
SEMI - Semivolatile Organic Compound
PST - Pesticide
TAL - Total Analyte List
MISC - Miscellaneous

TABLE 6-3

Table of Calculated ARAR Values

FRONTIER CHEMICAL

Parameter	Units	SW-1		SW-2		SW-3	
		Conc.	ARAR	Conc.	ARAR	Conc.	ARAR
Hardness	ppm	320		326		428	
pH	SU	7.0	6.5-8.5	7.0	6.5-8.5	7.0	6.5-8.5
Temp	deg C	20		20		20	
Ammonia	ppm	0.182	1.96	0.109	1.96	0.254	9.94
Cadmium	ppb	1.1	2.827	ND	2.869	3.1	20.22
Chromium	ppb	8.8	536.6	4.6	544.8	5.8	5712
Copper	ppb	7.6	31.95	24.9	32.46	11.3	69.75
Lead	ppb	7.1	14.04	6.1	14.37	1.8	520.5
Nickel	ppb	9.4	231.3	ND	234.6	21.6	5568

TABLE 6-4

Chemical Specific ARARs Versus Maximum Contaminant Concentrations

SEDIMENT CLEANUP CRITERIA (1)

Quarry Lake Sediments

SS-OC-1 Organic Carbon = 1.68%

	AWQS/GV (µg/L) (2)	LOG Kow (3)	Kow	Sediment Criterion (µg/gOC) (4)	Site Specific Criterion (µg/kg) (5)	Maximum Conc. (µg/kg)
Methylene Chloride						
1,1-Dichloroethane						
1,2-Dichlororethene						
Trichloroethene	11	2.29	195	2	36	20
Benzene	6	2.13	135	1	14	1
4-Methyl-2-Pentanone						
2-Hexanone						
Tetrachloroethene	1	2.88	759	1	13	4
Xylenes						2
Carbon Disulfide						
1,2-Dichorobenzene	50	3.38	2,399	120	2,015	50
1,2,4-Trichlorobenzene	50	4.26	18,197	910	15,285	100
2-Methylnaphthalene						11
Acenaphthene	500	4.33	21,380	10,690	179,589	9
Dibenzofuran						5
Fluorene						11
Di-n-butylphthalate	3	5.2	158,489	475	7,988	87
Aroclor-1254	0.001	6.03	1,071,519	1	18	300
Phenanthrene						86
Anthracene						20
Fluoranthene						66
Pyrene						97
Butylbenzylphthalate						17
Di-n-octylphthalate	3	9.2	1,584,893,192	4,754,680	79,878,617	57
Benzo(b)Fluoranthene						110
Benzo(k)Fluoranthene						49
Benzo(a)Pyrene	0.0012	6.04	1,096,478	1	22	30
Indeno(1,2,3-cd)Pyrene						18

1. Based on "Cleanup Criteria for Aquatic Sediments" 1989. Criteria was calculated for nonpolar organic compounds.
2. AWQS/GV = Ambient Water Quality Standard/Guidance Value (Class D Stream)
3. EPA Treatability Manual, Vol. I, EPA 600/2/-82-001a, 1983.
4. Sediment Criterion = AWQS/GV x Kow x 0.001
5. Site Specific Criterion = Sediment Criterion x Organic Carbon x 1000

TABLE 6-4 (cont'd)
Chemical Specific ARARs Versus Maximum Contaminant Concentrations
SEDIMENT CLEANUP CRITERIA (1)
Stream Sediments

SS-OC-4 Organic Carbon = 5.09%

	AWQS/GV (μg/L) (2)	LOG Kow (3)	Kow	Sediment Criterion (μg/gOC) (4)	Site Specific Criterion (μg/kg) (5)	Maximum Conc. (μg/kg)
2-Butanone						21
Phenanthrene						170
Anthracene						27
Fluoranthene	3900	5.33	213,796	833,805	42,440,685	610
Pyrene						630
Benzo(a)Anthracene						300
Chrysene						360
Di-n-Octylphthalate	3	9.2	1,584,893,192	4,754,680	242,013,190	110
Benzo(b)Fluoranthene						440
Benzo(k)Fluoranthene						360
Benzo(a)Pyrene	0.0012	6.04	1,096,478	1	67	300

1. Based on "Cleanup Criteria for Aquatic Sediments" 1989. Criteria was calculated for nonpolar organic compounds.
2. AWQS/GV = Ambient Water Quality Standard/Guidance Value (Class C Stream)
3. EPA Treatability Manual, Vol. I, EPA 600/2/-82-001a, 1983.
4. Sediment Criterion = AWQS/GV x Kow x 0.001
5. Site Specific Criterion = Sediment Criterion x Organic Carbon x 1000

TABLE 7-1

POTENTIAL CHEMICALS OF CONCERN
FRONTIER CHEMICAL PENDELTON SITE

Compound	Surface Soil	Groundwater	Quarry Lake Water
Acenaphthene	X		
Acenaphthylene	X		
Acetone	X	X	
Aldrin	X		
Aluminum		X	
Anthracene	X		
Arochlor-1254	X		
Arochlor-1260	X		
Arsenic		X	
Barium		X	
Benzene	X	X	
Benzo(a)anthracene	X		
Benzo(b)fluoranthene	X		
Benzo(k)fluoranthene	X		
Benzo(g,h,i)perylene	X		
Benzo(a)pyrene	X		
Benzoic acid		X	
Benzyl alcohol		X	
2-Butanone	X	X	
Butylbenzylphthalate		X	
Cadmium	X	X	
Carbon disulfide	X		
4 Chloroaniline		X	
Chlorobenzene		X	
bis(2-Chloroethoxy)methane		X	
bis(2-Chloroethyl)ether		X	

TABLE 7-1 (Continued)

POTENTIAL CHEMICALS OF CONCERN
FRONTIER CHEMICAL PENDELTON SITE

Compound	Surface Soil	Groundwater	Quarry Lake Water
Chloroform		X	
Chromium	X	X	
Chrysene	X		
Cyanide		X	
Dibenzofuran	X		
Di-n-butylphthalate		X	X
1,2-Dichlorobenzene	X		
1,3-Dichlorobenzene	X		
1,4-Dichlorobenzene	X	X	
1,1-Dichloroethane		X	
1,2-Dichloroethane		X	
1,2-Dichloroethene (total)	X	X	X
2,4-Dimethylphenol	X	X	
Dimethylphthalate	X		
Di-n-octylphthalate	X		
Ethylbenzene	X	X	
bis(2-Ethylhexyl)phthalate	X	X	
Fluoranthene	X	X	
Fluorene	X		
2-Hexanone	X		
Ideno(1,2,3-cd)pyrene	X		
Iron		X	X
Isophorone	X	X	
Methylene cloride		X	
2-Methylnaphthalene	X	X	
4-Methyl-2-pentanone		X	

TABLE 7-1 (Continued)

POTENTIAL CHEMICALS OF CONCERN
FRONTIER CHEMICAL PENDELTON SITE

Compound	Surface Soil	Groundwater	Quarry Lake Water
2-Methylphenol		X	
4-Methylphenol		X	
Naphthalene	X	X	
Nickel		X	
Nitrobenzene	X	X	
n-Nitrosodiphenylamine	X		
Phenanthrene	X	X	
Phenol	X	X	
Phenols (total)	X	X	X
Potassium		X	
Pyrene	X	X	
Selenium		X	
Tetrachloroethene	X	X	
Toluene	X	X	X
1,2,4-Trichlorobenzene	X	X	
1,1,1-Trichloroethane		X	
Trichloroethene	X	X	
Vinyl chloride		X	
Xylenes (total)	X	X	
Zinc		X	

TABLE 7 - 2

Intake Values for Trespasser/User Contact With Chemicals Ingested from Surface Soil Contact

		Pathway #1 - Trespassers		Pathway #8 - Users	
PARAMETER	Exposure Concentration (ppm)	Non-Carcinogenic Intake (mg/kg-day)	Carcinogenic Intake (mg/kg-day)	Non-Carcinogenic Intake (mg/kg-day)	Carcinogenic Intake (mg/kg-day)
Acetone	0.012	1.17E-09		2.35E-09	
Carbon Disulfide	0.019	1.86E-09		3.72E-09	
1,2-Dichloroethene (Total)	3.058				
2-Butanone	0.010	9.78E-10		1.96E-09	
Trichloroethene	0.378		1.58E-08		3.17E-08
Benzene	0.225		9.42E-09		1.89E-08
2-Hexanone	0.001				
Tetrachloroethene	1.100	1.08E-07	4.61E-08	2.16E-07	9.23E-08
Toluene	6.100	5.97E-07		1.20E-06	
Ethylbenzene	0.530	5.18E-08		1.04E-07	
Total Xylenes	4.100	4.01E-07		8.04E-07	
Phenol	0.220	2.15E-08		4.31E-08	
1,3-Dichlorobenzene	0.099				
1,4-Dichlorobenzene	0.410	4.01E-08	1.72E-08	8.04E-08	3.44E-08
1,2-Dichlorobenzene	2.641	2.58E-07		5.18E-07	
Nitrobenzene	0.230	2.25E-08		4.51E-08	
Isophorone	0.041	4.01E-09	1.72E-09	8.04E-09	3.44E-09
2,4-Dimethylphenol	0.082	8.02E-09		1.61E-08	
1,2,4-Trichlorobenzene	1.134	1.11E-07		2.22E-07	
Naphthalene	0.190	1.86E-08		3.72E-08	
2-Methylnaphthalene	0.240				
Dimethylphthalate	0.007	6.85E-10		1.37E-09	
Acenaphthylene	0.130	1.27E-08		2.55E-08	
Acenaphthene	0.140	1.37E-08		2.74E-08	
Dibenzofuran	0.120				
Fluorene	0.250	2.45E-08		4.90E-08	
n-Nitrosodiphenylamine	0.538				
Phenanthrene	0.711				
Anthracene	0.270	2.64E-08		5.29E-08	
Fluoranthene	0.844	8.25E-08		1.65E-07	
Pyrene	1.157	1.13E-07		2.27E-07	
Benzo(a)anthracene	0.581		2.44E-08		4.88E-08
Chrysene	0.641		2.69E-08		5.38E-08
bis(2-Ethylhexyl)phthalate	8.337	8.15E-07	3.49E-07	1.63E-06	6.99E-07
Di-n-octylphthalate	0.370	3.62E-08		7.25E-08	
Benzo(b)fluoranthene	0.619		2.59E-08		5.19E-08
Benzo(k)fluoranthene	0.809		3.39E-08		6.79E-08
Benzo(a)pyrene	0.633		2.65E-08		5.31E-08
Indeno(1,2,3-cd)pyrene	0.240		1.01E-08		2.01E-08
Benzo(g,h,i)perylene	0.260	2.54E-08		5.10E-08	
Aldrin	0.012	1.17E-09	5.03E-10	2.35E-09	1.01E-09
Arochlor-1254	4.776		2.00E-07		4.01E-07
Arochlor-1260	1.299		5.44E-08		1.09E-07
Cadmium	85.265	8.34E-06		1.67E-05	
Chromium	2745.579	2.69E-04		5.38E-04	
Phenols (Total)	8.148	7.97E-07		1.60E-06	

TABLE 7 - 3

Absorbed Dose for Trespasser/User Contact With Chemicals Dermally Absorbed from Surface Soils

PARAMETER	Exposure Concentration (ppm)	Pathway #2 - Trespassers		Pathway #9 - Users	
		Non-Carcinogenic Absorbed Dose (mg/kg-day)	Carcinogenic Absorbed Dose (mg/kg-day)	Non-Carcinogenic Absorbed Dose (mg/kg-day)	Carcinogenic Absorbed Dose (mg/kg-day)
Acetone	0.012	2.12E-09		1.17E-08	
Carbon Disulfide	0.019	3.36E-09		1.86E-08	
1,2-Dichloroethene (Total)	3.058				
2-Butanone	0.010	1.77E-09		9.78E-09	
Trichloroethene	0.378		2.87E-08		1.58E-07
Benzene	0.225		1.71E-08		9.42E-08
2-Hexanone	0.001				
Tetrachloroethene	1.100	1.95E-07	8.35E-08	1.08E-06	4.61E-07
Toluene	6.100	1.08E-06		5.97E-06	
Ethylbenzene	0.530	9.38E-08		5.18E-07	
Total Xylenes	4.100	7.26E-07		4.01E-06	
Phenol	0.220	3.89E-08		2.15E-07	
1,3-Dichlorobenzene	0.099				
1,4-Dichlorobenzene	0.410	7.26E-08	3.11E-08	4.01E-07	1.72E-07
1,2-Dichlorobenzene	2.641	4.68E-07		2.58E-06	
Nitrobenzene	0.230	4.07E-08		2.25E-07	
Isophorone	0.041	7.26E-09	3.11E-09	4.01E-08	1.72E-08
2,4-Dimethylphenol	0.082	1.45E-08		8.02E-08	
1,2,4-Trichlorobenzene	1.134	2.01E-07		1.11E-06	
Naphthalene	0.190	3.36E-08		1.86E-07	
2-Methylnaphthalene	0.240				
Dimethylphthalate	0.007	1.24E-09		6.85E-09	
Acenaphthylene	0.130	2.30E-08		1.27E-07	
Acenaphthene	0.140	2.48E-08		1.37E-07	
Dibenzofuran	0.120				
Fluorene	0.250	4.43E-08		2.45E-07	
n-Nitrosodiphenylamine	0.538				
Phenanthrene	0.711				
Anthracene	0.270	4.78E-08		2.64E-07	
Fluoranthene	0.844	1.49E-07		8.25E-07	
Pyrene	1.157	2.05E-07		1.13E-06	
Benzo(a)anthracene	0.581		4.41E-08		2.44E-07
Chrysene	0.641		4.87E-08		2.69E-07
bis(2-Ethylhexyl)phthalate	8.337	1.48E-06	6.33E-07	8.15E-06	3.49E-06
Di-n-octylphthalate	0.370	6.55E-08		3.62E-07	
Benzo(b)fluoranthene	0.619		4.70E-08		2.59E-07
Benzo(k)fluoranthene	0.809		6.14E-08		3.39E-07
Benzo(a)pyrene	0.633		4.80E-08		2.65E-07
Indeno(1,2,3-cd)pyrene	0.240		1.82E-08		1.01E-07
Benzo(g,h,i)perylene	0.260	4.60E-08		2.54E-07	
Aldrin	0.012	2.12E-09	9.11E-10	1.17E-08	5.03E-09
Arochlor-1254	4.776		3.63E-07		2.00E-06
Arochlor-1260	1.299		9.86E-08		5.44E-07
Cadmium	85.265	1.51E-05		8.34E-05	
Chromium	2745.579	4.86E-04		2.69E-03	
Phenols (Total)	8.148	1.44E-06		7.97E-06	

TABLE 7 - 4

Absorbed Dose for Trespasser/User Dermal Contact With Chemicals in Shallow Groundwater

			Pathway #3 - Trespassers		Pathway #10 - Users	
	Exposure	Dermal	Non-Carcinogenic	Carcinogenic	Non-Carcinogenic	Carcinogenic
	Concentration	Perm. Coeff.	Absorbed Dose	Absorbed Dose	Absorbed Dose	Absorbed Dose
PARAMETER	(ppm)	(cm/hr)	(mg/kg-day)	(mg/kg-day)	(mg/kg-day)	(mg/kg-day)
Vinyl Chloride	2.400	8.00E-04		1.71E-06		3.32E-06
Methylene Chloride	1.705	8.00E-04	2.84E-06	1.21E-06	5.50E-06	2.36E-06
Acetone	15.330	8.00E-04	2.55E-05		4.94E-05	
1,1-Dichloroethane	1.200	8.00E-04	2.00E-06		3.87E-06	
1,2-Dichloroethene (Total)	16.538	8.00E-04				
Chloroform	0.704	8.00E-04	1.17E-06		2.27E-06	
1,2-Dichloroethane	76.790	8.00E-04	1.28E-04	5.47E-05	2.48E-04	1.06E-04
2-Butanone	0.140	5.00E+00	1.46E-03		2.82E-03	
1,1,1-Trichloroethane	1.287	8.00E-04	2.14E-06		4.15E-06	
Trichloroethene	11.860	8.00E-04		8.44E-06		1.64E-05
Benzene	3.879	4.10E-01		1.42E-03		2.75E-03
4-Methyl-2-Pentanone	3.139	8.00E-04				
Tetrachloroethene	0.001	8.00E-04	1.66E-09	7.12E-10	3.22E-09	1.38E-09
Toluene	84.190	9.00E-04	1.58E-04		3.05E-04	
Chlorobenzene	0.150	8.00E-04	2.50E-07		4.84E-07	
Ethylbenzene	0.420	1.00E-03	8.74E-07		1.69E-06	
Total Xylenes	2.038	8.00E-04	3.39E-06		6.57E-06	
Phenol	5.433	8.22E-02	9.29E-04		1.80E-03	
bis(2-Chloroethyl)ether	0.034	8.00E-04				
1,4-Dichlorobenzene	0.001	8.00E-04	1.16E-09	4.98E-10	2.26E-09	9.69E-10
Benzyl Alcohol	0.067	8.00E-04	1.11E-07		2.15E-07	
2-Methylphenol	0.329	1.57E-01	1.08E-04		2.08E-04	
4-Methylphenol	1.263	1.75E-01	4.60E-04		8.91E-04	
Nitrobenzene	0.108	8.00E-04	1.80E-07		3.50E-07	
Isophorone	0.000	8.00E-04	4.66E-11	1.99E-11	9.03E-11	3.88E-11

TABLE 7 - 4 (continued)

	Exposure Concentration (ppm)	Dermal Perm. Coeff. (cm/hr)	Pathway #3 - Trespassers		Pathway #10 - Users	
			Non-Carcinogenic	Carcinogenic	Non-Carcinogenic	Carcinogenic
			Absorbed Dose (mg/kg-day)	Absorbed Dose (mg/kg-day)	Absorbed Dose (mg/kg-day)	Absorbed Dose (mg/kg-day)
2,4-Dimethylphenol	0.021	8.00E-04	3.44E-08		6.66E-08	
Benzoic Acid	0.381	8.00E-04	6.34E-07		1.23E-06	
Bis(2-chloroethoxy)methane	0.043	8.00E-04				
1,2,4-Trichlorobenzene	0.000	8.00E-04	6.66E-10		1.29E-09	
Naphthalene	0.113	8.00E-04	1.87E-07		3.63E-07	
4-Chloroaniline	0.008	8.00E-04	1.33E-08		2.58E-08	
2-Methylnaphthalene	0.006	8.00E-04				
Phenanthrene	0.001	8.00E-04				
Di-n-butylphthalate	0.003	8.00E-04	4.99E-09		9.67E-09	
Fluoranthene	0.001	8.00E-04	9.98E-10		1.93E-09	
Pyrene	0.001	8.00E-04	1.33E-09		2.58E-09	
Butylbenzylphthalate	0.002	8.00E-04	3.33E-09		6.45E-09	
bis(2-Ethylhexyl)phthalate	0.022	8.00E-04	3.74E-08	1.60E-08	7.25E-08	3.11E-08
Aluminum	3.484	7.20E-06				
Arsenic	0.019	8.00E-04	3.21E-08		6.22E-08	
Barium	0.128	8.00E-04	2.13E-07		4.13E-07	
Cadmium	0.008	8.00E-04	1.25E-08		2.43E-08	
Chromium	75.217	8.00E-04	1.25E-04		2.42E-04	
Iron	8.795	8.00E-04				
Nickel	0.150	8.00E-04	2.50E-07		4.85E-07	
Potassium	43.968	6.70E-05				
Selenium	0.003	8.00E-04	4.83E-09		9.35E-09	
Zinc	0.062	8.00E-04	1.03E-07		1.99E-07	
Cyanide	0.758	8.00E-04	1.26E-06		2.44E-06	
Phenols (Total)	27.529	6.10E-01	3.49E-02		6.77E-02	

TABLE 7 -5

Intake for Inhalation of Vapor Phase Chemicals by Trespassers

PARAMETER	Mass Fraction of Contaminant Emissions(ppm)	Emission Rate of Contaminant (mg/s)	Airborne Receptor Concentrations (mg/m3)	Pathway #4 - Trespassers	
				Non-Carcinogenic Intake (mg/kg-day)	Carcinogenic Intake (mg/kg-day)
Vinyl Chloride	2.400	1.62E-05	1.48E-06		7.01E-10
Methylene Chloride	1.705	1.04E-05	9.46E-07	1.05E-09	4.50E-10
Acetone	15.330	1.06E-04	9.66E-06	1.07E-08	
1,1-Dichloroethane	1.200	6.96E-06	6.33E-07	7.02E-10	
1,2-Dichloroethene (Total)	16.538	9.66E-05	8.78E-06		
Chloroform	0.704	3.84E-06	3.49E-07		1.66E-10
1,2-Dichloroethane	76.790	4.45E-04	4.05E-05	4.49E-08	1.92E-08
2-Butanone	0.140	9.03E-07	8.21E-08	9.11E-11	
1,1,1-Trichloroethane	1.287	6.75E-06	6.14E-07	6.82E-10	
Trichloroethene	11.860	6.26E-05	5.69E-06		2.70E-09
Benzene	3.879	2.44E-05	2.21E-06		1.05E-09
4-Methyl-2-Pentanone	3.139	1.81E-05	1.65E-06		
Tetrachloroethene	0.001	4.88E-09	4.44E-10		2.11E-13
Toluene	84.190	5.00E-04	4.55E-05	5.05E-08	
Chlorobenzene	0.150	8.33E-07	7.58E-08	8.41E-11	
Ethylbenzene	0.420	2.38E-06	2.16E-07		
Total Xylenes	2.038	1.15E-05	1.05E-06	1.17E-09	
Phenol	5.433	3.21E-05	2.91E-06		
bis(2-Chloroethyl)ether	0.034	1.73E-07	1.58E-08		
1,4-Dichlorobenzene	0.001	3.56E-09	3.23E-10		
Benzyl Alcohol	0.067	3.76E-07	3.42E-08		
2-Methylphenol	0.329	1.85E-06	1.69E-07		
4-Methylphenol	1.263	7.11E-06	6.47E-07		
Nitrobenzene	0.108	5.85E-07	5.32E-08	5.90E-11	
Isophorone	0.000	1.45E-10	1.32E-11		

TABLE 7 -5 (con't)

Intake for Inhalation of Vapor Phase Chemicals by Trespassers

	Mass Fraction of Contaminant Emissions(ppm)	Emission Rate of Contaminant (mg/s)	Airborne Receptor Concentrations (mg/m3)	Pathway #4 - Trespassers	
				Non-Carcinogenic Intake (mg/kg-day)	Carcinogenic Intake (mg/kg-day)
2,4-Dimethylphenol	0.021	1.12E-07	1.01E-08		
Benzoic Acid	0.381	2.06E-06	1.87E-07		
Bis(2-chloroethoxy)methane	0.043	2.07E-07	1.88E-08		
1,2,4-Trichlorobenzene	0.000	1.89E-09	1.72E-10	1.91E-13	
Naphthalene	0.113	5.99E-07	5.44E-08		
4-Chloroaniline	0.008	4.26E-08	3.87E-09		
2-Methylnaphthalene	0.006	3.08E-08	2.80E-09		
Phenanthrene	0.001	4.76E-09	4.33E-10		
Di-n-butylphthalate	0.003	1.23E-08	1.12E-09		
Fluoranthene	0.001	2.74E-09	2.49E-10		
Pyrene	0.001	3.65E-09	3.32E-10		
Butylbenzylphthalate	0.002	7.90E-09	7.18E-10		
bis(2-Ethylhexyl)phthalate	0.022	8.23E-08	7.48E-09		
Aluminum	3.484	0.00E+00	0.00E+00		
Arsenic	0.019	0.00E+00	0.00E+00		0.00E+00
Barium	0.128	0.00E+00	0.00E+00	0.00E+00	
Cadmium	0.008	0.00E+00	0.00E+00		0.00E+00
Chromium	75.217	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	8.795	0.00E+00	0.00E+00		
Nickel	0.150	0.00E+00	0.00E+00		0.00E+00
Potassium	43.968	0.00E+00	0.00E+00		
Selenium	0.003	0.00E+00	0.00E+00	0.00E+00	
Zinc	0.062	0.00E+00	0.00E+00		
Cyanide	0.758	0.00E+00	0.00E+00		
Phenols (Total)	27.529	0.00E+00	0.00E+00		

TABLE 7 - 6

Intake for Inhalation of Vapor Phase Chemicals by Residents

PARAMETER	Mass Fraction of Contaminant Emissions(ppm)	Emission Rate of Contaminant (mg/s)	Airborne Receptor Concentrations (mg/m3)	Pathway #5 - Residents	
				Non-Carcinogenic Intake (mg/kg-day)	Carcinogenic Intake (mg/kg-day)
Vinyl Chloride	2.400	1.62E-05	2.67E-08		1.09E-09
Methylene Chloride	1.705	1.04E-05	1.71E-08	1.64E-09	7.02E-10
Acetone	15.330	1.06E-04	1.75E-07	1.68E-08	
1,1-Dichloroethane	1.200	6.96E-06	1.14E-08	1.10E-09	
1,2-Dichloroethene (Total)	16.538	9.66E-05	1.59E-07		
Chloroform	0.704	3.84E-06	6.31E-09		2.59E-10
1,2-Dichloroethane	76.790	4.45E-04	7.32E-07	7.03E-08	3.00E-08
2-Butanone	0.140	9.03E-07	1.48E-09	1.43E-10	
1,1,1-Trichloroethane	1.287	6.75E-06	1.11E-08	1.07E-09	
Trichloroethene	11.860	6.26E-05	1.03E-07		4.22E-09
Benzene	3.879	2.44E-05	4.01E-08		1.64E-09
4-Methyl-2-Pentanone	3.139	1.81E-05	2.98E-08		
Tetrachloroethene	0.001	4.88E-09	8.02E-12		3.29E-13
Toluene	84.190	5.00E-04	8.22E-07	7.90E-08	
Chlorobenzene	0.150	8.33E-07	1.37E-09	1.32E-10	
Ethylbenzene	0.420	2.38E-06	3.91E-09		
Total Xylenes	2.038	1.15E-05	1.90E-08	1.82E-09	
Phenol	5.433	3.21E-05	5.27E-08		
bis(2-Chloroethyl)ether	0.034	1.73E-07	2.85E-10		
1,4-Dichlorobenzene	0.001	3.56E-09	5.85E-12		
Benzyl Alcohol	0.067	3.76E-07	6.19E-10		
2-Methylphenol	0.329	1.85E-06	3.05E-09		
4-Methylphenol	1.263	7.11E-06	1.17E-08		
Nitrobenzene	0.108	5.85E-07	9.61E-10	9.23E-11	
Isophorone	0.000	1.45E-10	2.39E-13		

TABLE 7 - 6 (con't)

Intake for Inhalation of Vapor Phase Chemicals by Residents

				Pathway #5 - Residents	
	Mass Fraction of Contaminant Emissions(ppm)	Emission Rate of Contaminant (mg/s)	Airborne Receptor Concentrations (mg/m3)	Non-Carcinogenic Intake (mg/kg-day)	Carcinogenic Intake (mg/kg-day)
2,4-Dimethylphenol	0.021	1.12E-07	1.83E-10		
Benzoic Acid	0.381	2.06E-06	3.39E-09		
Bis(2-chloroethoxy)methane	0.043	2.07E-07	3.40E-10		
1,2,4-Trichlorobenzene	0.000	1.89E-09	3.11E-12	2.99E-13	
Naphthalene	0.113	5.99E-07	9.84E-10		
4-Chloroaniline	0.008	4.26E-08	7.01E-11		
2-Methylnaphthalene	0.006	3.08E-08	5.07E-11		
Phenanthrene	0.001	4.76E-09	7.83E-12		
Di-n-butylphthalate	0.003	1.23E-08	2.02E-11		
Fluoranthene	0.001	2.74E-09	4.50E-12		
Pyrene	0.001	3.65E-09	6.01E-12		
Butylbenzylphthalate	0.002	7.90E-09	1.30E-11		
bis(2-Ethylhexyl)phthalate	0.022	8.23E-08	1.35E-10		
Aluminum	3.484	0.00E+00	0.00E+00		
Arsenic	0.019	0.00E+00	0.00E+00		0.00E+00
Barium	0.128	0.00E+00	0.00E+00	0.00E+00	
Cadmium	0.008	0.00E+00	0.00E+00		0.00E+00
Chromium	75.217	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	8.795	0.00E+00	0.00E+00		
Nickel	0.150	0.00E+00	0.00E+00		0.00E+00
Potassium	43.968	0.00E+00	0.00E+00		
Selenium	0.003	0.00E+00	0.00E+00	0.00E+00	
Zinc	0.062	0.00E+00	0.00E+00		
Cyanide	0.758	0.00E+00	0.00E+00		
Phenols (Total)	27.529	0.00E+00	0.00E+00		

TABLE 7 - 7

Respirable Intake for Trespasser Inhalation of Fugitive Dust Emissions

				Pathway #6 - Trespassers	
	Mass Fraction of Contaminant	Emission Rate of Contaminant	Airborne Receptor Concentrations	Non-carcinogenic Intake	Carcinogenic Intake
PARAMETER	Emissions (ppm)	(mg/hr)	(mg/m3)	(mg/kg-day)	(mg/kg-day)
Acetone	0.012	1.92E-01	6.35E-10	1.27E-12	
Carbon Disulfide	0.019	3.04E-01	1.00E-09	2.01E-12	
1,2-Dichloroethene (Total)	3.058	4.89E+01	1.62E-07		
2-Butanone	0.010	1.60E-01	5.29E-10	1.06E-12	
Trichloroethene	0.378	6.05E+00	2.00E-08		1.78E-11
Benzene	0.225	3.60E+00	1.19E-08		1.06E-11
2-Hexanone	0.001	1.60E-02	5.29E-11		
Tetrachloroethene	1.100	1.76E+01	5.82E-08		5.17E-11
Toluene	6.100	9.76E+01	3.23E-07	6.45E-10	
Ethylbenzene	0.530	8.48E+00	2.80E-08		
Total Xylenes	4.100	6.56E+01	2.17E-07	4.34E-10	
Phenol	0.220	3.52E+00	1.16E-08		
1,3-Dichlorobenzene	0.099	1.58E+00	5.23E-09		
1,4-Dichlorobenzene	0.410	6.56E+00	2.17E-08		
1,2-Dichlorobenzene	2.641	4.23E+01	1.40E-07	2.79E-10	
Nitrobenzene	0.230	3.68E+00	1.22E-08	2.43E-11	
Isophorone	0.041	6.56E-01	2.17E-09		
2,4-Dimethylphenol	0.082	1.31E+00	4.34E-09		
1,2,4-Trichlorobenzene	1.134	1.82E+01	6.00E-08	1.20E-10	
Naphthalene	0.190	3.04E+00	1.00E-08		
2-Methylnaphthalene	0.240	3.84E+00	1.27E-08		
Dimethylphthalate	0.007	1.12E-01	3.70E-10		
Acenaphthylene	0.130	2.08E+00	6.87E-09		
Acenaphthene	0.140	2.24E+00	7.40E-09		
Dibenzofuran	0.120	1.92E+00	6.35E-09		
Fluorene	0.250	4.00E+00	1.32E-08		
n-Nitrosodiphenylamine	0.538	8.61E+00	2.85E-08		
Phenanthrene	0.711	1.14E+01	3.76E-08		
Anthracene	0.270	4.32E+00	1.43E-08		
Fluoranthene	0.844	1.35E+01	4.46E-08		
Pyrene	1.157	1.85E+01	6.12E-08		
Benzo(a)anthracene	0.581	9.31E+00	3.07E-08		2.73E-11
Chrysene	0.641	1.03E+01	3.39E-08		3.01E-11
bis(2-Ethylhexyl)phthalate	8.337	1.33E+02	4.41E-07		
Di-n-octylphthalate	0.370	5.92E+00	1.96E-08		
Benzo(b)fluoranthene	0.619	9.91E+00	3.27E-08		2.91E-11
Benzo(k)fluoranthene	0.809	1.29E+01	4.28E-08		3.80E-11
Benzo(a)pyrene	0.633	1.01E+01	3.35E-08		2.97E-11
Indeno(1,2,3-cd)pyrene	0.240	3.84E+00	1.27E-08		1.13E-11
Benzo(g,h,i)perylene	0.260	4.16E+00	1.37E-08		
Aldrin	0.012	1.92E-01	6.35E-10		5.64E-13
Arochlor-1254	4.776	7.64E+01	2.53E-07		
Arochlor-1260	1.299	2.08E+01	6.87E-08		
Cadmium	85.265	1.36E+03	4.51E-06		4.01E-09
Chromium	2745.579	4.39E+04	1.45E-04	2.90E-07	
Phenols (Total)	8.148	1.30E+02	4.31E-07		

TABLE 7 - 8

Respirable Intake for Resident Inhalation of Fugitive Dust Emissions

PARAMETER	Mass Fraction of Contaminant Emissions (ppm)	Emission Rate of Contaminant (mg/hr)	Airborne Receptor Concentrations (mg/m3)	Pathway #1 - Residents: Non-carcinogenic Intake (mg/kg-day)	Pathway #1 - Residents: Carcinogenic Intake (mg/kg-day)
Acetone	0.012	1.92E-01	6.05E-10	1.10E-10	
Carbon Disulfide	0.019	3.04E-01	9.58E-10	1.74E-10	
1,2-Dichloroethene (Total)	3.058	4.89E+01	1.54E-07		
2-Butanone	0.010	1.60E-01	5.04E-10	9.16E-11	
Trichloroethene	0.378	6.05E+00	1.91E-08		1.48E-09
Benzene	0.225	3.60E+00	1.13E-08		8.82E-10
2-Hexanone	0.001	1.60E-02	5.04E-11		
Tetrachloroethene	1.100	1.76E+01	5.54E-08		4.31E-09
Toluene	6.100	9.76E+01	3.07E-07	5.59E-08	
Ethylbenzene	0.530	8.48E+00	2.67E-08		
Total Xylenes	4.100	6.56E+01	2.07E-07	3.76E-08	
Phenol	0.220	3.52E+00	1.11E-08		
1,3-Dichlorobenzene	0.099	1.58E+00	4.99E-09		
1,4-Dichlorobenzene	0.410	6.56E+00	2.07E-08		
1,2-Dichlorobenzene	2.641	4.23E+01	1.33E-07	2.42E-08	
Nitrobenzene	0.230	3.68E+00	1.16E-08	2.11E-09	
Isophorone	0.041	6.56E-01	2.07E-09		
2,4-Dimethylphenol	0.082	1.31E+00	4.13E-09		
1,2,4-Trichlorobenzene	1.134	1.82E+01	5.72E-08	1.04E-08	
Naphthalene	0.190	3.04E+00	9.58E-09		
2-Methylnaphthalene	0.240	3.84E+00	1.21E-08		
Dimethylphthalate	0.007	1.12E-01	3.53E-10		
Acenaphthylene	0.130	2.08E+00	6.55E-09		
Acenaphthene	0.140	2.24E+00	7.06E-09		
Dibenzofuran	0.120	1.92E+00	6.05E-09		
Fluorene	0.250	4.00E+00	1.26E-08		
n-Nitrosodiphenylamine	0.538	8.61E+00	2.71E-08		
Phenanthrene	0.711	1.14E+01	3.58E-08		
Anthracene	0.270	4.32E+00	1.36E-08		
Fluoranthene	0.844	1.35E+01	4.25E-08		
Pyrene	1.157	1.85E+01	5.83E-08		
Benzo(a)anthracene	0.581	9.31E+00	2.93E-08		2.28E-09
Chrysene	0.641	1.03E+01	3.23E-08		2.51E-09
bis(2-Ethylhexyl)phthalate	8.337	1.33E+02	4.20E-07		
Di-n-octylphthalate	0.370	5.92E+00	1.87E-08		
Benzo(b)fluoranthene	0.619	9.91E+00	3.12E-08		2.43E-09
Benzo(k)fluoranthene	0.809	1.29E+01	4.08E-08		3.17E-09
Benzo(a)pyrene	0.633	1.01E+01	3.19E-08		2.48E-09
Indeno(1,2,3-cd)pyrene	0.240	3.84E+00	1.21E-08		9.41E-10
Benzo(g,h,i)perylene	0.260	4.16E+00	1.31E-08		
Aldrin	0.012	1.92E-01	6.05E-10		4.71E-11
Arochlor-1254	4.776	7.64E+01	2.41E-07		
Arochlor-1260	1.299	2.08E+01	6.55E-08		
Cadmium	85.265	1.36E+03	4.30E-06		3.34E-07
Chromium	2745.579	4.39E+04	1.38E-04	2.51E-05	
Phenols (Total)	8.148	1.30E+02	4.11E-07		

TABLE 7 - 9

Intake for Inhalation of Vapor Phase Chemicals by Users

PARAMETER	Mass Fraction of Contaminant Emissions(ppm)	Emission Rate of Contaminant (mg/s)	Airborne Receptor Concentrations (mg/m3)	Pathway #11 - Users	
				Non-Carcinogenic Intake (mg/kg-day)	Carcinogenic Intake (mg/kg-day)
Vinyl Chloride	2.400	1.62E-05	1.48E-06		2.73E-09
Methylene Chloride	1.705	1.04E-05	9.46E-07	4.08E-09	1.75E-09
Acetone	15.330	1.06E-04	9.66E-06	4.17E-08	
1,1-Dichloroethane	1.200	6.96E-06	6.33E-07	2.73E-09	
1,2-Dichloroethene (Total)	16.538	9.66E-05	8.78E-06		
Chloroform	0.704	3.84E-06	3.49E-07		6.45E-10
1,2-Dichloroethane	76.790	4.45E-04	4.05E-05	1.75E-07	7.49E-08
2-Butanone	0.140	9.03E-07	8.21E-08	3.54E-10	
1,1,1-Trichloroethane	1.287	6.75E-06	6.14E-07	2.65E-09	
Trichloroethene	11.860	6.26E-05	5.69E-06		1.05E-08
Benzene	3.879	2.44E-05	2.21E-06		4.10E-09
4-Methyl-2-Pentanone	3.139	1.81E-05	1.65E-06		
Tetrachloroethene	0.001	4.88E-09	4.44E-10		8.21E-13
Toluene	84.190	5.00E-04	4.55E-05	1.96E-07	
Chlorobenzene	0.150	8.33E-07	7.58E-08	3.27E-10	
Ethylbenzene	0.420	2.38E-06	2.16E-07		
Total Xylenes	2.038	1.15E-05	1.05E-06	4.52E-09	
Phenol	5.433	3.21E-05	2.91E-06		
bis(2-Chloroethyl)ether	0.034	1.73E-07	1.58E-08		
1,4-Dichlorobenzene	0.001	3.56E-09	3.23E-10		
Benzyl Alcohol	0.067	3.76E-07	3.42E-08		
2-Methylphenol	0.329	1.85E-06	1.69E-07		
4-Methylphenol	1.263	7.11E-06	6.47E-07		
Nitrobenzene	0.108	5.85E-07	5.32E-08	2.29E-10	
Isophorone	0.000	1.45E-10	1.32E-11		

TABLE 7 - 9 (con't)
Intake for Inhalation of Vapor Phase Chemicals by Users

				Pathway #11 - Users	
	Mass Fraction of Contaminant Emissions(ppm)	Emission Rate of Contaminant (mg/s)	Airborne Receptor Concentrations (mg/m3)	Non-Carcinogenic Intake (mg/kg-day)	Carcinogenic Intake (mg/kg-day)
2,4-Dimethylphenol	0.021	1.12E-07	1.01E-08		
Benzoic Acid	0.381	2.06E-06	1.87E-07		
Bis(2-chloroethoxy)methane	0.043	2.07E-07	1.88E-08		
1,2,4-Trichlorobenzene	0.000	1.89E-09	1.72E-10	7.42E-13	
Naphthalene	0.113	5.99E-07	5.44E-08		
4-Chloroaniline	0.008	4.26E-08	3.87E-09		
2-Methylnaphthalene	0.006	3.08E-08	2.80E-09		
Phenanthrene	0.001	4.76E-09	4.33E-10		
Di-n-butylphthalate	0.003	1.23E-08	1.12E-09		
Fluoranthene	0.001	2.74E-09	2.49E-10		
Pyrene	0.001	3.65E-09	3.32E-10		
Butylbenzylphthalate	0.002	7.90E-09	7.18E-10		
bis(2-Ethylhexyl)phthalate	0.022	8.23E-08	7.48E-09		
Aluminum	3.484	0.00E+00	0.00E+00		
Arsenic	0.019	0.00E+00	0.00E+00		0.00E+00
Barium	0.128	0.00E+00	0.00E+00	0.00E+00	
Cadmium	0.008	0.00E+00	0.00E+00		0.00E+00
Chromium	75.217	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	8.795	0.00E+00	0.00E+00		
Nickel	0.150	0.00E+00	0.00E+00		0.00E+00
Potassium	43.968	0.00E+00	0.00E+00		
Selenium	0.003	0.00E+00	0.00E+00	0.00E+00	
Zinc	0.062	0.00E+00	0.00E+00		
Cyanide	0.758	0.00E+00	0.00E+00		
Phenols (Total)	27.529	0.00E+00	0.00E+00		

TABLE 7 - 10

Respirable Intake Concentrations for User Inhalation of Fugitive Dust Emissions

PARAMETER	Mass Fraction of Contaminant Emissions (ppm)	Emission Rate of Contaminant (mg/hr)	Airborne Receptor Concentrations (mg/m3)	Pathway #12 - Users	
				Non-carcinogenic Intake (mg/kg-day)	Carcinogenic Intake (mg/kg-day)
Acetone	0.012	1.92E-01	6.35E-10	5.27E-12	
Carbon Disulfide	0.019	3.05E-01	1.01E-09	8.35E-12	
1,2-Dichloroethene (Total)	3.058	4.90E+01	1.62E-07		
2-Butanone	0.010	1.60E-01	5.30E-10	4.39E-12	
Trichloroethene	0.378	6.06E+00	2.00E-08		7.13E-11
Benzene	0.225	3.60E+00	1.19E-08		4.24E-11
2-Hexanone	0.001	1.60E-02	5.30E-11		
Tetrachloroethene	1.100	1.76E+01	5.82E-08		2.07E-10
Toluene	6.100	9.78E+01	3.23E-07	2.68E-09	
Ethylbenzene	0.530	8.49E+00	2.81E-08		
Total Xylenes	4.100	6.57E+01	2.17E-07	1.80E-09	
Phenol	0.220	3.53E+00	1.16E-08		
1,3-Dichlorobenzene	0.099	1.59E+00	5.24E-09		
1,4-Dichlorobenzene	0.410	6.57E+00	2.17E-08		
1,2-Dichlorobenzene	2.641	4.23E+01	1.40E-07	1.16E-09	
Nitrobenzene	0.230	3.69E+00	1.22E-08	1.01E-10	
Isophorone	0.041	6.57E-01	2.17E-09		
2,4-Dimethylphenol	0.082	1.31E+00	4.34E-09		
1,2,4-Trichlorobenzene	1.134	1.82E+01	6.01E-08	4.99E-10	
Naphthalene	0.190	3.05E+00	1.01E-08		
2-Methylnaphthalene	0.240	3.85E+00	1.27E-08		
Dimethylphthalate	0.007	1.12E-01	3.71E-10		
Acenaphthylene	0.130	2.08E+00	6.88E-09		
Acenaphthene	0.140	2.24E+00	7.41E-09		
Dibenzofuran	0.120	1.92E+00	6.35E-09		
Fluorene	0.250	4.01E+00	1.32E-08		
n-Nitrosodiphenylamine	0.538	8.62E+00	2.85E-08		
Phenanthrene	0.711	1.14E+01	3.76E-08		
Anthracene	0.270	4.33E+00	1.43E-08		
Fluoranthene	0.844	1.35E+01	4.47E-08		
Pyrene	1.157	1.85E+01	6.12E-08		
Benzo(a)anthracene	0.581	9.32E+00	3.08E-08		1.10E-10
Chrysene	0.641	1.03E+01	3.40E-08		1.21E-10
bis(2-Ethylhexyl)phthalate	8.337	1.34E+02	4.41E-07		
Di-n-octylphthalate	0.370	5.93E+00	1.96E-08		
Benzo(b)fluoranthene	0.619	9.92E+00	3.28E-08		1.17E-10
Benzo(k)fluoranthene	0.809	1.30E+01	4.28E-08		1.52E-10
Benzo(a)pyrene	0.633	1.01E+01	3.35E-08		1.19E-10
Indeno(1,2,3-cd)pyrene	0.240	3.85E+00	1.27E-08		4.52E-11
Benzo(g,h,i)perylene	0.260	4.17E+00	1.38E-08		
Aldrin	0.012	1.92E-01	6.35E-10		2.26E-12
Arochlor-1254	4.776	7.66E+01	2.53E-07		
Arochlor-1260	1.299	2.08E+01	6.88E-08		
Cadmium	85.265	1.37E+03	4.51E-06		1.61E-08
Chromium	2745.579	4.40E+04	1.45E-04	1.21E-06	
Phenols (Total)	8.148	1.31E+02	4.31E-07		

TABLE 7 - 11

Absorbed Dose/Intake for Swimmers (Users) Via Dermal Contact with and Ingestion of Lakewater

			Dermal Contact		Ingestion	
			Pathway #14 - Users		Pathway #13 - Users	
	Exposure	Dermal	Non-Carcinogenic	Carcinogenic	Non-Carcinogenic	Carcinogenic
	Concentration	Perm. Coeff.	Absorbed Dose	Absorbed Dose	Intake	Intake
PARAMETER	(ppm)	(cm/hr)	(mg/kg-day)	(mg/kg-day)	(mg/kg-day)	(mg/kg-day)
1,2-Dichloroethene (Total)	0.004	8.00E-04				
Toluene	0.004	9.00E-04	3.66E-08		1.05E-07	
Di-n-butylphthalate	0.0004	8.00E-04	3.39E-09		1.10E-08	
Iron	1.301	8.00E-04				
Phenols (Total)	0.021	6.01E-01	1.35E-04		5.81E-07	

TABLE 7-12: Carcinogenic Dose-Response Information

FRACTION	COMPOUND	WEIGHT OF EVIDENCE		SLOPE FACTOR [mg/kg/day]-1		TARGET ORGAN	REFERENCES
		Inhal.	Oral	Inhal.	Oral	Inhal/Oral	
VOC's	Benzene	A	A	2.90E-02	2.90E-02	Blood/Blood	IRIS
	Bis(2-chloroethyl)ether	B2	B2	1.10E+00	1.10E+00		
	Chloroform	B2	B2	8.10E-02	6.10E-03	Liver/Kidney	IRIS
	1,1-Dichloroethane	C	C	ND	ND		
	1,2-Dichloroethane	B2	B2	9.10E-02	9.10E-02	Blood/Blood	IRIS
	1,1-Dichloroethene	C	C	1.20E+00	6.00E-01	Kidney	ATSDR(1989)
	Methylene Chloride	B2	B2	1.65E-03	7.50E-03	Lung/Liver	IRIS
	Tetrachloroethene	B2	B2	3.31E-03	5.10E-02	Liver/Liver	ATSDR(1988)*
	Trichloroethene	B2	B2	1.70E-02	1.10E-02	Lung/Liver	IRIS
	Vinyl Chloride	A	A	2.95E-01	2.30E+00	Liver/Lung	IRIS
SEMI-VOC's	Benzo(a)pyrene	B2	B2	6.10E+00	1.15E+01	Lung/Skin	EPA(1986)
	Benzo(b)fluoranthene	B2	B2	6.10E+00	1.15E+01	Lung/Skin	EPA(1986)
	Benzo(k)fluoranthene	B2	B2	6.10E+00	1.15E+01	Lung/Skin	EPA(1986)
	Benzo(a)anthracene	B2	B2	6.10E+00	1.15E+01	Lung/Skin	EPA(1986)
	bis(2-ethylhexyl)phthalate	B2	B2		1.40E-02	/Liver	IRIS
	Butyl benzyl phthalate		C		ND		
	Chrysene	B2	B2	6.10E+00	1.15E+01	Lung/Skin	EPA(1986)
	Dibenzo(a,h)anthracene	B2	B2	6.10E+00	1.15E+01	Lung/Skin	EPA(1986)
	1,4-Dichlorobenzene	B2	B2		2.40E-02	/Liver	IRIS
	Indeno(1,2,3-c,d)pyrene	C	C	6.10E+00	1.15E+01	Lung/Skin	EPA(1986)
	2-methylphenol	C	C	ND	ND		
	4-methylphenol	C	C	ND	ND		
PESTICIDE/ PCB's	Aldrin	B2	B2	1.70E+01	1.70E+01	Liver/Liver	IRIS
	Aroclor-1254	B2	B2		7.70E+00	/Liver	IRIS
	Aroclor-1260	B2	B2		7.70E+00	/Liver	IRIS
	Isophorone	C	C		4.10E-03		
INORGANICS	Arsenic	A	A	5.00E+01	ND	Lungs/Skin	IRIS
	Cadmium	B1		6.10E+00		Lungs/	IRIS
	Chromium(VI)	A		4.10E+01		Lungs/	IRIS
	Nickel	A		8.40E-01		Lungs/	IRIS

ATSDR, Agency for Toxic Substances and Disease Registry, Toxicological Profiles

IRIS, Integrated Risk Information System

EPA(1986), Superfund Public Health Evaluation Manual

GI, Gastrointestinal, (ie, mouth, stomach, intestines)

ND, Not Determined

TABLE 7-13: Non-Carcinogenic Chronic Dose-Response Information

FRACTION	COMPOUND	RfD [mg/kg/day] (Potency Measure) Inhal	Oral	AFFECTED ORGAN Inhal/Oral	REFERENCES
VOC's	Acetone	3.00E+00	1.00E-01	Liver/Kidney	EPA(1986)
	2-Butanone (MEK)	9.00E-02	5.00E-02	CNS/Fetus	HEAST
	bis(2-Chloroethoxy)methane				
	Carbon Disulfide	1.00E-02	1.00E-01		EPA(1986)
	Chlorobenzene	5.00E-03	2.00E-02	Liver&Kidney/"	IRIS
	Chloroform		1.00E-02	/Liver	IRIS
	1,1-Dichloroethane	1.00E-01	1.00E-01		
	1,2-Dichloroethane	9.10E-02	9.10E-02	Kidney	ATSDR (1989)
	1,1-Dichloroethene		9.00E-03	Liver	EPA(1986)
	trans-1,2-Dichloroethene		2.00E-02	/Blood	HEAST
	Ethylbenzene		1.00E-01	/Liver&Kidney	IRIS
	Methylene Chloride	3.00E+00	6.00E-02	/Liver	IRIS
	Tetrachloroethene		1.00E-02	/Liver	IRIS
	Toluene	2.00E+00	2.00E-01	CNS/CNS	EPA(1986)
	1,1,1-Trichloroethane	3.00E-01	9.00E-02	Liver/Liver	IRIS
	Trichloroethene				HEAST
	Xylenes(total)	3.00E-01	2.00E+00	CNS/GI	EPA(1986)/IRIS
SEMI-VOC's	Acenaphthene		6.00E-02	Eye/Lung	HEAST
	Acenaphthylene		4.00E-03	Eye/Lung	HEAST
	Anthracene		3.00E-01	Eye/Lung	HEAST
	4-Chloroaniline		4.00E-03	/Spleen	HEAST
	Benzoic Acid		4.00E+00	/General Irritant	IRIS
	Benzyl Alcohol		3.00E-01	/GI	HEAST
	Benzo(g,h,i)perylene		4.00E-03	Eye/Lung	HEAST
	bis(2-ethylhexyl)phthalate		2.00E-02	/Liver	IRIS
	Butyl Benzyl Phthalate		2.00E-01	/Kidney	HEAST
	Dibenzofuran				HEAST
	1,2-Dichlorobenzene	4.00E-02	9.00E-02	Body/Liver	IRIS
	1,3-Dichlorobenzene				HEAST
	1,4-Dichlorobenzene		7.00E-01		HEAST
	Dimethylphthalate		1.00E+00		HEAST
	2,4-Dimethylphenol		2.00E-02		IRIS
	Di-n-Butylphthalate		1.00E-01	/Death	IRIS
	Di-n-Octylphthalate		2.00E-02	/Kidney	HEAST
	Fluoranthene		4.00E-02	Eye/Lung	HEAST
	Fluorene		4.00E-02	Eye/Lung	HEAST
	2-Hexanone				HEAST
	2-Methylnaphthalene			Eye/Lung	HEAST
	4-Methyl-2-pentanone	2.00E-02	5.00E-02		
	2-Methylphenol (o-Cresol)		5.00E-02		

TABLE 7-13: Non-Carcinogenic Chronic Dose-Response Information (con't.)

FRACTION	COMPOUND	RfD [mg/kg/day] (Potency Measure) Inhal	Oral	AFFECTED ORGAN Inhal/Oral	REFERENCES
Semi-VOC's (cont)	4-Methylphenol (p-Cresol)		5.00E-02		IRIS
	Naphthalene		4.00E-03	Eye/Lung	HEAST
	Nitrobenzene	2.00E-03	5.00E-04		
	N-Nitrosodiphenylamine				NOT FOUND
	Phenanthrene			Eye/Lung	HEAST
	Phenol		6.00E-01		
	Pyrene		3.00E-02	Eye/Lung	HEAST
	1,2,4-Trichlorobenzene	3.00E-03	1.31E-03		HEAST
PESTICIDES/ PCB's	Aldrin		3.00E-05		
	Isophorone		2.00E-01		HEAST
INORGANICS	Aluminum				HEAST
	Arsenic		1.00E-03	/Skin	IRIS
	Barium	1.00E-04	5.00E-02	Fetus/Blood	IRIS
	Cadmium		5.00E-04	/Kidney	IRIS
	Chromium(III)	2.00E-06	5.00E-03	Cancer/Not Defined	IRIS
	Iron				HEAST
	Nickel		2.00E-02	Cancer/Body	IRIS
	Potassium				Not Found
	Selenium	1.00E-03	3.00E-03	/Skin	EPA(1986)/IRIS
	Zinc		2.00E-01	/Blood	IRIS
	Cyanides (NOS)		2.00E-02	/Thyroid&Nerve	IRIS

IRIS, Integrated Risk Information System, USEPA, last accessed October 1990.

HEAST, Health Effects Summary Tables, USEPA, published quarterly.

ATSDR, Agency for Toxic Substances and Disease Registry, Toxicological Profiles for Various Chemicals.

EPA,1986. Superfund Public Health Evaluation Manual.

GI, Gastrointestinal, (i.e., mouth, stomach, intestines)

CNS, Central Nervous System

NOS, Not Otherwise Specified

AFFECTED ORGANS are listed __/__ (Inhalation Organ/Oral Organ). A blank means not available or unspecified organ.

If a reference is listed without an RfD value and affected organ the reference showed the data as "INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT."

TABLE 7-14
Carcinogenic Risk for Trespasser Ingestion of Surface Soil
Pathway #1

PARAMETER	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Oral	Carcinogenic RISK (Unitless)
Acetone			0.00E+00
Carbon Disulfide			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
2-Butanone			0.00E+00
Trichloroethene	1.58E-08	1.10E-02	1.74E-10
Benzene	9.42E-09	2.90E-02	2.73E-10
2-Hexanone			0.00E+00
Tetrachloroethene	4.61E-08	5.10E-02	2.35E-09
Toluene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
1,3-Dichlorobenzene			0.00E+00
1,4-Dichlorobenzene	1.72E-08	2.40E-02	4.12E-10
1,2-Dichlorobenzene			0.00E+00
Nitrobenzene			0.00E+00
Isophorone	1.72E-09	4.10E-03	7.04E-12
2,4-Dimethylphenol			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
2-Methylnaphthalene			0.00E+00
Dimethylphthalate			0.00E+00
Acenaphthylene			0.00E+00
Acenaphthene			0.00E+00
Dibenzofuran			0.00E+00
Fluorene			0.00E+00
n-Nitrosodiphenylamine			0.00E+00
Phenanthrene			0.00E+00
Anthracene			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Benzo(a)anthracene	2.44E-08	1.15E+01	2.80E-07
Chrysene	2.69E-08	1.15E+01	3.09E-07
bis(2-Ethylhexyl)phthalate	3.49E-07	1.40E-02	4.89E-09
Di-n-octylphthalate			0.00E+00
Benzo(b)fluoranthene	2.59E-08	1.15E+01	2.98E-07
Benzo(k)fluoranthene	3.39E-08	1.15E+01	3.90E-07
Benzo(a)pyrene	2.65E-08	1.15E+01	3.05E-07
Indeno(1,2,3-cd)pyrene	1.01E-08	1.15E+01	1.16E-07
Benzo(g,h,i)perylene			0.00E+00
Aldrin	5.03E-10	1.70E+01	8.55E-09
Arochlor-1254	2.00E-07	7.70E+00	1.54E-06
Arochlor-1260	5.44E-08	7.70E+00	4.19E-07
Cadmium			0.00E+00
Chromium			0.00E+00
Phenols (Total)			0.00E+00
	Total Pathway Carcinogenic Risk =		3.67E-06

TABLE 7-15
Chronic Risk for Trespasser Ingestion of Surface Soil
Pathway #1

PARAMETER	Non-Carcinogenic Intake (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Oral	Chronic RISK (Unitless)
Acetone	1.17E-09	1.00E-01	1.17E-08
Carbon Disulfide	1.86E-09	1.00E-01	1.86E-08
1,2-Dichloroethene (Total)			
2-Butanone	9.78E-10	5.00E-02	1.96E-08
Trichloroethene			
Benzene			
2-Hexanone			
Tetrachloroethene	1.08E-07	1.00E-02	1.08E-05
Toluene	5.97E-07	2.00E-01	2.98E-06
Ethylbenzene	5.18E-08	1.00E-01	5.18E-07
Total Xylenes	4.01E-07	2.00E+00	2.00E-07
Phenol	2.15E-08	6.00E-01	3.59E-08
1,3-Dichlorobenzene			
1,4-Dichlorobenzene	4.01E-08	7.00E-01	5.73E-08
1,2-Dichlorobenzene	2.58E-07	9.00E-02	2.87E-06
Nitrobenzene	2.25E-08	5.00E-04	4.50E-05
Isophorone	4.01E-09	2.00E-01	2.00E-08
2,4-Dimethylphenol	8.02E-09	2.00E-02	4.01E-07
1,2,4-Trichlorobenzene	1.11E-07	1.31E-03	8.47E-05
Naphthalene	1.86E-08	4.00E-03	4.65E-06
2-Methylnaphthalene			
Dimethylphthalate	6.85E-10	1.00E+00	6.85E-10
Acenaphthylene	1.27E-08	4.00E-03	3.18E-06
Acenaphthene	1.37E-08	6.00E-02	2.28E-07
Dibenzofuran			
Fluorene	2.45E-08	4.00E-02	6.11E-07
n-Nitrosodiphenylamine			
Phenanthrene			
Anthracene	2.64E-08	3.00E-01	8.80E-08
Fluoranthene	8.25E-08	4.00E-02	2.06E-06
Pyrene	1.13E-07	3.00E-02	3.77E-06
Benzo(a)anthracene			
Chrysene			
bis(2-Ethylhexyl)phthalate	8.15E-07	2.00E-02	4.08E-05
Di-n-octylphthalate	3.62E-08	2.00E-02	1.81E-06
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Indeno(1,2,3-cd)pyrene			
Benzo(g,h,i)perylene	2.54E-08	4.00E-03	6.36E-06
Aldrin	1.17E-09	3.00E-05	3.91E-05
Arochlor-1254			
Arochlor-1260			
Cadmium	8.34E-06	5.00E-04	1.67E-02
Chromium	2.69E-04	5.00E-03	5.37E-02
Phenols (Total)	7.97E-07	6.00E-01	1.33E-06
	Total Pathway Chronic Risk =		7.06E-02

TABLE 7-16
Carcinogenic Risk for Trespasser Dermal Contact with Surface Soil
Pathway #2

PARAMETER	Carcinogenic Absorbed Dose (mg/kg-day)	Slope Factor (mg/kg-day)-1 Oral	Carcinogenic RISK (Unitless)
Acetone			0.00E+00
Carbon Disulfide			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
2-Butanone			0.00E+00
Trichloroethene	2.87E-08	1.10E-02	3.16E-10
Benzene	1.71E-08	2.90E-02	4.95E-10
2-Hexanone			0.00E+00
Tetrachloroethene	8.35E-08	5.10E-02	4.26E-09
Toluene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
1,3-Dichlorobenzene			0.00E+00
1,4-Dichlorobenzene	3.11E-08	2.40E-02	7.47E-10
1,2-Dichlorobenzene			0.00E+00
Nitrobenzene			0.00E+00
Isophorone	3.11E-09	4.10E-03	1.28E-11
2,4-Dimethylphenol			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
2-Methylnaphthalene			0.00E+00
Dimethylphthalate			0.00E+00
Acenaphthylene			0.00E+00
Acenaphthene			0.00E+00
Dibenzofuran			0.00E+00
Fluorene			0.00E+00
n-Nitrosodiphenylamine			0.00E+00
Phenanthrene			0.00E+00
Anthracene			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Benzo(a)anthracene	4.41E-08	1.15E+01	5.07E-07
Chrysene	4.87E-08	1.15E+01	5.60E-07
bis(2-Ethylhexyl)phthalate	6.33E-07	1.40E-02	8.86E-09
Di-n-octylphthalate			0.00E+00
Benzo(b)fluoranthene	4.70E-08	1.15E+01	5.40E-07
Benzo(k)fluoranthene	6.14E-08	1.15E+01	7.06E-07
Benzo(a)pyrene	4.80E-08	1.15E+01	5.52E-07
Indeno(1,2,3-cd)pyrene	1.82E-08	1.15E+01	2.09E-07
Benzo(g,h,i)perylene			0.00E+00
Aldrin	9.11E-10	1.70E+01	1.55E-08
Arochlor-1254	3.63E-07	7.70E+00	2.79E-06
Arochlor-1260	9.86E-08	7.70E+00	7.59E-07
Cadmium			0.00E+00
Chromium			0.00E+00
Phenols (Total)			0.00E+00
	Total Pathway Carcinogenic Risk =		6.66E-06

TABLE 7-17
Chronic Risk for Trespasser Dermal Contact with Surface Soil
Pathway #2

PARAMETER	Non-Carcinogenic Absorbed Dose (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Oral	Chronic RISK (Unitless)
Acetone	2.12E-09	1.00E-01	2.12E-08
Carbon Disulfide	3.36E-09	1.00E-01	3.36E-08
1,2-Dichloroethene (Total)			
2-Butanone	1.77E-09	5.00E-02	3.54E-08
Trichloroethene			
Benzene			
2-Hexanone			
Tetrachloroethene	1.95E-07	1.00E-02	1.95E-05
Toluene	1.08E-06	2.00E-01	5.40E-06
Ethylbenzene	9.38E-08	1.00E-01	9.38E-07
Total Xylenes	7.26E-07	2.00E+00	3.63E-07
Phenol	3.89E-08	6.00E-01	6.49E-08
1,3-Dichlorobenzene			
1,4-Dichlorobenzene	7.26E-08	7.00E-01	1.04E-07
1,2-Dichlorobenzene	4.68E-07	9.00E-02	5.19E-06
Nitrobenzene	4.07E-08	5.00E-04	8.14E-05
Isophorone	7.26E-09	2.00E-01	3.63E-08
2,4-Dimethylphenol	1.45E-08	2.00E-02	7.26E-07
1,2,4-Trichlorobenzene	2.01E-07	1.31E-03	1.53E-04
Naphthalene	3.36E-08	4.00E-03	8.41E-06
2-Methylnaphthalene			
Dimethylphthalate	1.24E-09	1.00E+00	1.24E-09
Acenaphthylene	2.30E-08	4.00E-03	5.75E-06
Acenaphthene	2.48E-08	6.00E-02	4.13E-07
Dibenzofuran			
Fluorene	4.43E-08	4.00E-02	1.11E-06
n-Nitrosodiphenylamine			
Phenanthrene			
Anthracene	4.78E-08	3.00E-01	1.59E-07
Fluoranthene	1.49E-07	4.00E-02	3.73E-06
Pyrene	2.05E-07	3.00E-02	6.82E-06
Benzo(a)anthracene			
Chrysene			
bis(2-Ethylhexyl)phthalate	1.48E-06	2.00E-02	7.38E-05
Di-n-octylphthalate	6.55E-08	2.00E-02	3.27E-06
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Indeno(1,2,3-cd)pyrene			
Benzo(g,h,i)perylene	4.60E-08	4.00E-03	1.15E-05
Aldrin	2.12E-09	3.00E-05	7.08E-05
Arochlor-1254			
Arochlor-1260			
Cadmium	1.51E-05	5.00E-04	3.02E-02
Chromium	4.86E-04	5.00E-03	9.72E-02
Phenols (Total)	1.44E-06	6.00E-01	2.40E-06
	Total Pathway Chronic Risk =		1.28E-01

TABLE 7 - 18

Carcinogenic Risk for Trespasser Contact with Shallow Groundwater

Pathway #3

PARAMETER	Carcinogenic Absorbed Dose (mg/kg-day)	Slope Factor (mg/kg-day)-1 Oral	Carcinogenic RISK (Unitless)
Vinyl Chloride	1.71E-06	2.30E+00	3.93E-06
Methylene Chloride	1.21E-06	7.50E-03	9.10E-09
Acetone			0.00E+00
1,1-Dichloroethane			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
Chloroform			0.00E+00
1,2-Dichloroethane	5.47E-05	9.10E-02	4.98E-06
2-Butanone			0.00E+00
1,1,1-Trichloroethane			0.00E+00
Trichloroethene	8.44E-06	1.10E-02	9.29E-08
Benzene	1.42E-03	2.90E-02	4.11E-05
4-Methyl-2-Pentanone			0.00E+00
Tetrachloroethene	7.12E-10	5.10E-02	3.63E-11
Toluene			0.00E+00
Chlorobenzene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
bis(2-Chloroethyl)ether			0.00E+00
1,4-Dichlorobenzene	4.98E-10	2.40E-02	1.20E-11
Benzyl Alcohol			0.00E+00
2-Methylphenol			0.00E+00
4-Methylphenol			0.00E+00
Nitrobenzene			0.00E+00
Isophorone	1.99E-11	4.10E-03	8.17E-14

TABLE 7 - 18 (con't)

Carcinogenic Risk for Trespasser Contact with Shallow Groundwater

Pathway #3

	Carcinogenic Absorbed Dose (mg/kg-day)	Slope Factor (mg/kg-day)-1 Oral	Carcinogenic RISK (Unitless)
2,4-Dimethylphenol			0.00E+00
Benzoic Acid			0.00E+00
Bis(2-chloroethoxy)methane			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
4-Chloroaniline			0.00E+00
2-Methylnaphthalene			0.00E+00
Phenanthrene			0.00E+00
Di-n-butylphthalate			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Butylbenzylphthalate			0.00E+00
bis(2-Ethylhexyl)phthalate	1.60E-08	1.40E-02	2.24E-10
Aluminum			0.00E+00
Arsenic			0.00E+00
Barium			0.00E+00
Cadmium			0.00E+00
Chromium			0.00E+00
Iron			0.00E+00
Nickel			0.00E+00
Potassium			0.00E+00
Selenium			0.00E+00
Zinc			0.00E+00
Cyanide			0.00E+00
Phenols (Total)			0.00E+00
		Total Pathway Carcinogenic RISK	5.01E-05

TABLE 7 - 19

Chronic Risk for Trespasser Dermal Contact with Shallow Groundwater

Pathway #3

PARAMETER	Non-Carcinogenic Absorbed Dose (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Oral	Chronic RISK (Unitless)
Vinyl Chloride			
Methylene Chloride	2.84E-06	6.00E-02	4.73E-05
Acetone	2.55E-05	1.00E-01	2.55E-04
1,1-Dichloroethane	2.00E-06	1.00E-01	2.00E-05
1,2-Dichloroethene (Total)			
Chloroform	1.17E-06	1.00E-02	1.17E-04
1,2-Dichloroethane	1.28E-04	9.10E-02	1.40E-03
2-Butanone	1.46E-03	5.00E-02	2.91E-02
1,1,1-Trichloroethane	2.14E-06	9.00E-02	2.38E-05
Trichloroethene			
Benzene			
4-Methyl-2-Pentanone			
Tetrachloroethene	1.66E-09	1.00E-02	1.66E-07
Toluene	1.58E-04	2.00E-01	7.88E-04
Chlorobenzene	2.50E-07	2.00E-02	1.25E-05
Ethylbenzene	8.74E-07	1.00E-01	8.74E-06
Total Xylenes	3.39E-06	2.00E+00	1.70E-06
Phenol	9.29E-04	6.00E-01	1.55E-03
bis(2-Chloroethyl)ether			
1,4-Dichlorobenzene	1.16E-09	7.00E-01	1.66E-09
Benzyl Alcohol	1.11E-07	3.00E-01	3.71E-07
2-Methylphenol	1.08E-04	5.00E-02	2.15E-03
4-Methylphenol	4.60E-04	5.00E-01	9.19E-04
Nitrobenzene	1.80E-07	5.00E-01	3.61E-07
Isophorone	4.66E-11	2.00E-01	2.33E-10

TABLE 7 - 19 (con't)

Chronic Risk for Trespasser Dermal Contact with Shallow Groundwater

Pathway #3

	Non-Carcinogenic Absorbed Dose (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Oral	Chronic RISK (Unitless)
2,4-Dimethylphenol	3.44E-08	2.00E-02	1.72E-06
Benzoic Acid	6.34E-07	4.00E+00	1.58E-07
Bis(2-chloroethoxy)methane			
1,2,4-Trichlorobenzene	6.66E-10	1.31E-03	5.08E-07
Naphthalene	1.87E-07	4.00E-03	4.68E-05
4-Chloroaniline	1.33E-08	4.00E-03	3.33E-06
2-Methylnaphthalene			
Phenanthrene			
Di-n-butylphthalate	4.99E-09	1.00E-01	4.99E-08
Fluoranthene	9.98E-10	4.00E-02	2.50E-08
Pyrene	1.33E-09	3.00E-02	4.44E-08
Butylbenzylphthalate	3.33E-09	2.00E-01	1.66E-08
bis(2-Ethylhexyl)phthalate	3.74E-08	2.00E-02	1.87E-06
Aluminum			
Arsenic	3.21E-08	1.00E-03	3.21E-05
Barium	2.13E-07	5.00E-02	4.26E-06
Cadmium	1.25E-08	5.00E-04	2.51E-05
Chromium	1.25E-04	5.00E-03	2.50E-02
Iron			
Nickel	2.50E-07	2.00E-02	1.25E-05
Potassium			
Selenium	4.83E-09	3.00E-03	1.61E-06
Zinc	1.03E-07	2.00E-01	5.13E-07
Cyanide	1.26E-06	2.00E-02	6.31E-05
Phenols (Total)	3.49E-02	6.00E-01	5.82E-02
		Total Pathway Chronic RISK	1.20E-01

TABLE 7 - 20

Carcinogenic Risk for Trespasser Inhalation of Vapor Phase Chemicals

Pathway #4

PARAMETER	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Inhalation	Carcinogenic RISK (Unitless)
Vinyl Chloride	7.01E-10	2.95E-01	2.07E-10
Methylene Chloride	4.50E-10	1.65E-03	7.42E-13
Acetone			0.00E+00
1,1-Dichloroethane			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
Chloroform	1.66E-10	8.10E-02	1.34E-11
1,2-Dichloroethane	1.92E-08	9.10E-02	1.75E-09
2-Butanone			0.00E+00
1,1,1-Trichloroethane			0.00E+00
Trichloroethene	2.70E-09	1.70E-02	4.59E-11
Benzene	1.05E-09	2.90E-02	3.05E-11
4-Methyl-2-Pentanone			0.00E+00
Tetrachloroethene	2.11E-13	3.31E-03	6.98E-16
Toluene			0.00E+00
Chlorobenzene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
bis(2-Chloroethyl)ether			0.00E+00
1,4-Dichlorobenzene			0.00E+00
Benzyl Alcohol			0.00E+00
2-Methylphenol			0.00E+00
4-Methylphenol			0.00E+00
Nitrobenzene			0.00E+00
Isophorone			0.00E+00

TABLE 7 - 20 (con't)
Carcinogenic Risk for Trespasser Inhalation of Vapor Phase Chemicals
Pathway #4

	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Inhalation	Carcinogenic RISK (Unitless)
2,4-Dimethylphenol			0.00E+00
Benzoic Acid			0.00E+00
Bis(2-chloroethoxy)methane			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
4-Chloroaniline			0.00E+00
2-Methylnaphthalene			0.00E+00
Phenanthrene			0.00E+00
Di-n-butylphthalate			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Butylbenzylphthalate			0.00E+00
bis(2-Ethylhexyl)phthalate			0.00E+00
Aluminum			0.00E+00
Arsenic	0.00E+00	5.00E+01	0.00E+00
Barium			0.00E+00
Cadmium	0.00E+00	6.10E+00	0.00E+00
Chromium	0.00E+00	4.10E+01	0.00E+00
Iron			0.00E+00
Nickel	0.00E+00	8.40E-01	0.00E+00
Potassium			0.00E+00
Selenium			0.00E+00
Zinc			0.00E+00
Cyanide			0.00E+00
Phenols (Total)			0.00E+00
		Total Pathway Carcinogenic RISK	2.05E-09

TABLE 7 - 21

Chronic Risk for Trespasser Inhalation of Vapor Phase Chemicals

Pathway #4

PARAMETER	Non-Carcinogenic Intake (mg/kg-day)	RfD(Potency Measure) (mg/kg-day) Inhalation	Chronic RISK (Unitless)
Vinyl Chloride			
Methylene Chloride	1.05E-09	3.00E+00	3.50E-10
Acetone	1.07E-08	3.00E+00	3.58E-09
1,1-Dichloroethane	7.02E-10	1.00E-01	7.02E-09
1,2-Dichloroethene (Total)			
Chloroform			
1,2-Dichloroethane	4.49E-08	9.10E-02	4.94E-07
2-Butanone	9.11E-11	9.00E-02	1.01E-09
1,1,1-Trichloroethane	6.82E-10	3.00E-01	2.27E-09
Trichloroethene			
Benzene			
4-Methyl-2-Pentanone			
Tetrachloroethene			
Toluene	5.05E-08	2.00E+00	2.52E-08
Chlorobenzene	8.41E-11	5.00E-03	1.68E-08
Ethylbenzene			
Total Xylenes	1.17E-09	3.00E-01	3.88E-09
Phenol			
bis(2-Chloroethyl)ether			
1,4-Dichlorobenzene			
Benzyl Alcohol			
2-Methylphenol			
4-Methylphenol			
Nitrobenzene	5.90E-11	2.00E-03	2.95E-08
Isophorone			

TABLE 7 - 21

Chronic Risk for Trespasser Inhalation of Vapor Phase Chemicals

Pathway #4

	Non-Carcinogenic Intake (mg/kg-day)	RfD(Potency Measure) (mg/kg-day) Inhalation	Chronic RISK (Unitless)
2,4-Dimethylphenol Benzoic Acid Bis(2-chloroethoxy)methane 1,2,4-Trichlorobenzene Naphthalene 4-Chloroaniline 2-Methylnaphthalene Phenanthrene Di-n-butylphthalate Fluoranthene Pyrene Butylbenzylphthalate bis(2-Ethylhexyl)phthalate	1.91E-13	3.00E-03	6.37E-11
Aluminum Arsenic Barium	0.00E+00	1.00E-04	0.00E+00
Cadmium Chromium	0.00E+00	2.00E-06	0.00E+00
Iron Nickel Potassium Selenium Zinc	0.00E+00	1.00E-03	0.00E+00
Cyanide Phenols (Total)			
		Total Pathway Chronic RISK	5.84E-07

TABLE 7 - 22

Carcinogenic Risk for Residential Inhalation of Vapor Phase Chemicals

Pathway #5

PARAMETER	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Inhalation	Carcinogenic RISK (Unitless)
Vinyl Chloride	1.09E-09	2.95E-01	3.23E-10
Methylene Chloride	7.02E-10	1.65E-03	1.16E-12
Acetone			0.00E+00
1,1-Dichloroethane			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
Chloroform	2.59E-10	8.10E-02	2.09E-11
1,2-Dichloroethane	3.00E-08	9.10E-02	2.73E-09
2-Butanone			0.00E+00
1,1,1-Trichloroethane			0.00E+00
Trichloroethene	4.22E-09	1.70E-02	7.17E-11
Benzene	1.64E-09	2.90E-02	4.76E-11
4-Methyl-2-Pentanone			0.00E+00
Tetrachloroethene	3.29E-13	3.31E-03	1.09E-15
Toluene			0.00E+00
Chlorobenzene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
bis(2-Chloroethyl)ether			0.00E+00
1,4-Dichlorobenzene			0.00E+00
Benzyl Alcohol			0.00E+00
2-Methylphenol			0.00E+00
4-Methylphenol			0.00E+00
Nitrobenzene			0.00E+00
Isophorone			0.00E+00

TABLE 7 - 22 (con't)
Carcinogenic Risk for Residential Inhalation of Vapor Phase Chemicals
Pathway #5

	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Inhalation	Carcinogenic RISK (Unitless)
2,4-Dimethylphenol			0.00E+00
Benzoic Acid			0.00E+00
Bis(2-chloroethoxy)methane			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
4-Chloroaniline			0.00E+00
2-Methylnaphthalene			0.00E+00
Phenanthrene			0.00E+00
Di-n-butylphthalate			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Butylbenzylphthalate			0.00E+00
bis(2-Ethylhexyl)phthalate			0.00E+00
Aluminum			0.00E+00
Arsenic	0.00E+00	5.00E+01	0.00E+00
Barium			0.00E+00
Cadmium	0.00E+00	6.10E+00	0.00E+00
Chromium	0.00E+00	4.10E+01	0.00E+00
Iron			0.00E+00
Nickel	0.00E+00	8.40E-01	0.00E+00
Potassium			0.00E+00
Selenium			0.00E+00
Zinc			0.00E+00
Cyanide			0.00E+00
Phenols (Total)			0.00E+00
		Total Pathway Carcinogenic RISK	3.20E-09

TABLE 7 - 23

Chronic Risk for Residential Inhalation of Vapor Phase Chemicals

Pathway #5

PARAMETER	Non-Carcinogenic Intake (mg/kg-day)	RfD(Potency Measure) (mg/kg-day) Inhalation	Chronic RISK (Unitless)
Vinyl Chloride			
Methylene Chloride	1.64E-09	3.00E+00	5.48E-10
Acetone	1.68E-08	3.00E+00	5.59E-09
1,1-Dichloroethane	1.10E-09	1.00E-01	1.10E-08
1,2-Dichloroethene (Total)			
Chloroform			
1,2-Dichloroethane	7.03E-08	9.10E-02	7.73E-07
2-Butanone	1.43E-10	9.00E-02	1.58E-09
1,1,1-Trichloroethane	1.07E-09	3.00E-01	3.55E-09
Trichloroethene			
Benzene			
4-Methyl-2-Pentanone			
Tetrachloroethene			
Toluene	7.90E-08	2.00E+00	3.95E-08
Chlorobenzene	1.32E-10	5.00E-03	2.63E-08
Ethylbenzene			
Total Xylenes	1.82E-09	3.00E-01	6.07E-09
Phenol			
bis(2-Chloroethyl)ether			
1,4-Dichlorobenzene			
Benzyl Alcohol			
2-Methylphenol			
4-Methylphenol			
Nitrobenzene	9.23E-11	2.00E-03	4.61E-08
Isophorone			

TABLE 7 - 23 (con't)
Chronic Risk for Residential Inhalation of Vapor Phase Chemicals
Pathway #5

	Non-Carcinogenic Intake (mg/kg-day)	RfD(Potency Measure) (mg/kg-day) Inhalation	Chronic RISK (Unitless)
2,4-Dimethylphenol			
Benzoic Acid			
Bis(2-chloroethoxy)methane			
1,2,4-Trichlorobenzene	2.99E-13	3.00E-03	9.97E-11
Naphthalene			
4-Chloroaniline			
2-Methylnaphthalene			
Phenanthrene			
Di-n-butylphthalate			
Fluoranthene			
Pyrene			
Butylbenzylphthalate			
bis(2-Ethylhexyl)phthalate			
Aluminum			
Arsenic			
Barium	0.00E+00	1.00E-04	0.00E+00
Cadmium			
Chromium	0.00E+00	2.00E-06	0.00E+00
Iron			
Nickel			
Potassium			
Selenium	0.00E+00	1.00E-03	0.00E+00
Zinc			
Cyanide			
Phenols (Total)			
		Total Pathway Chronic RISK	9.13E-07

TABLE 7 - 24

Carcinogenic Risk for Trespasser Inhalation of Fugitve Dust

Pathway #6

PARAMETER	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Inhalation	Carcinogenic RISK (Unitless)
Acetone			0.00E+00
Carbon Disulfide			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
2-Butanone			0.00E+00
Trichloroethene	1.78E-11	1.70E-02	3.02E-13
Benzene	1.06E-11	2.90E-02	3.06E-13
2-Hexanone			0.00E+00
Tetrachloroethene	5.17E-11	3.31E-03	1.71E-13
Toluene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
1,3-Dichlorobenzene			0.00E+00
1,4-Dichlorobenzene			0.00E+00
1,2-Dichlorobenzene			0.00E+00
Nitrobenzene			0.00E+00
Isophorone			0.00E+00
2,4-Dimethylphenol			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
2-Methylnaphthalene			0.00E+00
Dimethylphthalate			0.00E+00
Acenaphthylene			0.00E+00
Acenaphthene			0.00E+00
Dibenzofuran			0.00E+00
Fluorene			0.00E+00
n-Nitrosodiphenylamine			0.00E+00
Phenanthrene			0.00E+00
Anthracene			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Benzo(a)anthracene	2.73E-11	6.10E+00	1.67E-10
Chrysene	3.01E-11	6.10E+00	1.84E-10
bis(2-Ethylhexyl)phthalate			0.00E+00
Di-n-octylphthalate			0.00E+00
Benzo(b)fluoranthene	2.91E-11	6.10E+00	1.77E-10
Benzo(k)fluoranthene	3.80E-11	6.10E+00	2.32E-10
Benzo(a)pyrene	2.97E-11	6.10E+00	1.81E-10
Indeno(1,2,3-cd)pyrene	1.13E-11	6.10E+00	6.88E-11
Benzo(g,h,i)perylene			0.00E+00
Aldrin	5.64E-13	1.70E+01	9.59E-12
Arochlor-1254			0.00E+00
Arochlor-1260			0.00E+00
Cadmium	4.01E-09	6.10E+00	2.44E-08
Chromium			0.00E+00
Phenols (Total)			0.00E+00
Total Pathway Carcinogenic Risk =			2.55E-08

TABLE 7 - 25
Chronic Risk for Trespasser Inhalation of Fugitve Dust
Pathway #6

PARAMETER	Non-carcinogenic Intake (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Inhalation	Chronic RISK (Unitless)
Acetone	1.27E-12	3.00E+00	4.23E-13
Carbon Disulfide	2.01E-12	1.00E-02	2.01E-10
1,2-Dichloroethene (Total)			
2-Butanone	1.06E-12	9.00E-02	1.18E-11
Trichloroethene			
Benzene			
2-Hexanone			
Tetrachloroethene			
Toluene	6.45E-10	2.00E+00	3.23E-10
Ethylbenzene			
Total Xylenes	4.34E-10	3.00E-01	1.45E-09
Phenol			
1,3-Dichlorobenzene			
1,4-Dichlorobenzene			
1,2-Dichlorobenzene	2.79E-10	4.00E-02	6.98E-09
Nitrobenzene	2.43E-11	2.00E-03	1.22E-08
Isophorone			
2,4-Dimethylphenol			
1,2,4-Trichlorobenzene	1.20E-10	3.00E-03	4.00E-08
Naphthalene			
2-Methylnaphthalene			
Dimethylphthalate			
Acenaphthylene			
Acenaphthene			
Dibenzofuran			
Fluorene			
n-Nitrosodiphenylamine			
Phenanthrene			
Anthracene			
Fluoranthene			
Pyrene			
Benzo(a)anthracene			
Chrysene			
bis(2-Ethylhexyl)phthalate			
Di-n-octylphthalate			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Indeno(1,2,3-cd)pyrene			
Benzo(g,h,i)perylene			
Aldrin			
Arochlor-1254			
Arochlor-1260			
Cadmium			
Chromium	2.90E-07	2.00E-06	1.45E-01
Phenols (Total)			
	Total Pathway Chronic Risk =		1.45E-01

TABLE 7 - 26
Carcinogenic Risk for Resident Inhalation of Fugitve Dust
Pathway #7

PARAMETER	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Inhalation	Carcinogenic RISK (Unitless)
Acetone			0.00E+00
Carbon Disulfide			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
2-Butanone			0.00E+00
Trichloroethene	1.48E-09	1.70E-02	2.52E-11
Benzene	8.82E-10	2.90E-02	2.56E-11
2-Hexanone			0.00E+00
Tetrachloroethene	4.31E-09	3.31E-03	1.43E-11
Toluene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
1,3-Dichlorobenzene			0.00E+00
1,4-Dichlorobenzene			0.00E+00
1,2-Dichlorobenzene			0.00E+00
Nitrobenzene			0.00E+00
Isophorone			0.00E+00
2,4-Dimethylphenol			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
2-Methylnaphthalene			0.00E+00
Dimethylphthalate			0.00E+00
Acenaphthylene			0.00E+00
Acenaphthene			0.00E+00
Dibenzofuran			0.00E+00
Fluorene			0.00E+00
n-Nitrosodiphenylamine			0.00E+00
Phenanthrene			0.00E+00
Anthracene			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Benzo(a)anthracene	2.28E-09	6.10E+00	1.39E-08
Chrysene	2.51E-09	6.10E+00	1.53E-08
bis(2-Ethylhexyl)phthalate			0.00E+00
Di-n-octylphthalate			0.00E+00
Benzo(b)fluoranthene	2.43E-09	6.10E+00	1.48E-08
Benzo(k)fluoranthene	3.17E-09	6.10E+00	1.94E-08
Benzo(a)pyrene	2.48E-09	6.10E+00	1.51E-08
Indeno(1,2,3-cd)pyrene	9.41E-10	6.10E+00	5.74E-09
Benzo(g,h,i)perylene			0.00E+00
Aldrin	4.71E-11	1.70E+01	8.00E-10
Arochlor-1254			0.00E+00
Arochlor-1260			0.00E+00
Cadmium	3.34E-07	6.10E+00	2.04E-06
Chromium			0.00E+00
Phenols (Total)			0.00E+00
	Total Pathway Carcinogenic Risk =		2.12E-06

TABLE 7 - 27

Chronic Risk for Resident Inhalation of Fugitve Dust

Pathway #7

PARAMETER	Non-carcinogenic Intake (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Inhalation	Chronic RISK (Unitless)
Acetone	1.10E-10	3.00E+00	3.66E-11
Carbon Disulfide	1.74E-10	1.00E-02	1.74E-08
1,2-Dichloroethene (Total)			
2-Butanone	9.16E-11	9.00E-02	1.02E-09
Trichloroethene			
Benzene			
2-Hexanone			
Tetrachloroethene			
Toluene	5.59E-08	2.00E+00	2.79E-08
Ethylbenzene			
Total Xylenes	3.76E-08	3.00E-01	1.25E-07
Phenol			
1,3-Dichlorobenzene			
1,4-Dichlorobenzene			
1,2-Dichlorobenzene	2.42E-08	4.00E-02	6.05E-07
Nitrobenzene	2.11E-09	2.00E-03	1.05E-06
Isophorone			
2,4-Dimethylphenol			
1,2,4-Trichlorobenzene	1.04E-08	3.00E-03	3.46E-06
Naphthalene			
2-Methylnaphthalene			
Dimethylphthalate			
Acenaphthylene			
Acenaphthene			
Dibenzofuran			
Fluorene			
n-Nitrosodiphenylamine			
Phenanthrene			
Anthracene			
Fluoranthene			
Pyrene			
Benzo(a)anthracene			
Chrysene			
bis(2-Ethylhexyl)phthalate			
Di-n-octylphthalate			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Indeno(1,2,3-cd)pyrene			
Benzo(g,h,i)perylene			
Aldrin			
Arochlor-1254			
Arochlor-1260			
Cadmium			
Chromium	2.51E-05	2.00E-06	1.26E+01
Phenols (Total)			
	Total Pathway Chronic Risk =		1.26E+01

TABLE 7-28
Carcinogenic Risk for User Ingestion of Surface Soil
Pathway #8

PARAMETER	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Oral	Carcinogenic RISK (Unitless)
Acetone			0.00E+00
Carbon Disulfide			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
2-Butanone			0.00E+00
Trichloroethene	3.17E-08	1.10E-02	3.49E-10
Benzene	1.89E-08	2.90E-02	5.47E-10
2-Hexanone			0.00E+00
Tetrachloroethene	9.23E-08	5.10E-02	4.71E-09
Toluene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
1,3-Dichlorobenzene			0.00E+00
1,4-Dichlorobenzene	3.44E-08	2.40E-02	8.26E-10
1,2-Dichlorobenzene			0.00E+00
Nitrobenzene			0.00E+00
Isophorone	3.44E-09	4.10E-03	1.41E-11
2,4-Dimethylphenol			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
2-Methylnaphthalene			0.00E+00
Dimethylphthalate			0.00E+00
Acenaphthylene			0.00E+00
Acenaphthene			0.00E+00
Dibenzofuran			0.00E+00
Fluorene			0.00E+00
n-Nitrosodiphenylamine			0.00E+00
Phenanthrene			0.00E+00
Anthracene			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Benzo(a)anthracene	4.88E-08	1.15E+01	5.61E-07
Chrysene	5.38E-08	1.15E+01	6.19E-07
bis(2-Ethylhexyl)phthalate	6.99E-07	1.40E-02	9.79E-09
Di-n-octylphthalate			0.00E+00
Benzo(b)fluoranthene	5.19E-08	1.15E+01	5.97E-07
Benzo(k)fluoranthene	6.79E-08	1.15E+01	7.80E-07
Benzo(a)pyrene	5.31E-08	1.15E+01	6.11E-07
Indeno(1,2,3-cd)pyrene	2.01E-08	1.15E+01	2.32E-07
Benzo(g,h,i)perylene			0.00E+00
Aldrin	1.01E-09	1.70E+01	1.71E-08
Arochlor-1254	4.01E-07	7.70E+00	3.09E-06
Arochlor-1260	1.09E-07	7.70E+00	8.39E-07
Cadmium			0.00E+00
Chromium			0.00E+00
Phenols (Total)			0.00E+00
	Total Pathway Carcinogenic Risk =		7.36E-06

TABLE 7-29
Chronic Risk for User Ingestion of Surface Soil
Pathway #8

PARAMETER	Non-Carcinogenic Intake (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Oral	Chronic RISK (Unitless)
Acetone	2.35E-09	1.00E-01	2.35E-08
Carbon Disulfide	3.72E-09	1.00E-01	3.72E-08
1,2-Dichloroethene (Total)			
2-Butanone	1.96E-09	5.00E-02	3.92E-08
Trichloroethene			
Benzene			
2-Hexanone			
Tetrachloroethene	2.16E-07	1.00E-02	2.16E-05
Toluene	1.20E-06	2.00E-01	5.98E-06
Ethylbenzene	1.04E-07	1.00E-01	1.04E-06
Total Xylenes	8.04E-07	2.00E+00	4.02E-07
Phenol	4.31E-08	6.00E-01	7.19E-08
1,3-Dichlorobenzene			
1,4-Dichlorobenzene	8.04E-08	7.00E-01	1.15E-07
1,2-Dichlorobenzene	5.18E-07	9.00E-02	5.75E-06
Nitrobenzene	4.51E-08	5.00E-04	9.02E-05
Isophorone	8.04E-09	2.00E-01	4.02E-08
2,4-Dimethylphenol	1.61E-08	2.00E-02	8.04E-07
1,2,4-Trichlorobenzene	2.22E-07	1.31E-03	1.70E-04
Naphthalene	3.72E-08	4.00E-03	9.31E-06
2-Methylnaphthalene			
Dimethylphthalate	1.37E-09	1.00E+00	1.37E-09
Acenaphthylene	2.55E-08	4.00E-03	6.37E-06
Acenaphthene	2.74E-08	6.00E-02	4.57E-07
Dibenzofuran			
Fluorene	4.90E-08	4.00E-02	1.23E-06
n-Nitrosodiphenylamine			
Phenanthrene			
Anthracene	5.29E-08	3.00E-01	1.76E-07
Fluoranthene	1.65E-07	4.00E-02	4.14E-06
Pyrene	2.27E-07	3.00E-02	7.56E-06
Benzo(a)anthracene			
Chrysene			
bis(2-Ethylhexyl)phthalate	1.63E-06	2.00E-02	8.17E-05
Di-n-octylphthalate	7.25E-08	2.00E-02	3.63E-06
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Indeno(1,2,3-cd)pyrene			
Benzo(g,h,i)perylene	5.10E-08	4.00E-03	1.27E-05
Aldrin	2.35E-09	3.00E-05	7.84E-05
Arochlor-1254			
Arochlor-1260			
Cadmium	1.67E-05	5.00E-04	3.34E-02
Chromium	5.38E-04	5.00E-03	1.08E-01
Phenols (Total)	1.60E-06	6.00E-01	2.66E-06
	Total Pathway Chronic Risk =		1.42E-01

TABLE 7-30
Carcinogenic Risk for User Dermal Contact with Surface Soil
Pathway #9

PARAMETER	Carcinogenic Absorbed Dose (mg/kg-day)	Slope Factor (mg/kg-day)-1 Oral	Carcinogenic RISK (Unitless)
Acetone			0.00E+00
Carbon Disulfide			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
2-Butanone			0.00E+00
Trichloroethene	1.58E-07	1.10E-02	1.74E-09
Benzene	9.42E-08	2.90E-02	2.73E-09
2-Hexanone			0.00E+00
Tetrachloroethene	4.61E-07	5.10E-02	2.35E-08
Toluene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
1,3-Dichlorobenzene			0.00E+00
1,4-Dichlorobenzene	1.72E-07	2.40E-02	4.12E-09
1,2-Dichlorobenzene			0.00E+00
Nitrobenzene			0.00E+00
Isophorone	1.72E-08	4.10E-03	7.04E-11
2,4-Dimethylphenol			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
2-Methylnaphthalene			0.00E+00
Dimethylphthalate			0.00E+00
Acenaphthylene			0.00E+00
Acenaphthene			0.00E+00
Dibenzofuran			0.00E+00
Fluorene			0.00E+00
n-Nitrosodiphenylamine			0.00E+00
Phenanthrene			0.00E+00
Anthracene			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Benzo(a)anthracene	2.44E-07	1.15E+01	2.80E-06
Chrysene	2.69E-07	1.15E+01	3.09E-06
bis(2-Ethylhexyl)phthalate	3.49E-06	1.40E-02	4.89E-08
Di-n-octylphthalate			0.00E+00
Benzo(b)fluoranthene	2.59E-07	1.15E+01	2.98E-06
Benzo(k)fluoranthene	3.39E-07	1.15E+01	3.90E-06
Benzo(a)pyrene	2.65E-07	1.15E+01	3.05E-06
Indeno(1,2,3-cd)pyrene	1.01E-07	1.15E+01	1.16E-06
Benzo(g,h,i)perylene			0.00E+00
Aldrin	5.03E-09	1.70E+01	8.55E-08
Arochlor-1254	2.00E-06	7.70E+00	1.54E-05
Arochlor-1260	5.44E-07	7.70E+00	4.19E-06
Cadmium			0.00E+00
Chromium			0.00E+00
Phenols (Total)			0.00E+00
	Total Pathway Carcinogenic Risk =		3.67E-05

TABLE 7-31
Chronic Risk for User Dermal Contact with Surface Soil
Pathway #9

PARAMETER	Non-Carcinogenic Absorbed Dose (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Oral	Chronic RISK (Unitless)
Acetone	1.17E-08	1.00E-01	1.17E-07
Carbon Disulfide	1.86E-08	1.00E-01	1.86E-07
1,2-Dichloroethene (Total)			
2-Butanone	9.78E-09	5.00E-02	1.96E-07
Trichloroethene			
Benzene			
2-Hexanone			
Tetrachloroethene	1.08E-06	1.00E-02	1.08E-04
Toluene	5.97E-06	2.00E-01	2.98E-05
Ethylbenzene	5.18E-07	1.00E-01	5.18E-06
Total Xylenes	4.01E-06	2.00E+00	2.00E-06
Phenol	2.15E-07	6.00E-01	3.59E-07
1,3-Dichlorobenzene			
1,4-Dichlorobenzene	4.01E-07	7.00E-01	5.73E-07
1,2-Dichlorobenzene	2.58E-06	9.00E-02	2.87E-05
Nitrobenzene	2.25E-07	5.00E-04	4.50E-04
Isophorone	4.01E-08	2.00E-01	2.00E-07
2,4-Dimethylphenol	8.02E-08	2.00E-02	4.01E-06
1,2,4-Trichlorobenzene	1.11E-06	1.31E-03	8.47E-04
Naphthalene	1.86E-07	4.00E-03	4.65E-05
2-Methylnaphthalene			
Dimethylphthalate	6.85E-09	1.00E+00	6.85E-09
Acenaphthylene	1.27E-07	4.00E-03	3.18E-05
Acenaphthene	1.37E-07	6.00E-02	2.28E-06
Dibenzofuran			
Fluorene	2.45E-07	4.00E-02	6.11E-06
n-Nitrosodiphenylamine			
Phenanthrene			
Anthracene	2.64E-07	3.00E-01	8.80E-07
Fluoranthene	8.25E-07	4.00E-02	2.06E-05
Pyrene	1.13E-06	3.00E-02	3.77E-05
Benzo(a)anthracene			
Chrysene			
bis(2-Ethylhexyl)phthalate	8.15E-06	2.00E-02	4.08E-04
Di-n-octylphthalate	3.62E-07	2.00E-02	1.81E-05
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Indeno(1,2,3-cd)pyrene			
Benzo(g,h,i)perylene	2.54E-07	4.00E-03	6.36E-05
Aldrin	1.17E-08	3.00E-05	3.91E-04
Arochlor-1254			
Arochlor-1260			
Cadmium	8.34E-05	5.00E-04	1.67E-01
Chromium	2.69E-03	5.00E-03	5.37E-01
Phenols (Total)	7.97E-06	6.00E-01	1.33E-05
	Total Pathway Chronic Risk =		7.06E-01

TABLE 7 - 32

Carcinogenic Risk for User Dermal Contact with Shallow Groundwater

Pathway #10

PARAMETER	Carcinogenic Absorbed Dose (mg/kg-day)	Slope Factor (mg/kg-day)-1 Oral	Carcinogenic RISK (Unitless)
Vinyl Chloride	3.32E-06	2.30E+00	7.64E-06
Methylene Chloride	2.36E-06	7.50E-03	1.77E-08
Acetone			0.00E+00
1,1-Dichloroethane			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
Chloroform			0.00E+00
1,2-Dichloroethane	1.06E-04	9.10E-02	9.67E-06
2-Butanone			0.00E+00
1,1,1-Trichloroethane			0.00E+00
Trichloroethene	1.64E-05	1.10E-02	1.81E-07
Benzene	2.75E-03	2.90E-02	7.98E-05
4-Methyl-2-Pentanone			0.00E+00
Tetrachloroethene	1.38E-09	5.10E-02	7.06E-11
Toluene			0.00E+00
Chlorobenzene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
bis(2-Chloroethyl)ether			0.00E+00
1,4-Dichlorobenzene	9.69E-10	2.40E-02	2.33E-11
Benzyl Alcohol			0.00E+00
2-Methylphenol			0.00E+00
4-Methylphenol			0.00E+00
Nitrobenzene			0.00E+00
Isophorone	3.88E-11	4.10E-03	1.59E-13

TABLE 7 - 32 (con't)

Carcinogenic Risk for User Dermal Contact with Shallow Groundwater

Pathway #10

	Carcinogenic Absorbed Dose (mg/kg-day)	Slope Factor (mg/kg-day)-1 Oral	Carcinogenic RISK (Unitless)
2,4-Dimethylphenol			0.00E+00
Benzoic Acid			0.00E+00
Bis(2-chloroethoxy)methane			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
4-Chloroaniline			0.00E+00
2-Methylnaphthalene			0.00E+00
Phenanthrene			0.00E+00
Di-n-butylphthalate			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Butylbenzylphthalate			0.00E+00
bis(2-Ethylhexyl)phthalate	3.11E-08	1.40E-02	4.36E-10
Aluminum			0.00E+00
Arsenic			0.00E+00
Barium			0.00E+00
Cadmium			0.00E+00
Chromium			0.00E+00
Iron			0.00E+00
Nickel			0.00E+00
Potassium			0.00E+00
Selenium			0.00E+00
Zinc			0.00E+00
Cyanide			0.00E+00
Phenols (Total)			0.00E+00
		Total Pathway Carcinogenic RISK	9.73E-05

TABLE 7 - 33

Chronic Risk for User Dermal Contact with Shallow Groundwater

Pathway #10

PARAMETER	Non-Carcinogenic Absorbed Dose (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Oral	Chronic RISK (Unitless)
Vinyl Chloride			
Methylene Chloride	5.50E-06	6.00E-02	9.16E-05
Acetone	4.94E-05	1.00E-01	4.94E-04
1,1-Dichloroethane	3.87E-06	1.00E-01	3.87E-05
1,2-Dichloroethene (Total)			
Chloroform	2.27E-06	1.00E-02	2.27E-04
1,2-Dichloroethane	2.48E-04	9.10E-02	2.72E-03
2-Butanone	2.82E-03	5.00E-02	5.64E-02
1,1,1-Trichloroethane	4.15E-06	9.00E-02	4.61E-05
Trichloroethene			
Benzene			
4-Methyl-2-Pentanone			
Tetrachloroethene	3.22E-09	1.00E-02	3.22E-07
Toluene	3.05E-04	2.00E-01	1.53E-03
Chlorobenzene	4.84E-07	2.00E-02	2.42E-05
Ethylbenzene	1.69E-06	1.00E-01	1.69E-05
Total Xylenes	6.57E-06	2.00E+00	3.29E-06
Phenol	1.80E-03	6.00E-01	3.00E-03
bis(2-Chloroethyl)ether			
1,4-Dichlorobenzene	2.26E-09	7.00E-01	3.22E-09
Benzyl Alcohol	2.15E-07	3.00E-01	7.18E-07
2-Methylphenol	2.08E-04	5.00E-02	4.17E-03
4-Methylphenol	8.91E-04	5.00E-02	1.78E-02
Nitrobenzene	3.50E-07	5.00E-04	6.99E-04
Isophorone	9.03E-11	2.00E-01	4.51E-10

TABLE 7 - 33 (con't)

Chronic Risk for User Dermal Contact with Shallow Groundwater

Pathway #10

	Non-Carcinogenic Absorbed Dose (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Oral	Chronic RISK (Unitless)
2,4-Dimethylphenol	6.66E-08	2.00E-02	3.33E-06
Benzoic Acid	1.23E-06	4.00E+00	3.07E-07
Bis(2-chloroethoxy)methane			
1,2,4-Trichlorobenzene	1.29E-09	1.31E-03	9.84E-07
Naphthalene	3.63E-07	5.00E-04	7.26E-04
4-Chloroaniline	2.58E-08	4.00E-03	6.45E-06
2-Methylnaphthalene			
Phenanthrene			
Di-n-butylphthalate	9.67E-09	1.00E-01	9.67E-08
Fluoranthene	1.93E-09	4.00E-02	4.84E-08
Pyrene	2.58E-09	3.00E-02	8.60E-08
Butylbenzylphthalate	6.45E-09	2.00E-01	3.22E-08
bis(2-Ethylhexyl)phthalate	7.25E-08	2.00E-02	3.62E-06
Aluminum			
Arsenic	6.22E-08	1.00E-03	6.22E-05
Barium	4.13E-07	5.00E-02	8.25E-06
Cadmium	2.43E-08	5.00E-04	4.86E-05
Chromium	2.42E-04	5.00E-03	4.85E-02
Iron			
Nickel	4.85E-07	2.00E-02	2.42E-05
Potassium			
Selenium	9.35E-09	3.00E-03	3.12E-06
Zinc	1.99E-07	2.00E-01	9.93E-07
Cyanide	2.44E-06	2.00E-02	1.22E-04
Phenols (Total)	6.77E-02	6.00E-01	1.13E-01
		Total Pathway Chronic RISK	2.50E-01

TABLE 7 - 34

Carcinogenic Risk for User Inhalation of Vapor Phase Chemicals

Pathway #11

PARAMETER	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Inhalation	Carcinogenic RISK (Unitless)
Vinyl Chloride	2.73E-09	2.95E-01	8.06E-10
Methylene Chloride	1.75E-09	1.65E-03	2.89E-12
Acetone			0.00E+00
1,1-Dichloroethane			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
Chloroform	6.45E-10	8.10E-02	5.23E-11
1,2-Dichloroethane	7.49E-08	9.10E-02	6.82E-09
2-Butanone			0.00E+00
1,1,1-Trichloroethane			0.00E+00
Trichloroethene	1.05E-08	1.70E-02	1.79E-10
Benzene	4.10E-09	2.90E-02	1.19E-10
4-Methyl-2-Pentanone			0.00E+00
Tetrachloroethene	8.21E-13	3.31E-03	2.72E-15
Toluene			0.00E+00
Chlorobenzene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
bis(2-Chloroethyl)ether			0.00E+00
1,4-Dichlorobenzene			0.00E+00
Benzyl Alcohol			0.00E+00
2-Methylphenol			0.00E+00
4-Methylphenol			0.00E+00
Nitrobenzene			0.00E+00
Isophorone			0.00E+00

TABLE 7 - 34 (con't)
Carcinogenic Risk for User Inhalation of Vapor Phase Chemicals
Pathway #11

	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Inhalation	Carcinogenic RISK (Unitless)
2,4-Dimethylphenol			0.00E+00
Benzoic Acid			0.00E+00
Bis(2-chloroethoxy)methane			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
4-Chloroaniline			0.00E+00
2-Methylnaphthalene			0.00E+00
Phenanthrene			0.00E+00
Di-n-butylphthalate			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Butylbenzylphthalate			0.00E+00
bis(2-Ethylhexyl)phthalate			0.00E+00
Aluminum			0.00E+00
Arsenic	0.00E+00	5.00E+01	0.00E+00
Barium			0.00E+00
Cadmium	0.00E+00	6.10E+00	0.00E+00
Chromium	0.00E+00	4.10E+01	0.00E+00
Iron			0.00E+00
Nickel	0.00E+00	8.40E-01	0.00E+00
Potassium			0.00E+00
Selenium			0.00E+00
Zinc			0.00E+00
Cyanide			0.00E+00
Phenols (Total)			0.00E+00
		Total Pathway Carcinogenic RISK	7.98E-09

TABLE 7 - 35

Chronic Risk for User Inhalation of Vapor Phase Chemicals

Pathway #11

PARAMETER	Non-Carcinogenic Intake (mg/kg-day)	RfD(Potency Measure) (mg/kg-day) Inhalation	Chronic RISK (Unitless)
Vinyl Chloride			
Methylene Chloride	4.08E-09	3.00E+00	1.36E-09
Acetone	4.17E-08	3.00E+00	1.39E-08
1,1-Dichloroethane	2.73E-09	1.00E-01	2.73E-08
1,2-Dichloroethene (Total)			
Chloroform			
1,2-Dichloroethane	1.75E-07	9.10E-02	1.92E-06
2-Butanone	3.54E-10	9.00E-02	3.93E-09
1,1,1-Trichloroethane	2.65E-09	3.00E-01	8.82E-09
Trichloroethene			
Benzene			
4-Methyl-2-Pentanone			
Tetrachloroethene			
Toluene	1.96E-07	2.00E+00	9.80E-08
Chlorobenzene	3.27E-10	5.00E-03	6.53E-08
Ethylbenzene			
Total Xylenes	4.52E-09	3.00E-01	1.51E-08
Phenol			
bis(2-Chloroethyl)ether			
1,4-Dichlorobenzene			
Benzyl Alcohol			
2-Methylphenol			
4-Methylphenol			
Nitrobenzene	2.29E-10	2.00E-03	1.15E-07
Isophorone			

TABLE 7 - 35 (con't)
Chronic Risk for User Inhalation of Vapor Phase Chemicals
Pathway #11

	Non-Carcinogenic Intake (mg/kg-day)	RfD(Potency Measure) (mg/kg-day) Inhalation	Chronic RISK (Unitless)
2,4-Dimethylphenol			
Benzoic Acid			
Bis(2-chloroethoxy)methane			
1,2,4-Trichlorobenzene	7.42E-13	3.00E-03	2.47E-10
Naphthalene			
4-Chloroaniline			
2-Methylnaphthalene			
Phenanthrene			
Di-n-butylphthalate			
Fluoranthene			
Pyrene			
Butylbenzylphthalate			
bis(2-Ethylhexyl)phthalate			
Aluminum			
Arsenic			
Barium	0.00E+00	1.00E-04	0.00E+00
Cadmium			
Chromium	0.00E+00	2.00E-06	0.00E+00
Iron			
Nickel			
Potassium			
Selenium	0.00E+00	1.00E-03	0.00E+00
Zinc			
Cyanide			
Phenols (Total)			
		Total Pathway Chronic RISK	2.27E-06

TABLE 7 - 36
Carcinogenic Risk for User Inhalation of Fugitve Dust
Pathway #12

PARAMETER	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Inhalation	Carcinogenic RISK (Unitless)
Acetone			0.00E+00
Carbon Disulfide			0.00E+00
1,2-Dichloroethene (Total)			0.00E+00
2-Butanone			0.00E+00
Trichloroethene	7.13E-11	1.70E-02	1.21E-12
Benzene	4.24E-11	2.90E-02	1.23E-12
2-Hexanone			0.00E+00
Tetrachloroethene	2.07E-10	3.31E-03	6.86E-13
Toluene			0.00E+00
Ethylbenzene			0.00E+00
Total Xylenes			0.00E+00
Phenol			0.00E+00
1,3-Dichlorobenzene			0.00E+00
1,4-Dichlorobenzene			0.00E+00
1,2-Dichlorobenzene			0.00E+00
Nitrobenzene			0.00E+00
Isophorone			0.00E+00
2,4-Dimethylphenol			0.00E+00
1,2,4-Trichlorobenzene			0.00E+00
Naphthalene			0.00E+00
2-Methylnaphthalene			0.00E+00
Dimethylphthalate			0.00E+00
Acenaphthylene			0.00E+00
Acenaphthene			0.00E+00
Dibenzofuran			0.00E+00
Fluorene			0.00E+00
n-Nitrosodiphenylamine			0.00E+00
Phenanthrene			0.00E+00
Anthracene			0.00E+00
Fluoranthene			0.00E+00
Pyrene			0.00E+00
Benzo(a)anthracene	1.10E-10	6.10E+00	6.69E-10
Chrysene	1.21E-10	6.10E+00	7.37E-10
bis(2-Ethylhexyl)phthalate			0.00E+00
Di-n-octylphthalate			0.00E+00
Benzo(b)fluoranthene	1.17E-10	6.10E+00	7.12E-10
Benzo(k)fluoranthene	1.52E-10	6.10E+00	9.30E-10
Benzo(a)pyrene	1.19E-10	6.10E+00	7.28E-10
Indeno(1,2,3-cd)pyrene	4.52E-11	6.10E+00	2.76E-10
Benzo(g,h,i)perylene			0.00E+00
Aldrin	2.26E-12	1.70E+01	3.85E-11
Arochlor-1254			0.00E+00
Arochlor-1260			0.00E+00
Cadmium	1.61E-08	6.10E+00	9.80E-08
Chromium			0.00E+00
Phenols (Total)			0.00E+00
	Total Pathway Carcinogenic Risk =		1.02E-07

TABLE 7 - 37

Chronic Risk for User Inhalation of Fugitve Dust

Pathway #12

PARAMETER	Non-carcinogenic Intake (mg/kg-day)	Rfd(Potency Measure) (mg/kg-day) Inhalation	Chronic RISK (Unitless)
Acetone	5.27E-12	3.00E+00	1.76E-12
Carbon Disulfide	8.35E-12	1.00E-02	8.35E-10
1,2-Dichloroethene (Total)			
2-Butanone	4.39E-12	9.00E-02	4.88E-11
Trichloroethene			
Benzene			
2-Hexanone			
Tetrachloroethene			
Toluene	2.68E-09	2.00E+00	1.34E-09
Ethylbenzene			
Total Xylenes	1.80E-09	3.00E-01	6.01E-09
Phenol			
1,3-Dichlorobenzene			
1,4-Dichlorobenzene			
1,2-Dichlorobenzene	1.16E-09	4.00E-02	2.90E-08
Nitrobenzene	1.01E-10	2.00E-03	5.05E-08
Isophorone			
2,4-Dimethylphenol			
1,2,4-Trichlorobenzene	4.99E-10	3.00E-03	1.66E-07
Naphthalene			
2-Methylnaphthalene			
Dimethylphthalate			
Acenaphthylene			
Acenaphthene			
Dibenzofuran			
Fluorene			
n-Nitrosodiphenylamine			
Phenanthrene			
Anthracene			
Fluoranthene			
Pyrene			
Benzo(a)anthracene			
Chrysene			
bis(2-Ethylhexyl)phthalate			
Di-n-octylphthalate			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Indeno(1,2,3-cd)pyrene			
Benzo(g,h,i)perylene			
Aldrin			
Arochlor-1254			
Arochlor-1260			
Cadmium			
Chromium	1.21E-06	2.00E-06	6.03E-01
Phenols (Total)			
	Total Pathway Chronic Risk =		6.03E-01

TABLE 7 - 38

Carcinogenic Risk for Users Via Ingestion
of Quarry Lake Water During Swimming
Pathway #13

PARAMETER	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Oral	Carcinogenic RISK (Unitless)
1,2-Dichloroethene (Total)			
Toluene			
Di-n-butylphthalate			
Iron			
Phenols (Total)			
		Total Pathway Carcinogenic Risk	0.00E+00

TABLE 7 - 39

Chronic Risk for Users Via Ingestion
of Quarry Lake Water During Swimming
Pathway #13

PARAMETER	Non-carcinogenic Intake (mg/kg-day)	RFD(Potency Measure) (mg/kg-day) Oral	Chronic RISK (Unitless)
1,2-Dichloroethene (Total)			
Toluene	1.05E-07	2.00E-01	5.25E-07
Di-n-butylphthalate	1.10E-08	1.00E-01	1.10E-07
Iron			
Phenols (Total)	5.81E-07	6.00E-01	9.69E-07
		Total Pathway Carcinogenic Risk	1.60E-06

TABLE 7 - 40

Carcinogenic Risk for Users Via Dermal Absorption
of Quarry Lake Water During Swimming
Pathway #14

PARAMETER	Carcinogenic Intake (mg/kg-day)	Slope Factor (mg/kg-day)-1 Oral	Carcinogenic RISK (Unitless)
1,2-Dichloroethene (Total)			
Toluene			
Di-n-butylphthalate			
Iron			
Phenols (Total)			
		Total Pathway Carcinogenic Risk	0.00E+00

TABLE 7 - 41

Chronic Risk for Users Via Dermal Absorption
of Quarry Lake Water During Swimming
Pathway #14

PARAMETER	Non-carcinogenic Intake (mg/kg-day)	RFD(Potency Measure) (mg/kg-day) Oral	Chronic RISK (Unitless)
1,2-Dichloroethene (Total)			
Toluene	3.66E-08	2.00E-01	1.83E-07
Di-n-butylphthalate	3.39E-09	1.00E-01	3.39E-08
Iron			
Phenols (Total)	1.35E-04	6.00E-01	2.25E-04
		Total Pathway Carcinogenic Risk	2.26E-04

TABLE 7 - 42
Summary of Risks

Pathway	Number	Carcinogenic Risk	Chronic Risk
Trespasser Ingestion of Surface Soil	1	3.67E-06	7.06E-02
Trespasser Dermal Contact with Surface Soil	2	6.66E-06	1.28E-01
Trespr. Dermal Contact with Shallow Groundwater	3	5.01E-05	1.20E-01
Trespasser Inhalation of Vapors	4	2.05E-09	5.84E-07
Resident Inhalation of Vapors	5	3.20E-09	9.13E-07
Trespasser Inhalation of Fugitive Dust	6	2.55E-08	1.45E-01
Resident Inhalation of Fugitive Dust	7	2.12E-06	1.26E+01
User Ingestion of Surface Soil	8	7.36E-06	1.42E-01
User Dermal Contact with Surface Soil	9	3.67E-05	7.06E-01
User Dermal Contact with Shallow Groundwater	10	9.73E-05	2.50E-01
User Inhalation of Vapors	11	7.98E-09	2.27E-06
User Inhalation of Fugitive Dust	12	1.02E-07	6.03E-01
User Ingestion of Lake Water while Swimming	13	0.00E+00	1.60E-06
User Dermal Contact with Lake Water (Swimming)	14	0.00E+00	2.26E-04

Scenario	Pathways	Sum Canc. Risk	Sum Chronic Risk
Trespasser - NO ACTION	1-4, 6	6.05E-05	4.64E-01
Resident - NO ACTION	5, 7	2.12E-06	1.26E+01
User - FUTURE USE	8-14	1.41E-04	1.70E+00
Resident/Trespasser - NO ACTION	1-7	6.26E-05	1.31E+01
Resident/User - FUTURE USE	5,7-14	1.44E-04	1.43E+01

APPENDIX A

ANALYTICAL RESULTS

APPENDIX A

TABLE A-1: SUBSURFACE SOIL AND WASTE BORINGS

Analytical Results

Frontier Chemical

SAMPLE-ID		URS-B1	URS-B2	URS-B3	URS-B4	URS-B5	URS-B6
COLLECTION DATE		7/25/90	7/25/90	7/25/90	7/25/90	7/26/90	7/26/90
PARAMETER	TYPE						
Chloromethane	VOC						
Bromomethane	VOC						
Vinyl Chloride	VOC				21 J		
Chloroethane	VOC						
Methylene Chloride	VOC		R	R		R	
Acetone	VOC	R	R	R	R	R	
Carbon Disulfide	VOC				6 J		4
1,1-Dichloroethene	VOC				10 J		
1,1-Dichloroethane	VOC		120 J		220		4 J
1,2-Dichloroethene (Total)	VOC	3 J	4200	8900	690		9
Chloroform	VOC						
1,2-Dichloroethane	VOC				68		
2-Butanone	VOC	R	R	R	R		
1,1,1-Trichloroethane	VOC	8 J	330 J	870	120		
Carbon Tetrachloride	VOC						
Vinyl Acetate	VOC						
Bromodichloromethane	VOC						
1,2-Dichloropropane	VOC						
cis-1,3-Dichloropropene	VOC						
Trichloroethene	VOC	3 J	2500	18,000	160		26
Dibromochloromethane	VOC						
1,1,2-Trichloroethane	VOC						
Benzene	VOC		730 J	15,000	42		2 J
trans-1,3-Dichloropropene	VOC						
Bromoform	VOC						
4-Methyl-2-Pentanone	VOC		260 J	99,000 E			
2-Hexanone	VOC						
Tetrachloroethene	VOC		2500	6500	94		16
1,1,2,2-Tetrachloroethane	VOC						
Toluene	VOC	R	7600 B	100,000 B E	R	3 J	7 J
Chlorobenzene	VOC		7100	5900			
Ethylbenzene	VOC		1300	42,000 E	22 J		4 J
Styrene	VOC						
Total Xylenes	VOC	R	8100 B	120,000 B E	100 B		15

All results reported in μg/kg (ppb).

Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

B - Analyte detected in associated method blank.

E - Analyte concentration exceeded the calibration range.

R - Analyte rejected due to blank contamination.

TABLE A-1: SUBSURFACE SOIL AND WASTE BORING
Analytical Results
Frontier Chemical

SAMPLE-ID		URS-B7	URS-B8	URS-B9	URS-B10	URS-B11	URS-B12
COLLECTION DATE		7/26/90	7/26/90	7/27/90	7/27/90	2/13/91	2/13/91
PARAMETER	TYPE						
Chloromethane	VOC						
Bromomethane	VOC						
Vinyl Chloride	VOC			130			
Chloroethane	VOC						
Methylene Chloride	VOC		R		R	R	R
Acetone	VOC	R	R	R	R	R	R
Carbon Disulfide	VOC	2 J					
1,1-Dichloroethene	VOC				160 J		
1,1-Dichloroethane	VOC				130 J		
1,2-Dichloroethene (Total)	VOC	2 J		240	130 J		7
Chloroform	VOC						
1,2-Dichloroethane	VOC						
2-Butanone	VOC	R	R	R	R	R	R
1,1,1-Trichloroethane	VOC		300 J	17 J			
Carbon Tetrachloride	VOC						
Vinyl Acetate	VOC						
Bromodichloromethane	VOC						
1,2-Dichloropropane	VOC						
cis-1,3-Dichloropropene	VOC						
Trichloroethene	VOC	4 J		880	650 J		12
Dibromochloromethane	VOC						
1,1,2-Trichloroethane	VOC						
Benzene	VOC	5 J	310 J	290	260 J		
trans-1,3-Dichloropropene	VOC						
Bromoform	VOC						
4-Methyl-2-Pentanone	VOC	R	750 J	380 B	430 J		
2-Hexanone	VOC						
Tetrachloroethene	VOC		1000 J	170	280 J		
1,1,2,2-Tetrachloroethane	VOC						
Toluene	VOC	R	R	1500 B	R	R	R
Chlorobenzene	VOC						
Ethylbenzene	VOC	2 J	3200	160	1500		
Styrene	VOC						
Total Xylenes	VOC	R	23,000 B	1300 B	5900 B		R

All results reported in μg/kg (ppb).

Only detected results are reported.

J – Indicates the result is less than the sample quantitation limit but greater than zero.

B – Analyte detected in associated method blank.

E – Analyte concentration exceeded the calibration range.

R – Analyte rejected due to blank contamination.

TABLE A-1: SUBSURFACE SOIL AND WASTE BORINGS

Analytical Results

Frontier Chemical

SAMPLE-ID		URS-B1	URS-B2	URS-B3	URS-B4	URS-B5	URS-B6
COLLECTION DATE		7/25/90	7/25/90	7/25/90	7/25/90	7/26/90	7/26/90
PARAMETER	TYPE						
Phenol	SEMI			13,000			
bis(2-Chloroethyl)ether	SEMI						
2-Chlorophenol	SEMI						
1,3-Dichlorobenzene	SEMI						
1,4-Dichlorobenzene	SEMI		2900				
Benzyl Alcohol	SEMI						
1,2-Dichlorobenzene	SEMI		16,000	3100			
2-Methylphenol	SEMI			1300			
Bis(2-chloroisopropyl)ether	SEMI						
4-Methylphenol	SEMI			13,000			
n-Nitroso-di-n-propylamine	SEMI						
Hexachloroethane	SEMI						
Nitrobenzene	SEMI						
Isophorone	SEMI			600 J			
2-Nitrophenol	SEMI						
2,4-Dimethylphenol	SEMI			2100			
Benzoic Acid	SEMI						
Bis(2-chloroethoxy)methane	SEMI						
2,4-Dichlorophenol	SEMI						
1,2,4-Trichlorobenzene	SEMI		350 J				
Naphthalene	SEMI	170 J	330 J	750 J	100 J		
4-Chloroaniline	SEMI						
Hexachlorobutadiene	SEMI						
4-Chloro-3-methylphenol	SEMI						
2-Methylnaphthalene	SEMI	100 J	230 J	690 J	180 J		
Hexachlorocyclopentadiene	SEMI						
2,4,6-Trichlorophenol	SEMI						
2,4,5-Trichlorophenol	SEMI						
2-Chloronaphthalene	SEMI						
2-Nitroaniline	SEMI						
Dimethylphthalate	SEMI						
Acenaphthylene	SEMI	480 J	160 J				
2,6-Dinitrotoluene	SEMI						
3-Nitroaniline	SEMI						
Acenaphthene	SEMI	190 J					
2,4-Dinitrophenol	SEMI						

All results reported in μg/kg (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

TABLE A-1: SUBSURFACE SOIL AND WASTE BORING
Analytical Results
Frontier Chemical

SAMPLE-ID		URS-B7	URS-B8	URS-B9	URS-B10	URS-B11	URS-B12
COLLECTION DATE		7/26/90	7/26/90	7/27/90	7/27/90	2/13/91	2/13/91
PARAMETER	TYPE						
Phenol	SEMI		9400 J		660 J		720 J
bis(2-Chloroethyl)ether	SEMI						
2-Chlorophenol	SEMI						
1,3-Dichlorobenzene	SEMI						
1,4-Dichlorobenzene	SEMI						
Benzyl Alcohol	SEMI						
1,2-Dichlorobenzene	SEMI						
2-Methylphenol	SEMI						
Bis(2-chloroisopropyl)ether	SEMI						
4-Methylphenol	SEMI						
n-Nitroso-di-n-propylamine	SEMI						
Hexachloroethane	SEMI						
Nitrobenzene	SEMI						
Isophorone	SEMI						
2-Nitrophenol	SEMI						
2,4-Dimethylphenol	SEMI						
Benzoic Acid	SEMI				320 J		
Bis(2-chloroethoxy)methane	SEMI						
2,4-Dichlorophenol	SEMI						
1,2,4-Trichlorobenzene	SEMI		89,000		47,000		
Naphthalene	SEMI		7700 J				
4-Chloroaniline	SEMI						
Hexachlorobutadiene	SEMI						
4-Chloro-3-methylphenol	SEMI						
2-Methylnaphthalene	SEMI		6100 J				
Hexachlorocyclopentadiene	SEMI						
2,4,6-Trichlorophenol	SEMI						
2,4,5-Trichlorophenol	SEMI						
2-Chloronaphthalene	SEMI						
2-Nitroaniline	SEMI						
Dimethylphthalate	SEMI						
Acenaphthylene	SEMI						
2,6-Dinitrotoluene	SEMI						
3-Nitroaniline	SEMI						
Acenaphthene	SEMI						
2,4-Dinitrophenol	SEMI						

All results reported in μg/kg (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

TABLE A-1: SUBSURFACE SOIL AND WASTE BORINGS

Analytical Results

Frontier Chemical

SAMPLE-ID		URS-B1	URS-B2	URS-B3	URS-B4	URS-B5	URS-B6
COLLECTION DATE		7/25/90	7/25/90	7/25/90	7/25/90	7/26/90	7/26/90
PARAMETER	TYPE						
4-Nitrophenol	SEMI						
Dibenzofuran	SEMI	330 J			62 J		
2,4-Dinitrotoluene	SEMI						
Diethylphthalate	SEMI	150 J	240 J			R	
4-Chlorophenyl-phenyl Ether	SEMI						
Fluorene	SEMI	500 J	230 J				
4-Nitroaniline	SEMI						
4,6-Dinitro-2-methylphenol	SEMI						
n-Nitrosodiphenylamine	SEMI						
4-Bromophenyl-phenyl Ether	SEMI						
Hexachlorobenzene	SEMI						
Pentachlorophenol	SEMI						
Phenanthrene	SEMI	4600	2400	350 J	420 J		110 J
Anthracene	SEMI	780 J	360 J		76 J		
Di-n-butylphthalate	SEMI	300 J	100 J	2700	60 J	R	55 J
Fluoranthene	SEMI	5500	2300		400 J		140 J
Pyrene	SEMI	4500	2500	200 J	330 J		140 J
Butylbenzylphthalate	SEMI			410 J			
3,3'-Dichlorobenzidine	SEMI						
Benzo(a)anthracene	SEMI	2900	1600 J				
Chrysene	SEMI	2400	1500 J		210 J		
bis(2-Ethylhexyl)phthalate	SEMI	R	R	7600 B	R	R	R
Di-n-octylphthalate	SEMI						
Benzo(b)fluoranthene	SEMI	2200	1300 J	130 J	140 J		
Benzo(k)fluoranthene	SEMI	460 J	240 J		120 J		
Benzo(a)pyrene	SEMI	2100	1300 J		120 J		
Indeno(1,2,3-cd)pyrene	SEMI	2000	1500 J				
Dibenz(a,h)anthracene	SEMI	880 J	570 J				
Benzo(g,h,i)perylene	SEMI	1900	1200 J				

All results reported in μg/kg (ppb).

Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

B - Analyte detected in associated method blank.

R - Analyte rejected due to blank contamination.

TABLE A-1: SUBSURFACE SOIL AND WASTE BORING

Analytical Results

Frontier Chemical

SAMPLE-ID		URS-B7	URS-B8	URS-B9	URS-B10	URS-B11	URS-B12
COLLECTION DATE		7/26/90	7/26/90	7/27/90	7/27/90	2/13/91	2/13/91
PARAMETER	TYPE						
4-Nitrophenol	SEMI						
Dibenzofuran	SEMI						
2,4-Dinitrotoluene	SEMI						
Diethylphthalate	SEMI	52 J			330 J	64 J	46 J
4-Chlorophenyl-phenyl Ether	SEMI						
Fluorene	SEMI						
4-Nitroaniline	SEMI						
4,6-Dinitro-2-methylphenol	SEMI						
n-Nitrosodiphenylamine	SEMI						
4-Bromophenyl-phenyl Ether	SEMI						
Hexachlorobenzene	SEMI						
Pentachlorophenol	SEMI					2200 J	
Phenanthrene	SEMI	52 J	2300 J		310 J	20 J	
Anthracene	SEMI						
Di-n-butylphthalate	SEMI	65 J	920 J	160 J		140 J	66 J
Fluoranthene	SEMI	70 J			300 J	46 J	31 J
Pyrene	SEMI	91 J	1100 J	270 J	300 J	36 J	31 J
Butylbenzylphthalate	SEMI		2300 J				
3,3'-Dichlorobenzidine	SEMI						
Benzo(a)anthracene	SEMI						
Chrysene	SEMI			220 J			49 J
bis(2-Ethylhexyl)phthalate	SEMI	R	95,000 B	R	R	R	R
Di-n-octylphthalate	SEMI						
Benzo(b)fluoranthene	SEMI			260 J			
Benzo(k)fluoranthene	SEMI						
Benzo(a)pyrene	SEMI			190 J			
Indeno(1,2,3-cd)pyrene	SEMI			210 J			
Dibenz(a,h)anthracene	SEMI						
Benzo(g,h,i)perylene	SEMI			210 J			

All results reported in μg/kg (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

B - Analyte detected in associated method blank.

R - Analyte rejected due to blank contamination.

TABLE A-1: SUBSURFACE SOIL AND WASTE BORINGS

Analytical Results

Frontier Chemical

SAMPLE-ID		URS-B1	URS-B2	URS-B3	URS-B4	URS-B5	URS-B6
COLLECTION DATE		7/25/90	7/25/90	7/25/90	7/25/90	7/26/90	7/26/90
PARAMETER	TYPE						
alpha-BHC	PST						
beta-BHC	PST						
delta-BHC	PST						
gamma-BHC (Lindane)	PST						
Heptachlor	PST				1.6 J		
Aldrin	PST						3.5 J
Heptachlor Epoxide	PST						
Endosulfan I	PST						
Dieldrin	PST						
4,4'-DDE	PST						
Endrin	PST						
Endosulfan II	PST						
4,4'-DDD	PST						
Endosulfan Sulfate	PST						
4,4'-DDT	PST						
Methoxychlor	PST						
Endrin Ketone	PST						
alpha-Chlordane	PST						
gamma-Chlordane	PST	25 J					
Toxaphene	PST						
Aroclor-1016	PCB						
Aroclor-1221	PCB						
Aroclor-1232	PCB						
Aroclor-1242	PCB		3300				
Aroclor-1248	PCB						
Aroclor-1254	PCB			9200			
Aroclor-1260	PCB				91 J		140 J

All results reported in μg/kg (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

TABLE A-1: SUBSURFACE SOIL AND WASTE BORING
Analytical Results
Frontier Chemical

SAMPLE-ID		URS-B7	URS-B8	URS-B9	URS-B10	URS-B11	URS-B12
COLLECTION DATE		7/26/90	7/26/90	7/27/90	7/27/90	2/13/91	2/13/91
PARAMETER	TYPE						
alpha-BHC	PST						
beta-BHC	PST						10 J
delta-BHC	PST						
gamma-BHC (Lindane)	PST						
Heptachlor	PST						
Aldrin	PST						
Heptachlor Epoxide	PST						
Endosulfan I	PST						
Dieldrin	PST						
4,4'-DDE	PST						
Endrin	PST						
Endosulfan II	PST						
4,4'-DDD	PST						
Endosulfan Sulfate	PST						
4,4'-DDT	PST						
Methoxychlor	PST						
Endrin Ketone	PST						
alpha-Chlordane	PST						
gamma-Chlordane	PST						
Toxaphene	PST						
Aroclor-1016	PCB						
Aroclor-1221	PCB						
Aroclor-1232	PCB						
Aroclor-1242	PCB						
Aroclor-1248	PCB						
Aroclor-1254	PCB			3500			
Aroclor-1260	PCB	890	740		850		

All results reported in μg/kg (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

TABLE A-1: SUBSURFACE SOIL AND WASTE BORINGS
Analytical Results
Frontier Chemical

SAMPLE-ID		URS-B1	URS-B2	URS-B3	URS-B4	URS-B5	URS-B6
COLLECTION DATE		7/25/90	7/25/90	7/25/90	7/25/90	7/26/90	7/26/90
PARAMETER	TYPE						
Aluminum	MCP	18,400	23,300	21,700	12,900	21,000	21,000
Antimony	MCP					5.1 B N	5.3 NB
Arsenic	MCP	4.2	4.4	9.9 S	11.6 S	1 B	2.5 B S
Barium	MCP	218	153	137	88.9	276	141
Beryllium	MCP	1.2 B	0.96 B	0.97 B	0.94 B	0.86 B	0.82 B
Cadmium	MCP	1.8	0.69 B	9.6	0.91 B	0.49 B	62.1
Calcium	MCP	50,400	61,700	38,100	16,400	99,400	53,100
Chromium	MCP	30.4	80.5	610	28.8	28.7	610
Cobalt	MCP	13.7	15.5	12.9	9.2 B	14	17.2
Copper	MCP	72.3 *	29.0 *	42.7 *	34.1 *	26.6 *	155 *
Iron	MCP	23,300	30,800	40,400	21,700	25,400	34,300
Lead	MCP	70.5 *	55.3 *	80.9 *	64.0 *	8 *	29.6 *
Magnesium	MCP	9140 *	11,900 *	14,100 *	4690 *	14,100 *	13,100 *
Manganese	MCP	631	665	507	217	674	671
Mercury	MCP		0.1	0.15			
Nickel	MCP	26.6	119	27.5	35.3	27.1	84.7
Potassium	MCP	2820	4840	3840	1970	4010	4190
Selenium	MCP		0.58 B	0.59 B	0.66 B		
Silver	MCP						
Sodium	MCP	622 B	830 B	620 B	631 B	564 B	559 B
Thallium	MCP	0.30 B		0.29 B	0.45 B	0.27 B	0.24 B
Vanadium	MCP	29.7	43.3	41.1	27.1	37.5	75
Zinc	MCP	184	101	282	80.2	57.9	125
Cyanide	MCP	1.2	2.3	2.7			9.9
Phenols	MCP	1.24	3.32	94.2	2.18		4.35
Ammonia, as N	MISC	NA	NA	80.7	NA	NA	NA
Total Kjeldahl Nitrogen, as N	MISC	NA	NA	1210	NA	NA	NA
Nitrate-Nitrogen	MISC	NA	NA		NA	NA	NA
TOC	MISC	NA	NA	31,200	NA	NA	NA
pH (SU)	MISC	NA	NA	8.53	NA	NA	NA
Moisture (%)	MISC	NA	NA	19.7	NA	NA	NA

All results reported in mg/kg (ppm) unless otherwise stated.

Only detected results are reported.

N - Spike sample % recovery out of control limits.

NA - Not Analyzed

* - Duplicate analysis not within control limits.

B - Less than quantitation limit but greater than or equal to instrument detection limit.

S - The reported value was determined by the Method of Standard Additions (MSA).

TABLE A-1: SUBSURFACE SOIL AND WASTE BORING

Analytical Results

Frontier Chemical

SAMPLE-ID		URS-B7	URS-B8	URS-B9	URS-B10	URS-B11	URS-B12
COLLECTION DATE		7/26/90	7/26/90	7/27/90	7/27/90	2/13/91	2/13/91
PARAMETER	TYPE						
Aluminum	MCP	22,600	15,300	17,600	22,100	25300	20,900
Antimony	MCP		5.4 B N				
Arsenic	MCP	3.2 B S	2.9	2.6	4.4 B S	3.5 BNS	4.1 BNS
Barium	MCP	132	150	188	148	145	187
Beryllium	MCP	1	0.79 B	2.6	1.2 B	1.2 B	1.9
Cadmium	MCP	41.8	80.7	13.8	93.3	.57 B	.64 B
Calcium	MCP	49,700	182,000	139,000	73,300	63,600 *	44,100 *
Chromium	MCP	254	573	509	941	35	28.6
Cobalt	MCP	16.3	15.1	3.6 B	14	17.8	13.8
Copper	MCP	91.7 *	315 *	39.8 *	372 *	26.2	26.5
Iron	MCP	32,500	17,500	11,500	29,500	36,000	31,900
Lead	MCP	35 *	77 S *	83.1 *	50.2 *	8.8	15.7
Magnesium	MCP	13,500 *	18,200 *	10,100 *	10,900 *	15,200	17,500
Manganese	MCP	592	671	1150	476	697	534
Mercury	MCP			1.1			
Nickel	MCP	58.6	82.4	13.6	84.4	37.2	33.5
Potassium	MCP	4610	2720	1890	3800	5460	4540
Selenium	MCP	0.53 B	0.67 B	1.2 B S			
Silver	MCP						
Sodium	MCP	606 B	1390 B	765 B	1310	446 B	409 B
Thallium	MCP	0.44 B	0.31 B		0.38 B		
Vanadium	MCP	42.4	48.7	15	58.5	48.1	40.3
Zinc	MCP	136	133	224	113	73.6	81.4
Cyanide	MCP	4.6	7.5	17.8	8.6		
Phenols	MCP	2.36	25.5	4.43	3.72	NA	NA
Ammonia, as N	MISC	68	NA	59.4	NA	NA	NA
Total Kjeldahl Nitrogen, as N	MISC	641	NA	1540	NA	NA	NA
Nitrate-Nitrogen	MISC	3.37	NA	1.75	NA	NA	NA
TOC	MISC	15400	NA	36100	NA	NA	NA
pH (SU)	MISC	10.5	NA	11.7	NA	NA	NA
Moisture (%)	MISC	23.8	NA	20.2	NA	NA	NA

All results reported in mg/kg (ppm) unless otherwise stated.

Only detected results are reported.

N - Spike sample % recovery out of control limits.

NA - Not Analyzed

* - Duplicate analysis not within control limits.

B - Less than quantitation limit but greater than or equal to instrument detection limit.

S - The reported value was determined by the Method of Standard Additions (MSA).

TABLE A-1: SUBSURFACE SOIL AND WASTE BORINGS

Analytical Results

Frontier Chemical

SAMPLE-ID		URS-B1	URS-B2	URS-B3	URS-B4	URS-B5	URS-B6
COLLECTION DATE		7/25/90	7/25/90	7/25/90	7/25/90	7/26/90	7/26/90
PARAMETER	TYPE						
Corrisivity	MISC	NA	NA	NA	NA	NA	NEG
Ignitability	MISC	NA	NA	NA	NA	NA	NEG
Reactivity	MISC	NA	NA	NA	NA	NA	NEG
Sulfur (%)	MISC	NA	NA	NA	NA	NA	0.016
Chlorine (ppm)	MISC	NA	NA	NA	NA	NA	
Ash Weight (%)	MISC	NA	NA	NA	NA	NA	68.53
Heat of Combustion (BTU/lb)	MISC	NA	NA	NA	NA	NA	**
Reactive Cyanide (ppm)	MISC	NA	NA	NA	NA	NA	
Reactive Sulfide (ppm)	MISC	NA	NA	NA	NA	NA	
EP Tox - Arsenic	MCP	NA	NA	NA	NA	NA	
EP Tox - Barium	MCP	NA	NA	NA	NA	NA	210
EP Tox - Cadmium	MCP	NA	NA	NA	NA	NA	449
EP Tox - Chromium	MCP	NA	NA	NA	NA	NA	7 B
EP Tox - Lead	MCP	NA	NA	NA	NA	NA	
EP Tox - Mercury	MCP	NA	NA	NA	NA	NA	
EP Tox - Selenium	MCP	NA	NA	NA	NA	NA	
EP Tox - Silver	MCP	NA	NA	NA	NA	NA	
EP Tox - Lindane	PEST	NA	NA	NA	NA	NA	
EP Tox - Endrine	PEST	NA	NA	NA	NA	NA	
EP Tox - Methoxyclor	PEST	NA	NA	NA	NA	NA	
EP Tox - Toxaphene	PEST	NA	NA	NA	NA	NA	
EP Tox - 2,4-D	HERB	NA	NA	NA	NA	NA	
EP Tox - Silvex	HERB	NA	NA	NA	NA	NA	

All results reported in μg/L (ppb) unless otherwise stated.

Only detected results are reported.

NA - Not Analyzed

* - Duplicate analysis not within control limits.

NEG - Not reactive, corrosive, or ignitable.

B - Less than quantitation limit but greater than or equal to instrument detection limit.

** - Sample does not ignite for BTU analysis.

TABLE A-1: SUBSURFACE SOIL AND WASTE BORING

Analytical Results

Frontier Chemical

SAMPLE-ID		URS-B7	URS-B8	URS-B9	URS-B10	URS-B11	URS-B12
COLLECTION DATE		7/26/90	7/26/90	7/27/90	7/27/90	2/13/91	2/13/91
PARAMETER	TYPE						
Corrisivity	MISC	NA	NA	NA	NEG	NA	NA
Ignitability	MISC	NA	NA	NA	NEG	NA	NA
Reactivity	MISC	NA	NA	NA	NEG	NA	NA
Sulfur (%)	MISC	NA	NA	NA	NA	NA	NA
Chlorine (ppm)	MISC	NA	NA	NA	NA	NA	NA
Ash Weight (%)	MISC	NA	NA	NA	NA	NA	NA
Heat of Combustion (BTU/lb)	MISC	NA	NA	NA	NA	NA	NA
Reactive Cyanide (ppm)	MISC	NA	NA	NA		NA	NA
Reactive Sulfide (ppm)	MISC	NA	NA	NA	68.3	NA	NA
EP Tox - Arsenic	MCP	NA	NA	NA	24.4 *	NA	NA
EP Tox - Barium	MCP	NA	NA	NA	313	NA	NA
EP Tox - Cadmium	MCP	NA	NA	NA	755	NA	NA
EP Tox - Chromium	MCP	NA	NA	NA	42.3	NA	NA
EP Tox - Lead	MCP	NA	NA	NA		NA	NA
EP Tox - Mercury	MCP	NA	NA	NA		NA	NA
EP Tox - Selenium	MCP	NA	NA	NA		NA	NA
EP Tox - Silver	MCP	NA	NA	NA		NA	NA
EP Tox - Lindane	PEST	NA	NA	NA		NA	NA
EP Tox - Endrine	PEST	NA	NA	NA		NA	NA
EP Tox - Methoxyclor	PEST	NA	NA	NA		NA	NA
EP Tox - Toxaphene	PEST	NA	NA	NA		NA	NA
EP Tox - 2,4-D	HERB	NA	NA	NA		NA	NA
EP Tox - Silvex	HERB	NA	NA	NA		NA	NA

All results reported in μg/L (ppb) unless otherwise stated.

Only detected results are reported.

NA - Not Analyzed

* - Duplicate analysis not within control limits.

NEG - Not reactive, corrosive, or ignitable.

B - Less than quantitation limit but greater than or equal to instrument detection limit.

** - Sample does not ignite for BTU analysis.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-1	SPS-2	SPS-3	SPS-4	SPS-5	SPS-5RE	SPS-6	SPS-7	SPS-7RE
COLLECTION DATE		6/25/90	6/25/90	7/10/90	7/10/90	6/29/90	6/29/90	6/29/90	7/10/90	7/10/90
PARAMETER	TYPE									
Chloromethane	VOC					DR	DR			NA
Bromomethane	VOC					DR	DR			NA
Vinyl Chloride	VOC					DR	DR			NA
Chloroethane	VOC					DR	DR			NA
Methylene Chloride	VOC					DR	DR	R		NA
Acetone	VOC	R	R	R	R	DR	DR	R	R	NA
Carbon Disulfide	VOC		19			DR	DR			NA
1,1-Dichloroethene	VOC					DR	DR			NA
1,1-Dichloroethane	VOC					DR	DR			NA
1,2-Dichloroethene (Total)	VOC					DR	DR	5600		NA
Chloroform	VOC					DR	DR			NA
1,2-Dichloroethane	VOC					DR	DR			NA
2-Butanone	VOC	R	R		2 J	DR	DR		10 J	NA
1,1,1-Trichloroethane	VOC					DR	DR			NA
Carbon Tetrachloride	VOC					DR	DR			NA
Vinyl Acetate	VOC					DR	DR			NA
Bromodichloromethane	VOC					DR	DR			NA
1,2-Dichloropropane	VOC					DR	DR			NA
cis-1,3-Dichloropropene	VOC					DR	DR			NA
Trichloroethene	VOC					DR	DR	570 J		NA
Dibromochloromethane	VOC					DR	DR			NA
1,1,2-Trichloroethane	VOC					DR	DR			NA
Benzene	VOC					DR	DR	380 J	11	NA
trans-1,3-Dichloropropene	VOC					DR	DR			NA
Bromoform	VOC					DR	DR			NA
4-Methyl-2-Pentanone	VOC					DR	DR			NA
2-Hexanone	VOC					DR	DR			NA
Tetrachloroethene	VOC					DR	DR	1100		NA
1,1,2,2-Tetrachloroethane	VOC					DR	DR			NA
Toluene	VOC					DR	DR	6100		NA
Chlorobenzene	VOC					DR	DR			NA
Ethylbenzene	VOC					DR	DR	530 J		NA
Styrene	VOC					DR	DR			NA
Total Xylenes	VOC					DR	DR	4100 B		NA

All results reported in µg/kg (ppb).
Only detected results are reported.

J – Indicates the result is less than the sample quantitation limit but greater than zero.

NA – Not Analyzed

B – Analyte detected in associated method blank.

DR – Data review indicates this data is non-compliant with ASP.

R – Analyte rejected due to blank contamination.

RE – Sample was reanalyzed.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-8	SPS-9	SPS-10	SPS-11	SPS-11	SPS-12	SPS-12
COLLECTION DATE		7/23/90	12/20/90	6/26/90	12/27/90	3/14/91	12/27/90	3/14/91
PARAMETER	TYPE							
Chloromethane	VOC		NA		NA	NA	NA	NA
Bromomethane	VOC		NA		NA	NA	NA	NA
Vinyl Chloride	VOC		NA		NA	NA	NA	NA
Chloroethane	VOC		NA		NA	NA	NA	NA
Methylene Chloride	VOC		NA	R	NA	NA	NA	NA
Acetone	VOC	12 B	NA	R	NA	NA	NA	NA
Carbon Disulfide	VOC		NA		NA	NA	NA	NA
1,1-Dichloroethene	VOC		NA		NA	NA	NA	NA
1,1-Dichloroethane	VOC		NA		NA	NA	NA	NA
1,2-Dichloroethene (Total)	VOC		NA		NA	NA	NA	NA
Chloroform	VOC		NA		NA	NA	NA	NA
1,2-Dichloroethane	VOC		NA		NA	NA	NA	NA
2-Butanone	VOC	2 J	NA		NA	NA	NA	NA
1,1,1-Trichloroethane	VOC		NA		NA	NA	NA	NA
Carbon Tetrachloride	VOC		NA		NA	NA	NA	NA
Vinyl Acetate	VOC		NA		NA	NA	NA	NA
Bromodichloromethane	VOC		NA		NA	NA	NA	NA
1,2-Dichloropropane	VOC		NA		NA	NA	NA	NA
cis-1,3-Dichloropropene	VOC		NA		NA	NA	NA	NA
Trichloroethene	VOC		NA		NA	NA	NA	NA
Dibromochloromethane	VOC		NA		NA	NA	NA	NA
1,1,2-Trichloroethane	VOC		NA		NA	NA	NA	NA
Benzene	VOC		NA		NA	NA	NA	NA
trans-1,3-Dichloropropene	VOC		NA		NA	NA	NA	NA
Bromoform	VOC		NA		NA	NA	NA	NA
4-Methyl-2-Pentanone	VOC		NA		NA	NA	NA	NA
2-Hexanone	VOC	1 J B	NA		NA	NA	NA	NA
Tetrachloroethene	VOC		NA		NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	VOC		NA		NA	NA	NA	NA
Toluene	VOC		NA		NA	NA	NA	NA
Chlorobenzene	VOC		NA		NA	NA	NA	NA
Ethylbenzene	VOC		NA		NA	NA	NA	NA
Styrene	VOC		NA		NA	NA	NA	NA
Total Xylenes	VOC		NA		NA	NA	NA	NA

All results reported in µg/kg (ppb).

Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

NA - Not Analyzed

B - Analyte detected in associated method blank.

R - Analyte rejected due to blank contamination.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-1	SPS-2	SPS-3	SPS-4	SPS-5	SPS-5RE	SPS-6	SPS-7	SPS-7RE
COLLECTION DATE		6/25/90	6/25/90	7/10/90	7/10/90	6/29/90	6/29/90	6/29/90	7/10/90	7/10/90
PARAMETER	TYPE									
Phenol	SEMI						NA		220 J	
bis(2-Chloroethyl)ether	SEMI						NA			
2-Chlorophenol	SEMI						NA			
1,3-Dichlorobenzene	SEMI					99 J	NA			
1,4-Dichlorobenzene	SEMI					410 J	NA	230 J		87 J
Benzyl Alcohol	SEMI						NA			
1,2-Dichlorobenzene	SEMI		77 J		87 J	4900	NA	2800	210 J	250 J
2-Methylphenol	SEMI						NA			
Bis(2-chloroisopropyl)ether	SEMI						NA			
4-Methylphenol	SEMI						NA			
n-Nitroso-di-n-propylamine	SEMI						NA			
Hexachloroethane	SEMI						NA			
Nitrobenzene	SEMI					230 J	NA			
Isophorone	SEMI		41 J				NA			
2-Nitrophenol	SEMI						NA			
2,4-Dimethylphenol	SEMI					82 J	NA			
Benzoic Acid	SEMI	R	R	69 J			NA	R		
Bis(2-chloroethoxy)methane	SEMI						NA			
2,4-Dichlorophenol	SEMI						NA			
1,2,4-Trichlorobenzene	SEMI		480 J		160 J	1900	NA	1100	360 J	460 J
Naphthalene	SEMI				50 J	190 J	NA	120 J	120 J	150 J
4-Chloroaniline	SEMI						NA			
Hexachlorobutadiene	SEMI						NA			
4-Chloro-3-methylphenol	SEMI						NA			
2-Methylnaphthalene	SEMI				39 J	240 J	NA	74 J	98 J	120 J
Hexachlorocyclopentadiene	SEMI						NA			
2,4,6-Trichlorophenol	SEMI						NA			
2,4,5-Trichlorophenol	SEMI						NA			
2-Chloronaphthalene	SEMI						NA			
2-Nitroaniline	SEMI						NA			
Dimethylphthalate	SEMI						NA		7 J	
Acenaphthylene	SEMI				50 J		NA		90 J	130 J
2,6-Dinitrotoluene	SEMI						NA			
3-Nitroaniline	SEMI						NA			
Acenaphthene	SEMI				75 J		NA		110 J	140 J
2,4-Dinitrophenol	SEMI						NA			

All results reported in µg/kg (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

NA - Not Analyzed

R - Analyte rejected due to blank contamination.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-8	SPS-9	SPS-10	SPS-11	SPS-11	SPS-12	SPS-12
COLLECTION DATE		7/23/90	12/20/90	6/26/90	12/27/90	3/14/91	12/27/90	3/14/91
PARAMETER	TYPE							
Phenol	SEMI		NA		NA	NA	NA	NA
bis(2-Chloroethyl)ether	SEMI		NA		NA	NA	NA	NA
2-Chlorophenol	SEMI		NA		NA	NA	NA	NA
1,3-Dichlorobenzene	SEMI		NA		NA	NA	NA	NA
1,4-Dichlorobenzene	SEMI		NA		NA	NA	NA	NA
Benzyl Alcohol	SEMI		NA		NA	NA	NA	NA
1,2-Dichlorobenzene	SEMI		NA		NA	NA	NA	NA
2-Methylphenol	SEMI		NA		NA	NA	NA	NA
Bis(2-chloroisopropyl)ether	SEMI		NA		NA	NA	NA	NA
4-Methylphenol	SEMI		NA		NA	NA	NA	NA
n-Nitroso-di-n-propylamine	SEMI		NA		NA	NA	NA	NA
Hexachloroethane	SEMI		NA		NA	NA	NA	NA
Nitrobenzene	SEMI		NA		NA	NA	NA	NA
Isophorone	SEMI		NA		NA	NA	NA	NA
2-Nitrophenol	SEMI		NA		NA	NA	NA	NA
2,4-Dimethylphenol	SEMI		NA		NA	NA	NA	NA
Benzoic Acid	SEMI		NA	R	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	SEMI		NA		NA	NA	NA	NA
2,4-Dichlorophenol	SEMI		NA		NA	NA	NA	NA
1,2,4-Trichlorobenzene	SEMI		NA		NA	NA	NA	NA
Naphthalene	SEMI		NA		NA	NA	NA	NA
4-Chloroaniline	SEMI		NA		NA	NA	NA	NA
Hexachlorobutadiene	SEMI		NA		NA	NA	NA	NA
4-Chloro-3-methylphenol	SEMI		NA		NA	NA	NA	NA
2-Methylnaphthalene	SEMI		NA		NA	NA	NA	NA
Hexachlorocyclopentadiene	SEMI		NA		NA	NA	NA	NA
2,4,6-Trichlorophenol	SEMI		NA		NA	NA	NA	NA
2,4,5-Trichlorophenol	SEMI		NA		NA	NA	NA	NA
2-Chloronaphthalene	SEMI		NA		NA	NA	NA	NA
2-Nitroaniline	SEMI		NA		NA	NA	NA	NA
Dimethylphthalate	SEMI		NA		NA	NA	NA	NA
Acenaphthylene	SEMI		NA		NA	NA	NA	NA
2,6-Dinitrotoluene	SEMI		NA		NA	NA	NA	NA
3-Nitroaniline	SEMI		NA		NA	NA	NA	NA
Acenaphthene	SEMI		NA		NA	NA	NA	NA
2,4-Dinitrophenol	SEMI		NA		NA	NA	NA	NA

All results reported in µg/kg (ppb). NA - Not Analyzed

Only detected results are reported. R - Analyte rejected due to blank contamination.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-1	SPS-2	SPS-3	SPS-4	SPS-5	SPS-5RE	SPS-6	SPS-7	SPS-7RE
COLLECTION DATE		6/25/90	6/25/90	7/10/90	7/10/90	6/29/90	6/29/90	6/29/90	7/10/90	7/10/90
PARAMETER	TYPE									
4-Nitrophenol	SEMI						NA			
Dibenzofuran	SEMI						NA			120 J
2,4-Dinitrotoluene	SEMI						NA			
Diethylphthalate	SEMI			R		R	NA	R	R	R
4-Chlorophenyl-phenyl Ether	SEMI						NA			
Fluorene	SEMI				87 J		NA		200 J	250 J
4-Nitroaniline	SEMI						NA			
4,6-Dinitro-2-methylphenol	SEMI						NA			
n-Nitrosodiphenylamine	SEMI				28 J	670 J	NA		92 J	
4-Bromophenyl-phenyl Ether	SEMI						NA			
Hexachlorobenzene	SEMI						NA			
Pentachlorophenol	SEMI	110 J					NA			
Phenanthrene	SEMI		120 J	29 J	600 J	86 J	NA	93 J	1300	1700 J
Anthracene	SEMI				82 J		NA		210 J	270 J
Di-n-butylphthalate	SEMI	R	R	R	R	R	NA	R	R	R
Fluoranthene	SEMI		190 J	53 J	830	R	NA	120 J	1500	2000
Pyrene	SEMI		220 J	44 J	780 J		NA	150 J	2200	2400
Butylbenzylphthalate	SEMI						NA			
3,3'-Dichlorobenzidine	SEMI						NA			
Benzo(a)anthracene	SEMI						NA	96 J	790 J	1100 J
Chrysene	SEMI		150 J		420 J	140 J	NA	120 J	1100	1300 J
bis(2-Ethylhexyl)phthalate	SEMI	R	R	R	6500 B	R	NA	R	16000 BE	18000 B
Di-n-octylphthalate	SEMI			R	R	R	NA		370 J	320 J
Benzo(b)fluoranthene	SEMI		130 J	26 J	460 J		NA	130 J	1000	1200 J
Benzo(k)fluoranthene	SEMI		140 J		76 J		NA	110 J	1500	1400 J
Benzo(a)pyrene	SEMI		130 J		450 J		NA	120 J	970	1200 J
Indeno(1,2,3-cd)pyrene	SEMI				140 J		NA		240 J	180 J
Dibenz(a,h)anthracene	SEMI						NA			
Benzo(g,h,i)perylene	SEMI				140 J		NA		260 J	120 J

All results reported in μg/kg (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

B - Analyte detected in associated method blank.

NA - Not Analyzed

R - Analyte rejected due to blank contamination.

E - Compound concentration exceeded the calibration range.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-8	SPS-9	SPS-10	SPS-11	SPS-11	SPS-12	SPS-12
COLLECTION DATE		7/23/90	12/20/90	6/26/90	12/27/90	3/14/91	12/27/90	3/14/91
PARAMETER	TYPE							
4-Nitrophenol	SEMI		NA		NA	NA	NA	NA
Dibenzofuran	SEMI		NA		NA	NA	NA	NA
2,4-Dinitrotoluene	SEMI		NA		NA	NA	NA	NA
Diethylphthalate	SEMI	R	NA		NA	NA	NA	NA
4-Chlorophenyl-phenyl Ether	SEMI		NA		NA	NA	NA	NA
Fluorene	SEMI		NA		NA	NA	NA	NA
4-Nitroaniline	SEMI		NA		NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	SEMI		NA		NA	NA	NA	NA
n-Nitrosodiphenylamine	SEMI		NA		NA	NA	NA	NA
4-Bromophenyl-phenyl Ether	SEMI		NA		NA	NA	NA	NA
Hexachlorobenzene	SEMI		NA		NA	NA	NA	NA
Pentachlorophenol	SEMI		NA		NA	NA	NA	NA
Phenanthrene	SEMI		NA		NA	NA	NA	NA
Anthracene	SEMI		NA		NA	NA	NA	NA
Di-n-butylphthalate	SEMI	R	NA	R	NA	NA	NA	NA
Fluoranthene	SEMI		NA	R	NA	NA	NA	NA
Pyrene	SEMI		NA	R	NA	NA	NA	NA
Butylbenzylphthalate	SEMI		NA		NA	NA	NA	NA
3,3'-Dichlorobenzidine	SEMI		NA		NA	NA	NA	NA
Benzo(a)anthracene	SEMI		NA		NA	NA	NA	NA
Chrysene	SEMI		NA		NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	SEMI	R	NA	R	NA	NA	NA	NA
Di-n-octylphthalate	SEMI		NA		NA	NA	NA	NA
Benzo(b)fluoranthene	SEMI		NA		NA	NA	NA	NA
Benzo(k)fluoranthene	SEMI		NA		NA	NA	NA	NA
Benzo(a)pyrene	SEMI		NA		NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	SEMI		NA		NA	NA	NA	NA
Dibenz(a,h)anthracene	SEMI		NA		NA	NA	NA	NA
Benzo(g,h,i)perylene	SEMI		NA		NA	NA	NA	NA

All results reported in μg/kg (ppb). NA - Not Analyzed

Only detected results are reported. R - Analyte rejected due to blank contamination.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-1	SPS-2	SPS-3	SPS-4	SPS-5	SPS-5RE	SPS-6	SPS-7	SPS-7RE
COLLECTION DATE		6/25/90	6/25/90	7/10/90	7/10/90	6/29/90	6/29/90	6/29/90	7/10/90	7/10/90
PARAMETER	TYPE									
alpha-BHC	PST						NA			NA
beta-BHC	PST						NA			NA
delta-BHC	PST						NA			NA
gamma-BHC (Lindane)	PST						NA			NA
Heptachlor	PST						NA			NA
Aldrin	PST					12 J	NA	7.1 J		NA
Heptachlor Epoxide	PST						NA			NA
Endosulfan I	PST						NA			NA
Dieldrin	PST						NA			NA
4,4'-DDE	PST						NA			NA
Endrin	PST						NA			NA
Endosulfan II	PST						NA			NA
4,4'-DDD	PST						NA			NA
Endosulfan Sulfate	PST						NA			NA
4,4'-DDT	PST						NA			NA
Methoxychlor	PST						NA			NA
Endrin Ketone	PST						NA			NA
alpha-Chlordane	PST						NA			NA
gamma-Chlordane	PST						NA			NA
Toxaphene	PST						NA			NA
Aroclor-1016	PCB						NA			NA
Aroclor-1221	PCB						NA			NA
Aroclor-1232	PCB						NA			NA
Aroclor-1242	PCB						NA			NA
Aroclor-1248	PCB						NA			NA
Aroclor-1254	PCB				300 J		NA		11,000	NA
Aroclor-1260	PCB		1000			2000	NA	900		NA

All results reported in μg/kg (ppb).
Only detected results are reported.

J – Indicates the result is less than the sample quantitation limit but greater than zero.

NA – Not Analyzed

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-8	SPS-9	SPS-10	SPS-11	SPS-11	SPS-12	SPS-12
COLLECTION DATE		7/23/90	12/20/90	6/26/90	12/27/90	3/14/91	12/27/90	3/14/91
PARAMETER	TYPE							
alpha-BHC	PST		NA				NA	NA
beta-BHC	PST		NA				NA	NA
delta-BHC	PST		NA				NA	NA
gamma-BHC (Lindane)	PST		NA				NA	NA
Heptachlor	PST		NA				NA	NA
Aldrin	PST		NA		200		NA	NA
Heptachlor Epoxide	PST		NA				NA	NA
Endosulfan I	PST		NA				NA	NA
Dieldrin	PST		NA				NA	NA
4,4'-DDE	PST		NA				NA	NA
Endrin	PST		NA				NA	NA
Endosulfan II	PST		NA				NA	NA
4,4'-DDD	PST		NA				NA	NA
Endosulfan Sulfate	PST		NA				NA	NA
4,4'-DDT	PST		NA				NA	NA
Methoxychlor	PST		NA				NA	NA
Endrin Ketone	PST		NA				NA	NA
alpha-Chlordane	PST		NA				NA	NA
gamma-Chlordane	PST		NA				NA	NA
Toxaphene	PST		NA				NA	NA
Aroclor-1016	PCB		NA				NA	NA
Aroclor-1221	PCB		NA				NA	NA
Aroclor-1232	PCB		NA				NA	NA
Aroclor-1242	PCB		NA				NA	NA
Aroclor-1248	PCB		NA				NA	NA
Aroclor-1254	PCB		NA				NA	NA
Aroclor-1260	PCB		NA		12,000 C	12,000 C	NA	NA

All results reported in μg/kg (ppb).

Only detected results are reported.

NA - Not Analyzed

C - Confirmed by GCMS.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-1	SPS-2	SPS-3	SPS-4	SPS-5	SPS-5RE	SPS-6	SPS-7	SPS-7RE
COLLECTION DATE		6/25/90	6/25/90	7/10/90	7/10/90	6/29/90	6/29/90	6/29/90	7/10/90	7/10/90
PARAMETER	TYPE									
Aluminum	MCP	30,400	20,700	30,900	23,100	19,800 *	NA	19,600	29,200	NA
Antimony	MCP						NA			NA
Arsenic	MCP	5 S	6.6 S	3.6	4.1	7.4 S	NA	8.9 S	6.2	NA
Barium	MCP	146	157	151	166	458	NA	142	182	NA
Beryllium	MCP	1.3	1.0 B	1.2	0.96 B	0.78 B	NA	0.78 B	1.6	NA
Cadmium	MCP	0.46 B	19.3	4.5 *	50.8 *	8.4	NA	6.4	178 *	NA
Calcium	MCP	3480	79,400	3500	55,000	54,900	NA	62,200	61,100	NA
Chromium	MCP	38.2 *	300 *	60.3	336	151 *	NA	96.9 *	6300	NA
Cobalt	MCP	13.5	16.6	15.3	15.2	19.2	NA	15.1	11.4	NA
Copper	MCP	21.1 E	298 E	76.1	107	126 E	NA	39.3 E	135	NA
Iron	MCP	33,100 *	34,500 *	33,000	35,700	63,200 *	NA	46,600 *	30,900	NA
Lead	MCP	14.2	36	22 N	30.8 *	38.3	NA	11.4	74.5 *	NA
Magnesium	MCP	10,800	14,000	6080	11,600	13,500	NA	12,500	12,100	NA
Manganese	MCP	272 *	748 *	377	703	558 *	NA	551 *	754	NA
Mercury	MCP		0.19	0.13			NA			NA
Nickel	MCP	38.1	52.1	53.3	47.2	58.1	NA	31.3	31.7	NA
Potassium	MCP	3590	3690	4520	4230	4670	NA	4280	4650	NA
Selenium	MCP		0.42 B	.58 B N			NA			NA
Silver	MCP						NA			NA
Sodium	MCP	392 B	613 B	314 B	605 B	584 B	NA	716 B	1150	NA
Thallium	MCP						NA		0.61 B	NA
Vanadium	MCP	43.1	49	48	42.2	49	NA	35.7	46.6	NA
Zinc	MCP	103	116	164 E	136 E	121	NA	69.9	283 E	NA
Chromium-hexavalent	MCP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	MCP		9.8	0.75		4.1	NA	3.9	2.8	NA
Phenols	MCP		1.39		7.09	8.84	NA	1.19	4.28	NA
Ammonia, as N	MISC	NA	NA	257	23.3	NA	NA	NA	NA	NA
Nitrate-Nitrogen	MISC	NA	NA			NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen, as N	MISC	NA	NA	4870	1090	NA	NA	NA	NA	NA
Moisture (%)	MISC	NA	NA	21.8	19	NA	NA	NA	NA	NA
pH Units (SU)	MISC	NA	NA	5.58	7.33	NA	NA	NA	NA	NA
Total Organic Carbon	MISC	NA	NA	37,800	13,500	NA	NA	NA	NA	NA

All results reported in mg/kg (ppm) unless otherwise stated.

Only detected results are reported.

E – Estimated value due to interference.

N – Spike sample % recovery out of control limits.

NA – Not Analyzed

* – Duplicate analysis not within control limits.

B – Less than quantitation limit but greater than or equal to instrument detection limit.

S – The reported value was determined by Method of Standard Additions (MSA).

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-8	SPS-9	SPS-10	SPS-11	SPS-11	SPS-12	SPS-12
COLLECTION DATE		7/23/90	12/20/90	6/26/90	12/27/90	3/14/91	12/27/90	3/14/91
PARAMETER	TYPE							
Aluminum	MCP	19,400	NA	29,700 *	NA	NA	NA	NA
Antimony	MCP		NA		NA	NA	NA	NA
Arsenic	MCP	1.7 B W	NA	0.33 B W	NA	NA	NA	NA
Barium	MCP	129	NA	155	NA	NA	NA	NA
Beryllium	MCP	0.90 B	NA	1.1	NA	NA	NA	NA
Cadmium	MCP	1.2 *	NA	0.53 B	NA	NA	NA	NA
Calcium	MCP	52,000	NA	3850	NA	NA	NA	NA
Chromium	MCP	37	NA	35.2 *	NA	NA	NA	NA
Cobalt	MCP	14.5	NA	12.6	NA	NA	NA	NA
Copper	MCP	38.8	NA	18 E	NA	NA	NA	NA
Iron	MCP	29100	NA	36,200 *	NA	NA	NA	NA
Lead	MCP	9.4 N	NA	24.8	NA	NA	NA	NA
Magnesium	MCP	15,400	NA	6720	NA	NA	NA	NA
Manganese	MCP	619	NA	195 *	NA	NA	NA	NA
Mercury	MCP		NA		NA	NA	NA	NA
Nickel	MCP	30.6	NA	29.2	NA	NA	NA	NA
Potassium	MCP	4860	NA	3220	NA	NA	NA	NA
Selenium	MCP		NA	0.71 B W	NA	NA	NA	NA
Silver	MCP		NA		NA	NA	NA	NA
Sodium	MCP	429 B	NA	277 B	NA	NA	NA	NA
Thallium	MCP	0.48 B	NA		NA	NA	NA	NA
Vanadium	MCP	36.8	NA	44.2	NA	NA	NA	NA
Zinc	MCP	65.7 E	NA	153	NA	NA	NA	NA
Chromium-hexavalent	MCP	NA		NA		NA		NA
Cyanide	MCP	0.72	NA		NA	NA	NA	NA
Phenols	MCP	11.6	NA		NA	NA	NA	NA
Ammonia, as N	MISC	NA	NA	NA	NA	NA	NA	NA
Nitrate-Nitrogen	MISC	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen, as N	MISC	NA	NA	NA	NA	NA	NA	NA
Moisture (%)	MISC	NA	NA	NA	NA	NA	NA	NA
pH Units (SU)	MISC	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	MISC	NA	NA	NA	NA	NA	NA	NA

All results reported in mg/kg (ppm) unless otherwise stated.

Only detected results are reported.

E - Estimated value due to interference.

N - Spike sample % recovery out of control limits.

NA - Not Analyzed

* - Duplicate analysis not within control limits.

B - Less than quantitation limit but greater than or equal to instrument detection limit.

S - The reported value was determined by Method of Standard Additions (MSA).

W - Post-digestion spike is out of control limits.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-1	SPS-2	SPS-3	SPS-4	SPS-5	SPS-5RE	SPS-6	SPS-7	SPS-7RE
COLLECTION DATE		6/25/90	6/25/90	7/10/90	7/10/90	6/29/90	6/29/90	6/29/90	7/10/90	7/10/90
PARAMETER	TYPE									
Corrosivity	MISC	NA	NA	NA	NA	NEG	NA	NEG	NA	NA
Ignitability	MISC	NA	NA	NA	NA	NEG	NA	NEG	NA	NA
Reactivity	MISC	NA	NA	NA	NA	NEG	NA	NEG	NA	NA
Sulfur %	MISC	NA	NA	NA	NA	0.028	NA	0.13	NA	NA
Chlorine (ppm)	MISC	NA	NA	NA	NA		NA		NA	NA
Ash Weight %	MISC	NA	NA	NA	NA	84.99	NA	83.85	NA	NA
Heat of Combustion (BTU/lb)	MISC	NA	NA	NA	NA	**	NA	**	NA	NA
Reactive Cyanide (ppm)	MISC	NA	NA	NA	NA		NA		NA	NA
Reactive Sulfide (ppm)	MISC	NA	NA	NA	NA		NA		NA	NA
EP Tox - Arsenic	MCP	NA	NA	NA	NA		NA		NA	NA
EP Tox - Barium	MCP	NA	NA	NA	NA	75.4 B	NA	47.7 B	NA	NA
EP Tox - Cadmium	MCP	NA	NA	NA	NA	2.7 B	NA	24.7	NA	NA
EP Tox - Chromium	MCP	NA	NA	NA	NA		NA		NA	NA
EP Tox - Lead	MCP	NA	NA	NA	NA		NA		NA	NA
EP Tox - Mercury	MCP	NA	NA	NA	NA		NA		NA	NA
EP Tox - Selenium	MCP	NA	NA	NA	NA		NA		NA	NA
EP Tox - Silver	MCP	NA	NA	NA	NA		NA		NA	NA
EP Tox - gamma-BHC	PEST	NA	NA	NA	NA		NA		NA	NA
EP Tox - Endrine	PEST	NA	NA	NA	NA		NA		NA	NA
EP Tox - Methoxyclor	PEST	NA	NA	NA	NA		NA		NA	NA
EP Tox - Toxaphene	PEST	NA	NA	NA	NA		NA		NA	NA
EP Tox - 2,4-D	HERB	NA	NA	NA	NA		NA		NA	NA
EP Tox - Silvex	HERB	NA	NA	NA	NA		NA		NA	NA

All results reported in ug/L (ppb) unless otherwise stated.

Only detected results are reported.

** - Sample does not ignite for BTU analysis.

NA - Not Analyzed

B - Less than quantitation limit but greater than or equal to instrument detection limit.

NEG - Not reactive, corrosive, or ignitable.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-8	SPS-9	SPS-10	SPS-11	SPS-11	SPS-12	SPS-12
COLLECTION DATE		7/23/90	12/20/90	6/26/90	12/27/90	3/14/91	12/27/90	3/14/91
PARAMETER	TYPE							
Corrosivity	MISC	NA	NA	NA	NA	NA	NA	NA
Ignitability	MISC	NA	NA	NA	NA	NA	NA	NA
Reactivity	MISC	NA	NA	NA	NA	NA	NA	NA
Sulfur %	MISC	NA	NA	NA	NA	NA	NA	NA
Chlorine (ppm)	MISC	NA	NA	NA	NA	NA	NA	NA
Ash Weight %	MISC	NA	NA	NA	NA	NA	NA	NA
Heat of Combustion (BTU/lb)	MISC	NA	NA	NA	NA	NA	NA	NA
Reactive Cyanide (ppm)	MISC	NA	NA	NA	NA	NA	NA	NA
Reactive Sulfide (ppm)	MISC	NA	NA	NA	NA	NA	NA	NA
EP Tox - Arsenic	MCP	NA	NA	NA	NA	NA	NA	NA
EP Tox - Barium	MCP	NA	NA	NA	NA	NA	NA	NA
EP Tox - Cadmium	MCP	NA	NA	NA	NA	NA	NA	NA
EP Tox - Chromium	MCP	NA	NA	NA	NA	NA	NA	NA
EP Tox - Lead	MCP	NA	NA	NA	NA	NA	NA	NA
EP Tox - Mercury	MCP	NA	NA	NA	NA	NA	NA	NA
EP Tox - Selenium	MCP	NA	NA	NA	NA	NA	NA	NA
EP Tox - Silver	MCP	NA	NA	NA	NA	NA	NA	NA
EP Tox - gamma-BHC	PEST	NA	NA	NA	NA	NA	NA	NA
EP Tox - Endrine	PEST	NA	NA	NA	NA	NA	NA	NA
EP Tox - Methoxyclor	PEST	NA	NA	NA	NA	NA	NA	NA
EP Tox - Toxaphene	PEST	NA	NA	NA	NA	NA	NA	NA
EP Tox - 2,4-D	HERB	NA	NA	NA	NA	NA	NA	NA
EP Tox - Silvex	HERB	NA	NA	NA	NA	NA	NA	NA

All results reported in ug/L (ppb) unless otherwise stated.

Only detected results are reported.

** - Sample does not ignite for BTU analysis.

NA - Not Analyzed

B - Less than quantitation limit but greater than or equal to instrument detection limit.

NEG - Not reactive, corrosive, or ignitable.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-1	SPS-2	SPS-3	SPS-4	SPS-5	SPS-5RE	SPS-6	SPS-7	SPS-7RE
COLLECTION DATE		6/25/90	6/25/90	7/10/90	7/10/90	6/29/90	6/29/90	6/29/90	7/10/90	7/10/90
PARAMETER	TYPE									
Benzene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
3&4-Methylphenol (total)	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tech. Chlordane	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP (Silvex)	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	TCLP	NA	NA	NA	NA	NA	NA	NA	NA	NA

All results reported in mg/L (ppm) NA - Not analyzed.

Only detected results are reported.

TABLE A-2: SURFACE SOIL

Analytical Results

SAMPLE-ID		SPS-8	SPS-9	SPS-10	SPS-11	SPS-11	SPS-12	SPS-12
COLLECTION DATE		7/23/90	12/20/90	6/26/90	12/27/90	3/14/91	12/27/90	3/14/91
PARAMETER	TYPE							
Benzene	TCLP	NA		NA	NA	NA		NA
Carbon Tetrachloride	TCLP	NA		NA	NA	NA		NA
Chlorobenzene	TCLP	NA		NA	NA	NA		NA
Chloroform	TCLP	NA		NA	NA	NA		NA
2-Butanone	TCLP	NA		NA	NA	NA		NA
Tetrachloroethene	TCLP	NA	0.003	NA	NA	NA	11.22	NA
Trichloroethene	TCLP	NA	R	NA	NA	NA	5.92	NA
Vinyl Chloride	TCLP	NA		NA	NA	NA		NA
1,2-Dichloroethane	TCLP	NA		NA	NA	NA		NA
1,1-Dichloroethene	TCLP	NA		NA	NA	NA		NA
1,4-Dichlorobenzene	TCLP	NA		NA	NA	NA		NA
Hexachloroethane	TCLP	NA		NA	NA	NA		NA
Nitrobenzene	TCLP	NA		NA	NA	NA		NA
2,4,6-Trichlorophenol	TCLP	NA		NA	NA	NA		NA
2,4,5-Trichlorophenol	TCLP	NA		NA	NA	NA		NA
2,4-Dinitrotoluene	TCLP	NA		NA	NA	NA		NA
Hexachlorobenzene	TCLP	NA		NA	NA	NA		NA
Pentachlorophenol	TCLP	NA		NA	NA	NA		NA
2-Methylphenol	TCLP	NA		NA	NA	NA		NA
3&4-Methylphenol (total)	TCLP	NA		NA	NA	NA		NA
Pyridine	TCLP	NA		NA	NA	NA		NA
Hexachloro-1,3-butadiene	TCLP	NA		NA	NA	NA		NA
gamma-BHC (Lindane)	TCLP	NA		NA	NA	NA		NA
Heptachlor	TCLP	NA		NA	NA	NA		NA
Heptachlor epoxide	TCLP	NA		NA	NA	NA		NA
Endrin	TCLP	NA		NA	NA	NA		NA
Methoxychlor	TCLP	NA		NA	NA	NA		NA
Toxaphene	TCLP	NA		NA	NA	NA		NA
Tech. Chlordane	TCLP	NA		NA	NA	NA		NA
2,4-D	TCLP	NA		NA	NA	NA		NA
2,4,5-TP (Silvex)	TCLP	NA		NA	NA	NA		NA
Arsenic	TCLP	NA		NA	NA	NA		NA
Barium	TCLP	NA	0.39	NA	NA	NA	0.79 E	NA
Cadmium	TCLP	NA	0.32	NA	NA	NA	0.09	NA
Chromium	TCLP	NA	0.01 B	NA	NA	NA		NA
Lead	TCLP	NA		NA	NA	NA		NA
Mercury	TCLP	NA		NA	NA	NA		NA
Selenium	TCLP	NA		NA	NA	NA	0.05	NA
Silver	TCLP	NA		NA	NA	NA		NA

All results reported in mg/L (ppm)
Only detected results are reported.

NA - Not analyzed.
E - Estimated value due to interference.
R - Analyte rejected due to blank contamination.

B - The reported value is less than the quantitation limit but greater than or equal to the detection limit.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS

Analytical Results

SAMPLE-ID		SW-3	SW-4	SW-4RE	SW-5	SW-6	LS-1	LS-2	LS-3
COLLECTION DATE		7/17/90	12/18/90	12/18/90	12/18/90	12/18/90	7/12/90	7/12/90	7/12/90
PARAMETER	TYPE								
Chloromethane	VOC			NA					
Bromomethane	VOC			NA					
Vinyl Chloride	VOC			NA					
Chloroethane	VOC			NA					
Methylene Chloride	VOC			NA			R	R	R
Acetone	VOC	R		NA	R		R	R	R
Carbon Disulfide	VOC			NA					
1,1-Dichloroethene	VOC			NA					
1,1-Dichloroethane	VOC			NA					
1,2-Dichloroethene (Total)	VOC			NA	3 J	4 J		5 J	
Chloroform	VOC			NA					
1,2-Dichloroethane	VOC			NA					
2-Butanone	VOC			NA			R	R	R
1,1,1-Trichloroethane	VOC			NA					
Carbon Tetrachloride	VOC			NA					
Vinyl Acetate	VOC			NA					
Bromodichloromethane	VOC			NA					
1,2-Dichloropropane	VOC			NA					
cis-1,3-Dichloropropene	VOC			NA					
Trichloroethene	VOC			NA				4 J	
Dibromochloromethane	VOC			NA					
1,1,2-Trichloroethane	VOC			NA					
Benzene	VOC			NA					
trans-1,3-Dichloropropene	VOC			NA					
Bromoform	VOC			NA					
4-Methyl-2-Pentanone	VOC			NA					
2-Hexanone	VOC			NA					
Tetrachloroethene	VOC			NA				2 J	
1,1,2,2-Tetrachloroethane	VOC			NA					
Toluene	VOC			NA	3 J	4 J			
Chlorobenzene	VOC			NA					
Ethylbenzene	VOC			NA					
Styrene	VOC			NA					
Total Xylenes	VOC			NA					

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
R - Analyte rejected due to blank contamination.
NA - Not analyzed.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-4	LS-5	LS-6	LS-7	LS-8	LS-9	LS-10
COLLECTION DATE		7/12/90	7/13/90	7/13/90	7/30/90	7/30/90	7/30/90	7/30/90
PARAMETER	TYPE							
Chloromethane	VOC							
Bromomethane	VOC							
Vinyl Chloride	VOC							
Chloroethane	VOC							
Methylene Chloride	VOC	R	R	R				4 J
Acetone	VOC	R	R	R	R	R	R	R
Carbon Disulfide	VOC							
1,1-Dichloroethene	VOC							
1,1-Dichloroethane	VOC		2 J					
1,2-Dichloroethene (Total)	VOC		36	4 J	6 J	2 J		
Chloroform	VOC							
1,2-Dichloroethane	VOC							
2-Butanone	VOC	R	R	R			R	R
1,1,1-Trichloroethane	VOC							
Carbon Tetrachloride	VOC							
Vinyl Acetate	VOC							
Bromodichloromethane	VOC							
1,2-Dichloropropane	VOC							
cis-1,3-Dichloropropene	VOC							
Trichloroethene	VOC		20	2 J	6J			
Dibromochloromethane	VOC							
1,1,2-Trichloroethane	VOC							
Benzene	VOC		1 J					
trans-1,3-Dichloropropene	VOC							
Bromoform	VOC							
4-Methyl-2-Pentanone	VOC	0.8 J						
2-Hexanone	VOC	1 J						
Tetrachloroethene	VOC		3 J		4 J			
1,1,2,2-Tetrachloroethane	VOC							
Toluene	VOC		R					
Chlorobenzene	VOC							
Ethylbenzene	VOC							
Styrene	VOC							
Total Xylenes	VOC		2 J				R	

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
R - Analyte rejected due to blank contamination.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-11	LS-12	LS-13	LS-14	LS-15	LS-16	LS-17
COLLECTION DATE		8/1/90	8/1/90	8/1/90	8/1/90	7/31/90	7/31/90	7/31/90
PARAMETER	TYPE							
Chloromethane	VOC							
Bromomethane	VOC							
Vinyl Chloride	VOC							
Chloroethane	VOC							
Methylene Chloride	VOC	R	R	R		R	R	
Acetone	VOC	R	R	R	R	R	R	R
Carbon Disulfide	VOC			0.9 J	2 J			2 J
1,1-Dichloroethene	VOC							
1,1-Dichloroethane	VOC				1 J			
1,2-Dichloroethene (Total)	VOC			4 J	13			5 J
Chloroform	VOC							
1,2-Dichloroethane	VOC							
2-Butanone	VOC		7	R	R	R	8	R
1,1,1-Trichloroethane	VOC							
Carbon Tetrachloride	VOC							
Vinyl Acetate	VOC							
Bromodichloromethane	VOC							
1,2-Dichloropropane	VOC							
cis-1,3-Dichloropropene	VOC							
Trichloroethene	VOC							
Dibromochloromethane	VOC							
1,1,2-Trichloroethane	VOC							
Benzene	VOC							
trans-1,3-Dichloropropene	VOC							
Bromoform	VOC							
4-Methyl-2-Pentanone	VOC							
2-Hexanone	VOC							
Tetrachloroethene	VOC							
1,1,2,2-Tetrachloroethane	VOC							
Toluene	VOC				R	R		R
Chlorobenzene	VOC							
Ethylbenzene	VOC							
Styrene	VOC							
Total Xylenes	VOC							R

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
R - Analyte rejected due to blank contamination.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS

Analytical Results

SAMPLE-ID		SW-3	SW-4	SW-4RE	SW-5	SW-6	LS-1	LS-2	LS-3
COLLECTION DATE		7/17/90	12/18/90	12/18/90	12/18/90	12/18/90	7/12/90	7/12/90	7/12/90
PARAMETER	TYPE								
Phenol	SEMI								
bis(2-Chloroethyl)ether	SEMI								
2-Chlorophenol	SEMI								
1,3-Dichlorobenzene	SEMI								
1,4-Dichlorobenzene	SEMI								
Benzyl Alcohol	SEMI								
1,2-Dichlorobenzene	SEMI								
2-Methylphenol	SEMI								
Bis(2-chloroisopropyl)ether	SEMI								
4-Methylphenol	SEMI								
n-Nitroso-di-n-propylamine	SEMI								
Hexachloroethane	SEMI								
Nitrobenzene	SEMI								
Isophorone	SEMI								
2-Nitrophenol	SEMI								
2,4-Dimethylphenol	SEMI								
Benzoic Acid	SEMI								
Bis(2-chloroethoxy)methane	SEMI								
2,4-Dichlorophenol	SEMI								
1,2,4-Trichlorobenzene	SEMI								
Naphthalene	SEMI								
4-Chloroaniline	SEMI								
Hexachlorobutadiene	SEMI								
4-Chloro-3-methylphenol	SEMI								
2-Methylnaphthalene	SEMI								
Hexachlorocyclopentadiene	SEMI								
2,4,6-Trichlorophenol	SEMI								
2,4,5-Trichlorophenol	SEMI								
2-Chloronaphthalene	SEMI								
2-Nitroaniline	SEMI								
Dimethylphthalate	SEMI								
Acenaphthylene	SEMI								
2,6-Dinitrotoluene	SEMI								
3-Nitroaniline	SEMI								
Acenaphthene	SEMI							9 J	
2,4-Dinitrophenol	SEMI								

J - Indicates the result is less than the sample quantitation limit but greater than zero.

NA - Not analyzed.

All results reported in µg/kg or µg/L (ppb).

Only detected results are reported.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-4	LS-5	LS-6	LS-7	LS-8	LS-9	LS-10
COLLECTION DATE		7/12/90	7/13/90	7/13/90	7/30/90	7/30/90	7/30/90	7/30/90
PARAMETER	TYPE							
Phenol	SEMI							
bis(2-Chloroethyl)ether	SEMI							
2-Chlorophenol	SEMI							
1,3-Dichlorobenzene	SEMI							
1,4-Dichlorobenzene	SEMI							
Benzyl Alcohol	SEMI							
1,2-Dichlorobenzene	SEMI		50 J	13 J				
2-Methylphenol	SEMI							
Bis(2-chloroisopropyl)ether	SEMI							
4-Methylphenol	SEMI							
n-Nitroso-di-n-propylamine	SEMI							
Hexachloroethane	SEMI							
Nitrobenzene	SEMI							
Isophorone	SEMI							
2-Nitrophenol	SEMI							
2,4-Dimethylphenol	SEMI							
Benzoic Acid	SEMI		44 J	50 J				
Bis(2-chloroethoxy)methane	SEMI							
2,4-Dichlorophenol	SEMI							
1,2,4-Trichlorobenzene	SEMI		41 J	100 J				
Naphthalene	SEMI							
4-Chloroaniline	SEMI							
Hexachlorobutadiene	SEMI							
4-Chloro-3-methylphenol	SEMI							
2-Methylnaphthalene	SEMI		10 J	11 J				
Hexachlorocyclopentadiene	SEMI							
2,4,6-Trichlorophenol	SEMI							
2,4,5-Trichlorophenol	SEMI							
2-Chloronaphthalene	SEMI							
2-Nitroaniline	SEMI							
Dimethylphthalate	SEMI							
Acenaphthylene	SEMI							
2,6-Dinitrotoluene	SEMI							
3-Nitroaniline	SEMI							
Acenaphthene	SEMI							
2,4-Dinitrophenol	SEMI							

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

J – Indicates the result is less than the sample quantitation limit but greater than zero.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-11	LS-12	LS-13	LS-14	LS-15	LS-16	LS-17
COLLECTION DATE		8/1/90	8/1/90	8/1/90	8/1/90	7/31/90	7/31/90	7/31/90
PARAMETER	TYPE							
Phenol	SEMI							
bis(2-Chloroethyl)ether	SEMI							
2-Chlorophenol	SEMI							
1,3-Dichlorobenzene	SEMI							
1,4-Dichlorobenzene	SEMI							
Benzyl Alcohol	SEMI							
1,2-Dichlorobenzene	SEMI							
2-Methylphenol	SEMI							
Bis(2-chloroisopropyl)ether	SEMI							
4-Methylphenol	SEMI							
n-Nitroso-di-n-propylamine	SEMI							
Hexachloroethane	SEMI							
Nitrobenzene	SEMI							
Isophorone	SEMI							
2-Nitrophenol	SEMI							
2,4-Dimethylphenol	SEMI							
Benzoic Acid	SEMI							
Bis(2-chloroethoxy)methane	SEMI							
2,4-Dichlorophenol	SEMI							
1,2,4-Trichlorobenzene	SEMI							
Naphthalene	SEMI							
4-Chloroaniline	SEMI							
Hexachlorobutadiene	SEMI							
4-Chloro-3-methylphenol	SEMI							
2-Methylnaphthalene	SEMI							
Hexachlorocyclopentadiene	SEMI							
2,4,6-Trichlorophenol	SEMI							
2,4,5-Trichlorophenol	SEMI							
2-Chloronaphthalene	SEMI							
2-Nitroaniline	SEMI							
Dimethylphthalate	SEMI							
Acenaphthylene	SEMI							
2,6-Dinitrotoluene	SEMI							
3-Nitroaniline	SEMI							
Acenaphthene	SEMI							
2,4-Dinitrophenol	SEMI							

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS

Analytical Results

SAMPLE-ID		SW-3	SW-4	SW-4RE	SW-5	SW-6	LS-1	LS-2	LS-3
COLLECTION DATE		7/17/90	12/18/90	12/18/90	12/18/90	12/18/90	7/12/90	7/12/90	7/12/90
PARAMETER	TYPE								
4-Nitrophenol	SEMI								
Dibenzofuran	SEMI							5 J	
2,4-Dinitrotoluene	SEMI								
Diethylphthalate	SEMI	R					R	R	R
4-Chlorophenyl-phenyl Ether	SEMI								
Fluorene	SEMI							11 J	
4-Nitroaniline	SEMI								
4,6-Dinitro-2-methylphenol	SEMI								
n-Nitrosodiphenylamine	SEMI								
4-Bromophenyl-phenyl Ether	SEMI								
Hexachlorobenzene	SEMI								
Pentachlorophenol	SEMI								
Phenanthrene	SEMI							86 J	
Anthracene	SEMI							20 J	
Di-n-butylphthalate	SEMI	R		0.4 J			R	R	R
Fluoranthene	SEMI						13 J	120 J	
Pyrene	SEMI						15 J	97 J	7 J
Butylbenzylphthalate	SEMI						9 J	11 J	8 J
3,3'-Dichlorobenzidine	SEMI								
Benzo(a)anthracene	SEMI								
Chrysene	SEMI								
bis(2-Ethylhexyl)phthalate	SEMI	R	R	R	R	R	R	R	R
Di-n-octylphthalate	SEMI							5 J	13 J
Benzo(b)fluoranthene	SEMI							19 J	
Benzo(k)fluoranthene	SEMI							49 J	
Benzo(a)pyrene	SEMI							23 J	
Indeno(1,2,3-cd)pyrene	SEMI								
Dibenz(a,h)anthracene	SEMI								
Benzo(g,h,i)perylene	SEMI								

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

R - Analyte rejected due to blank contamination.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-4	LS-5	LS-6	LS-7	LS-8	LS-9	LS-10
COLLECTION DATE		7/12/90	7/13/90	7/13/90	7/30/90	7/30/90	7/30/90	7/30/90
PARAMETER	TYPE							
4-Nitrophenol	SEMI							
Dibenzofuran	SEMI							
2,4-Dinitrotoluene	SEMI							
Diethylphthalate	SEMI	R	R	R				
4-Chlorophenyl-phenyl Ether	SEMI							
Fluorene	SEMI							
4-Nitroaniline	SEMI							
4,6-Dinitro-2-methylphenol	SEMI							
n-Nitrosodiphenylamine	SEMI							
4-Bromophenyl-phenyl Ether	SEMI							
Hexachlorobenzene	SEMI							
Pentachlorophenol	SEMI							
Phenanthrene	SEMI			45 J				
Anthracene	SEMI							
Di-n-butylphthalate	SEMI	R	R	R	66 J			62 J
Fluoranthene	SEMI		52 J	59 J				
Pyrene	SEMI		49 J	55 J				
Butylbenzylphthalate	SEMI	15 J	17 J	11 J				
3,3'-Dichlorobenzidine	SEMI							
Benzo(a)anthracene	SEMI							
Chrysene	SEMI							
bis(2-Ethylhexyl)phthalate	SEMI	R	R	R	R	R	R	R
Di-n-octylphthalate	SEMI	8 J	18 J	10 J				
Benzo(b)fluoranthene	SEMI		16 J	63 J				
Benzo(k)fluoranthene	SEMI		25 J					
Benzo(a)pyrene	SEMI			30 J				
Indeno(1,2,3-cd)pyrene	SEMI			18 J				
Dibenz(a,h)anthracene	SEMI							
Benzo(g,h,i)perylene	SEMI							

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
R - Analyte rejected due to blank contamination.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-11	LS-12	LS-13	LS-14	LS-15	LS-16	LS-17
COLLECTION DATE		8/1/90	8/1/90	8/1/90	8/1/90	7/31/90	7/31/90	7/31/90
PARAMETER	TYPE							
4-Nitrophenol	SEMI							
Dibenzofuran	SEMI							
2,4-Dinitrotoluene	SEMI							
Diethylphthalate	SEMI							
4-Chlorophenyl-phenyl Ether	SEMI							
Fluorene	SEMI							
4-Nitroaniline	SEMI							
4,6-Dinitro-2-methylphenol	SEMI							
n-Nitrosodiphenylamine	SEMI							
4-Bromophenyl-phenyl Ether	SEMI							
Hexachlorobenzene	SEMI							
Pentachlorophenol	SEMI							
Phenanthrene	SEMI							
Anthracene	SEMI							
Di-n-butylphthalate	SEMI			57 J	81 J		54 J	87 J
Fluoranthene	SEMI				92 J			78 J
Pyrene	SEMI				68 J			
Butylbenzylphthalate	SEMI							
3,3'-Dichlorobenzidine	SEMI							
Benzo(a)anthracene	SEMI							
Chrysene	SEMI							
bis(2-Ethylhexyl)phthalate	SEMI	R	R	R	R	R	R	R
Di-n-octylphthalate	SEMI		57 J					
Benzo(b)fluoranthene	SEMI				110 J			
Benzo(k)fluoranthene	SEMI							
Benzo(a)pyrene	SEMI							
Indeno(1,2,3-cd)pyrene	SEMI							
Dibenz(a,h)anthracene	SEMI							
Benzo(g,h,i)perylene	SEMI							

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
R - Analyte rejected due to blank contamination.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		SW-3	SW-4	SW-4RE	SW-5	SW-6	LS-1	LS-2	LS-3
COLLECTION DATE		7/17/90	12/18/90	12/18/90	12/18/90	12/18/90	7/12/90	7/12/90	7/12/90
PARAMETER	TYPE								
alpha-BHC	PST			NA					
beta-BHC	PST			NA					
delta-BHC	PST			NA					
gamma-BHC (Lindane)	PST			NA					
Heptachlor	PST			NA					
Aldrin	PST			NA					
Heptachlor Epoxide	PST			NA					
Endosulfan I	PST			NA					
Dieldrin	PST			NA					
4,4'-DDE	PST			NA					
Endrin	PST			NA					
Endosulfan II	PST			NA					
4,4'-DDD	PST			NA					
Endosulfan Sulfate	PST			NA					
4,4'-DDT	PST			NA					
Methoxychlor	PST			NA					
Endrin Ketone	PST			NA					
alpha-Chlordane	PST			NA					
gamma-Chlordane	PST			NA					
Toxaphene	PST			NA					
Aroclor-1016	PCB			NA					
Aroclor-1221	PCB			NA					
Aroclor-1232	PCB			NA					
Aroclor-1242	PCB			NA					
Aroclor-1248	PCB			NA					
Aroclor-1254	PCB			NA					
Aroclor-1260	PCB			NA					

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

J – Indicates the result is less than the sample quantitation limit but greater than zero.
NA – Not analyzed.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-11	LS-12	LS-13	LS-14	LS-15	LS-16	LS-17
COLLECTION DATE		8/1/90	8/1/90	8/1/90	8/1/90	7/31/90	7/31/90	7/31/90
PARAMETER	TYPE							
alpha-BHC	PST							
beta-BHC	PST							
delta-BHC	PST							
gamma-BHC (Lindane)	PST							
Heptachlor	PST							
Aldrin	PST							
Heptachlor Epoxide	PST							
Endosulfan I	PST							
Dieldrin	PST							
4,4'-DDE	PST							
Endrin	PST							
Endosulfan II	PST							
4,4'-DDD	PST							
Endosulfan Sulfate	PST							
4,4'-DDT	PST							
Methoxychlor	PST							
Endrin Ketone	PST							
alpha-Chlordane	PST							
gamma-Chlordane	PST							
Toxaphene	PST							
Aroclor-1016	PCB							
Aroclor-1221	PCB							
Aroclor-1232	PCB							
Aroclor-1242	PCB							
Aroclor-1248	PCB							
Aroclor-1254	PCB							
Aroclor-1260	PCB							

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS

Analytical Results

SAMPLE-ID		SW-3	SW-4	SW-4RE	SW-5	SW-6	LS-1	LS-2	LS-3
COLLECTION DATE		7/17/90	12/18/90	12/18/90	12/18/90	12/18/90	7/12/90	7/12/90	7/12/90
PARAMETER	TYPE								
Aluminum	MCP	1270	82.2 BE	NA	114 BE	85.2 BE	21,000	27,300	22,700
Antimony	MCP			NA					
Arsenic	MCP			NA			3.6	5.1	2.6
Barium	MCP	40.2 B	36.5 B	NA	36.5 B	34.6 B	134	141	137
Beryllium	MCP			NA			0.93 B	1.3	1.2
Cadmium	MCP	3.1 B		NA				14.9 *	
Calcium	MCP	110,000	127,000	NA	125,000	127,000	47,000	49,700	38,700
Chromium	MCP	5.8 B		NA			27.4	48.3	30.3
Cobalt	MCP			NA			12.2	17.2	16.9
Copper	MCP	11.3 B		NA			19.9	81.5	27.3
Iron	MCP	1510	188	NA	206	251	27,600	34,200	33,200
Lead	MCP	1.8 B W		NA			11.4 N S	17.9 N	
Magnesium	MCP	23,900	27,700	NA	27,300	27,700	12,700	13,100	15,300
Manganese	MCP	53	9 B	NA	9.2 B	9 B	497	632	625
Mercury	MCP			NA					
Nickel	MCP	21.6 B	18.1 B	NA	14.8 B	16.3 B	26.1	78.5	35.7
Potassium	MCP	2990 B	2690 B	NA	2410	3020 B	5100	5380	5170
Selenium	MCP			NA					
Silver	MCP			NA		3.1 B			
Sodium	MCP	23,300	26,300	NA	26,000	26,300	401 B	524 B	571 B
Thallium	MCP			NA					
Vanadium	MCP	11.7 B		NA			37.7	48.2	41.7
Zinc	MCP	19.2 B	10.4 B	NA	14.7	11.9	62.5 E	102 E	78.3 E
Cyanide	MCP			NA				10.1	
Phenols (ppm)	MCP		0.015	NA	0.009	0.021	0.314	0.33	0.408

All surface water results reported in ug/kg (ppb).
All sediment results are reported in mg/l (ppm).
Only detected results are reported.

E – Estimated value due to interference.
W – Post-digestion spike is out of control limits.
B – Less than quantitation limit but greater than or equal to instrument detection limit.
NA – Not analyzed.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-4	LS-5	LS-6	LS-7	LS-8	LS-9	LS-10
COLLECTION DATE		7/12/90	7/13/90	7/13/90	7/30/90	7/30/90	7/30/90	7/30/90
PARAMETER	TYPE							
alpha-BHC	PST							
beta-BHC	PST							
delta-BHC	PST							
gamma-BHC (Lindane)	PST							
Heptachlor	PST							
Aldrin	PST							
Heptachlor Epoxide	PST							
Endosulfan I	PST							
Dieldrin	PST							
4,4'-DDE	PST							
Endrin	PST							
Endosulfan II	PST							
4,4'-DDD	PST							
Endosulfan Sulfate	PST							
4,4'-DDT	PST							
Methoxychlor	PST							
Endrin Ketone	PST							
alpha-Chlordane	PST							
gamma-Chlordane	PST							
Toxaphene	PST							
Aroclor-1016	PCB							
Aroclor-1221	PCB							
Aroclor-1232	PCB							
Aroclor-1242	PCB							
Aroclor-1248	PCB							
Aroclor-1254	PCB		300 J	120 J				
Aroclor-1260	PCB							

All results reported in μg/kg or μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-11	LS-12	LS-13	LS-14	LS-15	LS-16	LS-17
COLLECTION DATE		8/1/90	8/1/90	8/1/90	8/1/90	7/31/90	7/31/90	7/31/90
PARAMETER	TYPE							
Aluminum	MCP	23,300	22,100	22,900	18,200	21,300	17,100	30,500
Antimony	MCP							
Arsenic	MCP	3.2	4.7 B S	2 B	3.1 B	5.5 S	4.2	4.6
Barium	MCP	171	154	140	130	141	107	206
Beryllium	MCP	1.1 B	0.94 B	1.1 B		0.97 B	0.47 B	0.86 B
Cadmium	MCP	5.7	5.5	6	36.4	50.1	86.9	56.3
Calcium	MCP	56,200	47,800	32,500	47,800	38,400	28,000	52,900
Chromium	MCP	66.6	61.7	60.5	243	762	1100	637
Cobalt	MCP	17.1	16.2	14.5	16.8	18	16	24.1
Copper	MCP	51.8 E *	39 E *	44 E *	86.6 E *	135 E *	245 E *	253 E *
Iron	MCP	34,100	32,000	29,100	29,000	37,000	33,700	53,500
Lead	MCP	12.3 *	11.5 *	10.3 *	22.9 * S	31.5 S *	34.7 S *	40.4 S *
Magnesium	MCP	13,400 *	13,800 *	10,500 *	12,500 *	10,500 *	7480 *	15,500 *
Manganese	MCP	592	583	430	573	502	409	713
Mercury	MCP							
Nickel	MCP	41	37.2	34.2	46.1	70.1	90.4	93.2
Potassium	MCP	4560	5250	4720	3620	3270	2630	5410
Selenium	MCP							
Silver	MCP							
Sodium	MCP	413 B	438 B	360 B	466 B	354 B	462 B	529 B
Thallium	MCP							
Vanadium	MCP	44	42.6	41.2	41.5	47.6	71.3	75.4
Zinc	MCP	89.2 E	77.1 E	75.6 E	107 E	149 E	147 E	194 E
Cyanide	MCP				1.9		1.2	22.9
Phenols (ppm)	MCP						0.621	0.741

All surface water results reported in ug/kg (ppb).
All sediment results are reported in mg/l (ppm).
Only detected results are reported.

E - Estimated value due to interference.
* - Duplicate analysis not within control limits.
B - Less than quantitation limit but greater than or equal to instrument detection limit.
S - The reported value was determined by the Method of Standard Additions (MSA).

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS

Analytical Results

SAMPLE-ID		SW-3	SW-4	SW-4RE	SW-5	SW-6	LS-1	LS-2	LS-3
COLLECTION DATE		7/17/90	12/18/90	12/18/90	12/18/90	12/18/90	7/12/90	7/12/90	7/12/90
PARAMETER	TYPE								
Bicarbonate	MISC	94	102	NA	105	106	NA	NA	NA
BOD	MISC			NA		1	NA	NA	NA
COD	MISC		16.3	NA	16.3	16.3	NA	NA	NA
Chloride	MISC	40	37.9	NA	37.8	37.6	NA	NA	NA
Hardness	MISC	428	430	NA	410	470	NA	NA	NA
Ammonia, as N	MISC	0.254	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen, as N	MISC	0.359	1.68	NA	1.64	0.758	NA	NA	NA
Alkalinity	MISC	94.4	102	NA	106	106	NA	NA	NA
Acidity	MISC	12.7	16.2	NA	14.4	15.6	NA	NA	NA
Nitrate-Nitrogen	MISC	0.333	0.142	NA	0.129	0.143	NA	NA	NA
Phosphate	MISC			NA			NA	NA	NA
Oil and Grease	MISC		4	NA	4.1		NA	NA	NA
TOC	MISC	3.99	5.68	NA	5.56	5.70	NA	NA	NA
TSS	MISC	7.1	16.7	NA	10.4	9.1	NA	NA	NA
TDS	MISC	629	694	NA	698	695	NA	NA	NA
Sulfate	MISC	337	354	NA	358	366	NA	NA	NA
Sulfide	MISC		1.60	NA			NA	NA	NA
pH Units	MISC		NA	NA	NA	NA	NA	NA	NA
Specific Conductance	MISC		NA	NA	NA	NA	NA	NA	NA
Moisture %	MISC		NA	NA	NA	NA	NA	NA	NA

All results reported in mg/L (ppm) or mg/kg (ppm) unless otherwise stated.

Only detected results are reported.

NA - Not Analyzed

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-4	LS-5	LS-6	LS-7	LS-8	LS-9	LS-10
COLLECTION DATE		7/12/90	7/13/90	7/13/90	7/30/90	7/30/90	7/30/90	7/30/90
PARAMETER	TYPE							
Aluminum	MCP	27,300	16,400	22,900	24,000	21,100	31,300	28,800
Antimony	MCP							
Arsenic	MCP	3.3	2.7	3.3	2.1 B W	3.5 B S	3.6	3.8
Barium	MCP	170	96.5	139	168	153	173	176
Beryllium	MCP	1.2	0.59 B	1.1 B	1.0 B	0.95 B	1.3 B	1.4 B
Cadmium	MCP		3.1 *	7.7 *	5.2	4.8	7.1	46.4
Calcium	MCP	24,900	31,800	49,500	61,300	51,100	27,600	52,000
Chromium	MCP	34.1	61	127	80.9	67	104	412
Cobalt	MCP	16.1	9.9	13.4 B	18.4	17.1	18.2	21.1 B
Copper	MCP	22.8	28.7	40.7	38.8 *	36.1 *	70 *	174 *
Iron	MCP	32,800	22,000	28,400	35,500	30,700	39,900	48,200
Lead	MCP	10.8 N	13.1 N S	14.3 N	7.6 * + S	9.7 *	18.5 *	17.2 *
Magnesium	MCP	12,300	9650	13,000	17,200 *	12,500 *	10,900 *	12,600 *
Manganese	MCP	488	391	519	731	664	547	746
Mercury	MCP							
Nickel	MCP	33.9	24.9	33.6	39.3	36.3	44.6	84.6
Potassium	MCP	5520	4160	6280	5970	4170	5730	5830
Selenium	MCP							
Silver	MCP							
Sodium	MCP	399 B	407 B	624 B	625 B	457 B	459 B	705 B
Thallium	MCP				0.31 B	0.27 B		
Vanadium	MCP	44.1	31	43.2	44.4	39.1	57.8	76.7
Zinc	MCP	101 E	51.9 E	67 E	85.7	98.7	130	146
Cyanide	MCP				1.8			1.3
Phenols (ppm)	MCP	0.508	0.548	1.06	0.674			0.7

All surface water results reported in ug/kg (ppb).

All sediment results are reported in mg/l (ppm).

Only detected results are reported.

E – Estimated value due to interference.

N – Spike sample % recovery out of control limits.

* – Duplicate analysis not within control limits.

B – Less than quantitation limit but greater than or equal to instrument detection limit.

+ – Correlation coefficient for the MSA is less than 0.995.

S – The reported value was determined by the Method of Standard Additions (MSA).

W – Post-digestion spike is out of control limits.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-4	LS-5	LS-6	LS-7	LS-8	LS-9	LS-10
COLLECTION DATE		7/12/90	7/13/90	7/13/90	7/30/90	7/30/90	7/30/90	7/30/90
PARAMETER	TYPE							
Bicarbonate	MISC	NA	NA	NA	NA	NA		NA
BOD	MISC	NA	NA	NA	NA	NA		NA
COD	MISC	NA	NA	NA	NA	NA		NA
Chloride	MISC	NA	NA	NA	NA	NA		NA
Hardness	MISC	NA	NA	NA	NA	NA		NA
Ammonia, as N	MISC	NA	NA	NA	NA	NA	103	NA
Total Kjeldahl Nitrogen, as N	MISC	NA	NA	NA	NA	NA	2290	NA
Alkalinity	MISC	NA	NA	NA	NA	NA		NA
Acidity	MISC	NA	NA	NA	NA	NA		NA
Nitrate-Nitrogen	MISC	NA	NA	NA	NA	NA		NA
Phosphate	MISC	NA	NA	NA	NA	NA		NA
Oil and Grease	MISC	NA	NA	NA	NA	NA		NA
TOC	MISC	NA	NA	NA	NA	NA	23000	NA
TSS	MISC	NA	NA	NA	NA	NA		NA
TDS	MISC	NA	NA	NA	NA	NA		NA
Sulfate	MISC	NA	NA	NA	NA	NA		NA
Sulfide	MISC	NA	NA	NA	NA	NA		NA
pH Units	MISC	NA	NA	NA	NA	NA	7.3	NA
Specific Conductance	MISC	NA	NA	NA	NA	NA		NA
Moisture %	MISC	NA	NA	NA	NA	NA	39.1	NA

All results reported in mg/L (ppm) or mg/kg (ppm) unless otherwise stated.

Only detected results are reported.

NA - Not Analyzed.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-11	LS-12	LS-13	LS-14	LS-15	LS-16	LS-17
COLLECTION DATE		8/1/90	8/1/90	8/1/90	8/1/90	7/31/90	7/31/90	7/31/90
PARAMETER	TYPE							
Bicarbonate	MISC	NA	NA	NA	NA	NA		NA
BOD	MISC	NA	NA	NA	NA	NA		NA
COD	MISC	NA	NA	NA	NA	NA		NA
Chloride	MISC	NA	NA	NA	NA	NA		NA
Hardness	MISC	NA	NA	NA	NA	NA		NA
Ammonia, as N	MISC	NA	NA	NA	NA	NA	121	NA
Total Kjeldahl Nitrogen, as N	MISC	NA	NA	NA	NA	NA	1140	NA
Alkalinity	MISC	NA	NA	NA	NA	NA		NA
Acidity	MISC	NA	NA	NA	NA	NA		NA
Nitrate-Nitrogen	MISC	NA	NA	NA	NA	NA		NA
Phosphate	MISC	NA	NA	NA	NA	NA		NA
Oil and Grease	MISC	NA	NA	NA	NA	NA		NA
TOC	MISC	NA	NA	NA	NA	NA	12,700	NA
TSS	MISC	NA	NA	NA	NA	NA		NA
TDS	MISC	NA	NA	NA	NA	NA		NA
Sulfate	MISC	NA	NA	NA	NA	NA		NA
Sulfide	MISC	NA	NA	NA	NA	NA		NA
pH Units	MISC	NA	NA	NA	NA	NA	7.42	NA
Specific Conductance	MISC	NA	NA	NA	NA	NA		NA
Moisture %	MISC	NA	NA	NA	NA	NA	35.7	NA

All results reported in mg/L (ppm) or mg/kg (ppm) unless otherwise stated.

NA - Not Analyzed

Only detected results are reported.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS

Analytical Results

SAMPLE-ID		SW-3	SW-4	SW-4RE	SW-5	SW-6	LS-1	LS-2	LS-3
COLLECTION DATE		7/17/90	12/18/90	12/18/90	12/18/90	12/18/90	7/12/90	7/12/90	7/12/90
PARAMETER	TYPE								
Corrisivity	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Ignitability	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Reactivity	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur (%)	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Chlorine (ppm)	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Ash Weight (%)	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Heat of Combustion (BTU/lb)	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Reactive Cyanide (ppm)	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Reactive Sulfide (ppm)	MISC	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Arsenic	MCP	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Barium	MCP	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Cadmium	MCP	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Chromium	MCP	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Lead	MCP	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Mercury	MCP	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Selenium	MCP	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Silver	MCP	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Lindane	PEST	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Endrine	PEST	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Methoxyclor	PEST	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Toxaphene	PEST	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - 2,4-D	HERB	NA	NA	NA	NA	NA	NA	NA	NA
EP Tox - Silvex	HERB	NA	NA	NA	NA	NA	NA	NA	NA

All results reported in μg/L (ppb) unless otherwise stated.

Only detected results are reported.

** - Sample does not ignite for BTU analysis.

NA - Not Analyzed

* - Duplicate analysis not within control limits.

B - Less than quantitation limit but greater than or equal to instrument detection limit.

NEG - Not reactive, corrosive, or ignitable.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-4	LS-5	LS-6	LS-7	LS-8	LS-9	LS-10
COLLECTION DATE		7/12/90	7/13/90	7/13/90	7/30/90	7/30/90	7/30/90	7/30/90
PARAMETER	TYPE							
Corrisivity	MISC	NA	NEG	NA	NA	NA	NA	NA
Ignitability	MISC	NA	NEG	NA	NA	NA	NA	NA
Reactivity	MISC	NA	NEG	NA	NA	NA	NA	NA
Sulfur (%)	MISC	NA	0.013	NA	NA	NA	NA	NA
Chlorine (ppm)	MISC	NA		NA	NA	NA	NA	NA
Ash Weight (%)	MISC	NA	57.94	NA	NA	NA	NA	NA
Heat of Combustion (BTU/lb)	MISC	NA	**	NA	NA	NA	NA	NA
Reactive Cyanide (ppm)	MISC	NA		NA	NA	NA	NA	NA
Reactive Sulfide (ppm)	MISC	NA		NA	NA	NA	NA	NA
EP Tox - Arsenic	MCP	NA		NA	NA	NA	NA	NA
EP Tox - Barium	MCP	NA	713	NA	NA	NA	NA	NA
EP Tox - Cadmium	MCP	NA	92.5	NA	NA	NA	NA	NA
EP Tox - Chromium	MCP	NA	7.8 B	NA	NA	NA	NA	NA
EP Tox - Lead	MCP	NA	17.6 *	NA	NA	NA	NA	NA
EP Tox - Mercury	MCP	NA		NA	NA	NA	NA	NA
EP Tox - Selenium	MCP	NA		NA	NA	NA	NA	NA
EP Tox - Silver	MCP	NA		NA	NA	NA	NA	NA
EP Tox - Lindane	PEST	NA		NA	NA	NA	NA	NA
EP Tox - Endrine	PEST	NA		NA	NA	NA	NA	NA
EP Tox - Methoxyclor	PEST	NA		NA	NA	NA	NA	NA
EP Tox - Toxaphene	PEST	NA		NA	NA	NA	NA	NA
EP Tox - 2,4-D	HERB	NA		NA	NA	NA	NA	NA
EP Tox - Silvex	HERB	NA		NA	NA	NA	NA	NA

All results reported in μg/L (ppb) unless otherwise stated.

Only detected results are reported.

** - Sample does not ignite for BTU analysis.

NA - Not Analyzed

* - Duplicate analysis not within control limits.

B - Less than quantitation limit but greater than or equal to instrument detection limit.

NEG - Not reactive, corrosive, or ignitable.

TABLE A-3: QUARRY LAKE WATER
AND LAKE BOTTOM SEDIMENTS
Analytical Results

SAMPLE-ID		LS-11	LS-12	LS-13	LS-14	LS-15	LS-16	LS-17
COLLECTION DATE		8/1/90	8/1/90	8/1/90	8/1/90	7/31/90	7/31/90	7/31/90
PARAMETER	TYPE							
Corrisivity	MISC	NA	NA	NA	NA	NA	NA	NEG
Ignitability	MISC	NA	NA	NA	NA	NA	NA	NEG
Reactivity	MISC	NA	NA	NA	NA	NA	NA	NEG
Sulfur (%)	MISC	NA	NA	NA	NA	NA	NA	0.011
Chlorine (ppm)	MISC	NA	NA	NA	NA	NA	NA	
Ash Weight (%)	MISC	NA	NA	NA	NA	NA	NA	39.17
Heat of Combustion (BTU/lb)	MISC	NA	NA	NA	NA	NA	NA	**
Reactive Cyanide (ppm)	MISC	NA	NA	NA	NA	NA	NA	
Reactive Sulfide (ppm)	MISC	NA	NA	NA	NA	NA	NA	34.6
EP Tox - Arsenic	MCP	NA	NA	NA	NA	NA	NA	26.2
EP Tox - Barium	MCP	NA	NA	NA	NA	NA	NA	317 E
EP Tox - Cadmium	MCP	NA	NA	NA	NA	NA	NA	405
EP Tox - Chromium	MCP	NA	NA	NA	NA	NA	NA	31.5
EP Tox - Lead	MCP	NA	NA	NA	NA	NA	NA	
EP Tox - Mercury	MCP	NA	NA	NA	NA	NA	NA	
EP Tox - Selenium	MCP	NA	NA	NA	NA	NA	NA	
EP Tox - Silver	MCP	NA	NA	NA	NA	NA	NA	
EP Tox - Lindane	PEST	NA	NA	NA	NA	NA	NA	
EP Tox - Endrine	PEST	NA	NA	NA	NA	NA	NA	
EP Tox - Methoxyclor	PEST	NA	NA	NA	NA	NA	NA	
EP Tox - Toxaphene	PEST	NA	NA	NA	NA	NA	NA	
EP Tox - 2,4-D	HERB	NA	NA	NA	NA	NA	NA	
EP Tox - Silvex	HERB	NA	NA	NA	NA	NA	NA	

All results reported in μg/L (ppb)
unless otherwise stated.
Only detected results are reported.

** - Sample does not ignite for BTU analysis.
NA - Not Analyzed
* - Duplicate analysis not within control limits.
NEG - Not reactive, corrosive, or ignitable.
E - Estimated value due to interference.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch
SAMPLE-ID		SW-1	SW-2	SW-7	SW-8	SW-9
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90
PARAMETER	TYPE					
Chloromethane	VOC					
Bromomethane	VOC					
Vinyl Chloride	VOC					
Chloroethane	VOC					
Methylene Chloride	VOC					
Acetone	VOC					
Carbon Disulfide	VOC					
1,1-Dichloroethene	VOC					
1,1-Dichloroethane	VOC					
1,2-Dichloroethene (Total)	VOC					2.0 J
Chloroform	VOC					
1,2-Dichloroethane	VOC					
2-Butanone	VOC					
1,1,1-Trichloroethane	VOC					
Carbon Tetrachloride	VOC					
Vinyl Acetate	VOC					
Bromodichloromethane	VOC					
1,2-Dichloropropane	VOC					
cis-1,3-Dichloropropene	VOC					
Trichloroethene	VOC					
Dibromochloromethane	VOC					
1,1,2-Trichloroethane	VOC					
Benzene	VOC					
trans-1,3-Dichloropropene	VOC					
Bromoform	VOC					
4-Methyl-2-Pentanone	VOC					
2-Hexanone	VOC					
Tetrachloroethene	VOC					
1,1,2,2-Tetrachloroethane	VOC					
Toluene	VOC					
Chlorobenzene	VOC					
Ethylbenzene	VOC					
Styrene	VOC					
Total Xylenes	VOC			4.0 J		

All results reported in μg/L (ppb).

Only detected results are reported.

R - Analyte rejected due to blank contamination.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch	RR Ditch	NE Pond	NE Pond
SAMPLE-ID		SS-1	SS-2	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90	12/20/90	12/18/90	12/18/90
PARAMETER	TYPE								
Chloromethane	VOC								
Bromomethane	VOC								
Vinyl Chloride	VOC								
Chloroethane	VOC								
Methylene Chloride	VOC			R	R	R		R	R
Acetone	VOC	R	R	R	R	R	R	R	R
Carbon Disulfide	VOC								
1,1-Dichloroethene	VOC								
1,1-Dichloroethane	VOC								
1,2-Dichloroethene (Total)	VOC								
Chloroform	VOC								
1,2-Dichloroethane	VOC								
2-Butanone	VOC	21		R	R				13 J
1,1,1-Trichloroethane	VOC								
Carbon Tetrachloride	VOC								
Vinyl Acetate	VOC								
Bromodichloromethane	VOC								
1,2-Dichloropropane	VOC								
cis-1,3-Dichloropropene	VOC								
Trichloroethene	VOC								
Dibromochloromethane	VOC								
1,1,2-Trichloroethane	VOC								
Benzene	VOC				1 J				
trans-1,3-Dichloropropene	VOC								
Bromoform	VOC								
4-Methyl-2-Pentanone	VOC								
2-Hexanone	VOC								
Tetrachloroethene	VOC								
1,1,2,2-Tetrachloroethane	VOC								
Toluene	VOC								
Chlorobenzene	VOC								
Ethylbenzene	VOC								
Styrene	VOC								
Total Xylenes	VOC								

All results reported in μg/L (ppb).

Only detected results are reported.

R - Analyte rejected due to blank contamination.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch
SAMPLE-ID		SW-1	SW-2	SW-7	SW-8	SW-9
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90
PARAMETER	TYPE					
Phenol	SEMI					
bis(2-Chloroethyl)ether	SEMI					
2-Chlorophenol	SEMI					
1,3-Dichlorobenzene	SEMI					
1,4-Dichlorobenzene	SEMI					
Benzyl Alcohol	SEMI					
1,2-Dichlorobenzene	SEMI					
2-Methylphenol	SEMI					
Bis(2-chloroisopropyl)ether	SEMI					
4-Methylphenol	SEMI					
n-Nitroso-di-n-propylamine	SEMI					
Hexachloroethane	SEMI					
Nitrobenzene	SEMI					
Isophorone	SEMI					
2-Nitrophenol	SEMI					
2,4-Dimethylphenol	SEMI					
Benzoic Acid	SEMI	0.7 J	0.7 J			
Bis(2-chloroethoxy)methane	SEMI					
2,4-Dichlorophenol	SEMI					
1,2,4-Trichlorobenzene	SEMI					
Naphthalene	SEMI					
4-Chloroaniline	SEMI					
Hexachlorobutadiene	SEMI					
4-Chloro-3-methylphenol	SEMI					
2-Methylnaphthalene	SEMI					
Hexachlorocyclopentadiene	SEMI					
2,4,6-Trichlorophenol	SEMI					
2,4,5-Trichlorophenol	SEMI					
2-Chloronaphthalene	SEMI					
2-Nitroaniline	SEMI					
Dimethylphthalate	SEMI					
Acenaphthylene	SEMI		1 J			
2,6-Dinitrotoluene	SEMI					
3-Nitroaniline	SEMI					
Acenaphthene	SEMI					
2,4-Dinitrophenol	SEMI					

All results reported in μg/L (ppb).

Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

R - Analyte rejected due to blank contamination.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch	RR Ditch	NE Pond	NE Pond
SAMPLE-ID		SS-1	SS-2	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90	12/20/90	12/18/90	12/18/90
PARAMETER	TYPE								
Phenol	SEMI								
bis(2-Chloroethyl)ether	SEMI								
2-Chlorophenol	SEMI								
1,3-Dichlorobenzene	SEMI								
1,4-Dichlorobenzene	SEMI								
Benzyl Alcohol	SEMI								
1,2-Dichlorobenzene	SEMI								
2-Methylphenol	SEMI								
Bis(2-chloroisopropyl)ether	SEMI								
4-Methylphenol	SEMI								
n-Nitroso-di-n-propylamine	SEMI								
Hexachloroethane	SEMI								
Nitrobenzene	SEMI								
Isophorone	SEMI								
2-Nitrophenol	SEMI								
2,4-Dimethylphenol	SEMI								
Benzoic Acid	SEMI	R	R	300 J	260 J	790 J	300 J		150 J
Bis(2-chloroethoxy)methane	SEMI								
2,4-Dichlorophenol	SEMI								
1,2,4-Trichlorobenzene	SEMI								
Naphthalene	SEMI						42 J		
4-Chloroaniline	SEMI								
Hexachlorobutadiene	SEMI								
4-Chloro-3-methylphenol	SEMI								
2-Methylnaphthalene	SEMI				65 J				
Hexachlorocyclopentadiene	SEMI								
2,4,6-Trichlorophenol	SEMI								
2,4,5-Trichlorophenol	SEMI								
2-Chloronaphthalene	SEMI								
2-Nitroaniline	SEMI								
Dimethylphthalate	SEMI								
Acenaphthylene	SEMI						75 J		
2,6-Dinitrotoluene	SEMI								
3-Nitroaniline	SEMI								
Acenaphthene	SEMI								
2,4-Dinitrophenol	SEMI								

All results reported in μg/L (ppb).

Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

R - Analyte rejected due to blank contamination.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch
SAMPLE-ID		SW-1	SW-2	SW-7	SW-8	SW-9
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90
PARAMETER	TYPE					
4-Nitrophenol	SEMI		9 J			
Dibenzofuran	SEMI					
2,4-Dinitrotoluene	SEMI					
Diethylphthalate	SEMI					
4-Chlorophenyl-phenyl Ether	SEMI					
Fluorene	SEMI					
4-Nitroaniline	SEMI		4 J			
4,6-Dinitro-2-methylphenol	SEMI					
n-Nitrosodiphenylamine	SEMI					
4-Bromophenyl-phenyl Ether	SEMI					
Hexachlorobenzene	SEMI					
Pentachlorophenol	SEMI		6 J			
Phenanthrene	SEMI					
Anthracene	SEMI					
Di-n-butylphthalate	SEMI	R	R			R
Fluoranthene	SEMI	1 J	5 J			
Pyrene	SEMI	0.6 J	4 J			
Butylbenzylphthalate	SEMI		21			
3,3'-Dichlorobenzidine	SEMI					
Benzo(a)anthracene	SEMI	0.6 J	13			
Chrysene	SEMI		16			
bis(2-Ethylhexyl)phthalate	SEMI	R	R	R	R	R
Di-n-octylphthalate	SEMI		26			
Benzo(b)fluoranthene	SEMI		25			
Benzo(k)fluoranthene	SEMI		22			
Benzo(a)pyrene	SEMI		16			
Indeno(1,2,3-cd)pyrene	SEMI		17			
Dibenz(a,h)anthracene	SEMI		15			
Benzo(g,h,i)perylene	SEMI		16			

All results reported in μg/L (ppb).

Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

R - Analyte rejected due to blank contamination.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch	RR Ditch	NE Pond	NE Pond
SAMPLE-ID		SS-1	SS-2	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90	12/20/90	12/18/90	12/18/90
PARAMETER	TYPE								
4-Nitrophenol	SEMI					540 J			
Dibenzofuran	SEMI								
2,4-Dinitrotoluene	SEMI								
Diethylphthalate	SEMI	R	R	37 J					
4-Chlorophenyl-phenyl Ether	SEMI								
Fluorene	SEMI								
4-Nitroaniline	SEMI								
4,6-Dinitro-2-methylphenol	SEMI								
n-Nitrosodiphenylamine	SEMI								
4-Bromophenyl-phenyl Ether	SEMI								
Hexachlorobenzene	SEMI								
Pentachlorophenol	SEMI					780 J			
Phenanthrene	SEMI	70 J	170 J		87 J	89 J	320 J		
Anthracene	SEMI		27 J				45 J		
Di-n-butylphthalate	SEMI	R	R	R	R	R	R	R	R
Fluoranthene	SEMI	610 J	170 J	27 J	140 J	160 J	880 J		
Pyrene	SEMI	630 J	210 J	23 J	92 J	290 J	960 J		
Butylbenzylphthalate	SEMI								
3,3'-Dichlorobenzidine	SEMI								
Benzo(a)anthracene	SEMI	300 J	83 J				510 J		
Chrysene	SEMI	360 J	93 J		63 J	100 J	600 J		
bis(2-Ethylhexyl)phthalate	SEMI	R	R	R	R	R	R	R	R
Di-n-octylphthalate	SEMI	110 J		26 J					
Benzo(b)fluoranthene	SEMI	440 J	58 J	32 J	76 J	170 J	1100 J		
Benzo(k)fluoranthene	SEMI	360 J	61 J				83 J		
Benzo(a)pyrene	SEMI	300 J	59 J				400 J		
Indeno(1,2,3-cd)pyrene	SEMI						280 J		
Dibenz(a,h)anthracene	SEMI								
Benzo(g,h,i)perylene	SEMI						290 J		

All results reported in μg/L (ppb).

Only detected results are reported.

J – Indicates the result is less than the sample quantitation limit but greater than zero.

R – Analyte rejected due to blank contamination.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch
SAMPLE-ID		SW-1	SW-2	SW-7	SW-8	SW-9
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90
PARAMETER	TYPE					
alpha-BHC	PST					
beta-BHC	PST					
delta-BHC	PST					
gamma-BHC (Lindane)	PST					
Heptachlor	PST					
Aldrin	PST					
Heptachlor Epoxide	PST					
Endosulfan I	PST					
Dieldrin	PST					
4,4'-DDE	PST					
Endrin	PST					
Endosulfan II	PST					
4,4'-DDD	PST					
Endosulfan Sulfate	PST					
4,4'-DDT	PST					
Methoxychlor	PST					
Endrin Ketone	PST					
alpha-Chlordane	PST					
gamma-Chlordane	PST					
Toxaphene	PST					
Aroclor-1016	PCB					
Aroclor-1221	PCB					
Aroclor-1232	PCB					
Aroclor-1242	PCB					
Aroclor-1248	PCB					
Aroclor-1254	PCB					
Aroclor-1260	PCB					

All results reported in $\mu g/L$ (ppb).

Only detected results are reported.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch	RR Ditch	NE Pond	NE Pond
SAMPLE-ID		SS-1	SS-2	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90	12/20/90	12/18/90	12/18/90
PARAMETER	TYPE								
alpha-BHC	PST								
beta-BHC	PST								
delta-BHC	PST								
gamma-BHC (Lindane)	PST								
Heptachlor	PST								
Aldrin	PST								
Heptachlor Epoxide	PST								
Endosulfan I	PST								
Dieldrin	PST								
4,4'-DDE	PST								
Endrin	PST								
Endosulfan II	PST								
4,4'-DDD	PST								
Endosulfan Sulfate	PST								
4,4'-DDT	PST								
Methoxychlor	PST								
Endrin Ketone	PST								
alpha-Chlordane	PST								
gamma-Chlordane	PST								
Toxaphene	PST								
Aroclor-1016	PCB								
Aroclor-1221	PCB								
Aroclor-1232	PCB								
Aroclor-1242	PCB								
Aroclor-1248	PCB								
Aroclor-1254	PCB								
Aroclor-1260	PCB								

All results reported in $\mu g/L$ (ppb).

Only detected results are reported.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch
SAMPLE-ID		SW-1	SW-2	SW-7	SW-8	SW-9
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90
PARAMETER	TYPE					
Aluminum	MCP	6030 E N *	2220 E N *	4140 E	4270 E	1510 E
Antimony	MCP					
Arsenic	MCP	2.9 B	2.1 B			
Barium	MCP	91.8 B	58.9 B	49.9 B	55 B	26.9 B
Beryllium	MCP					
Cadmium	MCP	1.1 B				
Calcium	MCP	85,600	82,800	48,600	49,500	36,400
Chromium	MCP	8.8 B	4.6 B	6 B	9.1 B	4.0 B
Cobalt	MCP					
Copper	MCP	7.6 B	24.9 B			
Iron	MCP	7180	2760	4060	4010	1540
Lead	MCP	7.1 W	6.1	2.6 BW	2.6 B	1.2 B
Magnesium	MCP	34,900	33,300	18,700	19,200	10,700
Manganese	MCP	327	146	68.8	52.2	42.2
Mercury	MCP					
Nickel	MCP	9.4 B				
Potassium	MCP	4070 B	4050 B	4560	4380 B	2990 B
Selenium	MCP					
Silver	MCP					
Sodium	MCP	32,200 E	32,800 E	15,700	16,000	10,500
Thallium	MCP					
Vanadium	MCP	12.5 B	8.0 B	4.8 B	4.6 B	
Zinc	MCP	73.6 *	300 *	50.9	56.1	21
Cyanide	MCP					
Phenols (mg/kg)	MCP				0.021	0.015
Cr-hexavalent (mg/kg)	MCP	NA	NA	NA	NA	NA

Results for are reported
in mg/kg (ppm) unless otherwise stated.
Only detected results are reported.

E - Estimated value due to interference.
N - Spike sample % recovery out of control limits.
* - Duplicate analysis not within control limits.
B - Less than quantitation limit but greater than or equal to instrument detection limit.
W - Post-digestion spike is out of control limits.
S - The reported value was determined by the method of standard additions (MSA).
NA - Not analyzed.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch	RR Ditch	NE Pond	NE Pond
SAMPLE-ID		SS-1	SS-2	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90	12/20/90	12/18/90	12/18/90
PARAMETER	TYPE								
Aluminum	MCP	13,000 *	20,200 *	27,200	15,800	45,500	31,400	40,400	44,300
Antimony	MCP								
Arsenic	MCP	4.1	5.1 S	3.2 B	3.9	5.6	12.9	3.4 B	4.2 B
Barium	MCP	84.5	123	148	83.9	221	209	212	252
Beryllium	MCP	0.70 B	0.82 B	1.4 B	1.3 B	1.9 B	1.7 B	1.8 B	1.1 B
Cadmium	MCP	5.8	0.58 B			7	2.2		
Calcium	MCP	53,600	8520	5110	4500	21,200	49,000	32,200	38,600
Chromium	MCP	27.1 *	26.0 *	35.1	21.2	101	696	50.9	58.2
Cobalt	MCP	11.5 B	14.9	14.6 B	11.9 B	34.9	17.3 B	17.3 B	20 B
Copper	MCP	21.3 E	22.2 E	14.8	12.6	85.2	55.2	38.5	30
Iron	MCP	20,300 *	33,500 *	25,500	20,400	57,600	44,200	40,000	45,600
Lead	MCP	37.8 S	14	16.4	17.5	58.2	62.8	18.6 S	22.2
Magnesium	MCP	30,200	8670	7250	4460	15,500	13,500	13,300	15,000
Manganese	MCP	473 *	387 *	291	206	866	511	612	695
Mercury	MCP								
Nickel	MCP	24.6	29.8	30.1	21.1	88.6	51.3	39	43.3
Potassium	MCP	1980	3090	5690	2970	8960	7290	10,300	10,000
Selenium	MCP								
Silver	MCP								
Sodium	MCP	441 B	400 B	223	171	403 B	383	330 B	302 B
Thallium	MCP								
Vanadium	MCP	22.9	36.2	51.5	32.2	87.9	67.2	74	78.9
Zinc	MCP	149	120	199	138	285	197	132	154
Cyanide	MCP								
Phenols (mg/kg)	MCP	2.16	1.76	4.63	3.67	2.64		2.59	3.24
Cr-hexavalent (mg/kg)	MCP	NA	NA	NA	NA	NA		NA	NA

Results for are reported
in mg/kg (ppm) unless otherwise stated.
Only detected results are reported.

E - Estimated value due to interference.
N - Spike sample % recovery out of control limits.
* - Duplicate analysis not within control limits.
B - Less than quantitation limit but greater than or equal to instrument detection limit.
W - Post-digestion spike is out of control limits.
S - The reported value was determined by the method of standard additions (MSA).
NA - Not analyzed.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch
SAMPLE-ID		SW-1	SW-2	SW-7	SW-8	SW-9
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90
PARAMETER	TYPE					
Bicarbonate	MISC	214	225	NA	NA	NA
BOD	MISC	11	4	NA	NA	NA
COD	MISC	32	16.8	NA	NA	NA
Chloride	MISC	74.3	70.1	NA	NA	NA
Hardness	MISC	320	326	NA	NA	NA
Ammonia, as N	MISC	0.182	0.109	NA	NA	NA
Total Kjeldahl Nitrogen, as N	MISC	0.769	0.794	NA	NA	NA
Alkalinity	MISC	215	225	NA	NA	NA
Acidity	MISC	37.4	19.2	NA	NA	NA
Nitrate-Nitrogen	MISC	437	0.184	NA	NA	NA
Phosphate	MISC	0.159	0.159	NA	NA	NA
Oil and Grease	MISC			NA	NA	NA
TOC	MISC	5.62	5.66	NA	NA	NA
TSS	MISC	315	77.6	NA	NA	NA
TDS	MISC	558	534	NA	NA	NA
Sulfate	MISC	122	116	NA	NA	NA
Sulfide	MISC	1.5		NA	NA	NA
pH Units	MISC			NA	NA	NA
Specific Conductance	MISC			NA	NA	NA
Moisture %	MISC			NA	NA	NA

Results for are reported

in mg/L (ppm) unless otherwise stated.

NA - Not Analyzed.

Only detected results are reported.

TABLE A-4: MISCELLANEOUS SURFACE WATERS AND SEDIMENTS

Analytical Results

WATER BODY		Bull Ck.	Bull Ck.	Bull Ck.	Bull Ck.	TL. Ditch	RR Ditch	NE Pond	NE Pond
SAMPLE-ID		SS-1	SS-2	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
COLLECTION DATE		6/27/90	6/27/90	12/27/90	12/27/90	12/20/90	12/20/90	12/18/90	12/18/90
PARAMETER	TYPE								
Bicarbonate	MISC	NA	NA	NA	NA	NA	NA	NA	NA
BOD	MISC	NA	NA	NA	NA	NA	NA	NA	NA
COD	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Hardness	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia, as N	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen, as N	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Acidity	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-Nitrogen	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Oil and Grease	MISC	NA	NA	NA	NA	NA	NA	NA	NA
TOC	MISC	NA	NA	NA	NA	NA	NA	NA	NA
TSS	MISC	NA	NA	NA	NA	NA	NA	NA	NA
TDS	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	MISC	NA	NA	NA	NA	NA	NA	NA	NA
pH Units	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Specific Conductance	MISC	NA	NA	NA	NA	NA	NA	NA	NA
Moisture %	MISC	NA	NA	NA	NA	NA	NA	NA	NA

Results for are reported

in mg/L (ppm) unless otherwise stated.

NA - Not Analyzed.

Only detected results are reported.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1S	GW-85-2S	GW-85-2S	GW-85-3S	GW-85-5S	GW-85-5S	GW-85-7S	GW-85-7S	GW-88-1A	GW-88-1ARE
COLLECTION DATE		8/31/90	8/28/90	2/19/91	8/30/90	8/27/90	2/19/91	8/28/90	2/19/91	8/30/90	8/30/90
PARAMETER	TYPE										
Chloromethane	VOC										NA
Bromomethane	VOC										NA
Vinyl Chloride	VOC										NA
Chloroethane	VOC										NA
Methylene Chloride	VOC			R	6700 J		R				NA
Acetone	VOC			R	26,000		R	R	R		NA
Carbon Disulfide	VOC										NA
1,1-Dichloroethene	VOC									2 J	NA
1,1-Dichloroethane	VOC									3 J	NA
1,2-Dichloroethene (Total)	VOC										NA
Chloroform	VOC				1900 J						NA
1,2-Dichloroethane	VOC				230,000						NA
2-Butanone	VOC			3 J			1 J		2 J		NA
1,1,1-Trichloroethane	VOC				2400 J						NA
Carbon Tetrachloride	VOC										NA
Vinyl Acetate	VOC										NA
Bromodichloromethane	VOC										NA
1,2-Dichloropropane	VOC										NA
cis-1,3-Dichloropropene	VOC										NA
Trichloroethene	VOC			1 J	2500 J						NA
Dibromochloromethane	VOC										NA
1,1,2-Trichloroethane	VOC										NA
Benzene	VOC										NA
trans-1,3-Dichloropropene	VOC										NA
Bromoform	VOC										NA
4-Methyl-2-Pentanone	VOC				9100 J						NA
2-Hexanone	VOC										NA
Tetrachloroethene	VOC		1 J	1 J							NA
1,1,2,2-Tetrachloroethane	VOC										NA
Toluene	VOC				260,000						NA
Chlorobenzene	VOC										NA
Ethylbenzene	VOC										NA
Styrene	VOC										NA
Total Xylenes	VOC										NA

All results reported in μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
B - Analyte detected in associated method blank.

R - Compound rejected due to blank contamination.
NA - Not Analyzed.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-2A	GW-88-4A	GW-88-4ARE	GW-88-8A	GW-88-10A	GW-88-11A	GW-88-11A	GW-88-12A	GW-88-12A
COLLECTION DATE		8/30/90	8/31/90	8/31/90	8/31/90	2/22/91	8/29/90	2/22/91	8/29/90	2/22/91
PARAMETER	TYPE									
Chloromethane	VOC			NA						
Bromomethane	VOC			NA						
Vinyl Chloride	VOC			NA	2400 J					
Chloroethane	VOC			NA						
Methylene Chloride	VOC			NA	10,000	R		R		
Acetone	VOC		14	NA	35,000	R		R		
Carbon Disulfide	VOC			NA						
1,1-Dichloroethene	VOC			NA						
1,1-Dichloroethane	VOC	12	3 J	NA	1200					
1,2-Dichloroethene (Total)	VOC		8	NA	22,000	3000	41,000	24,000	2 J	
Chloroform	VOC			NA	R		450 J			
1,2-Dichloroethane	VOC		8	NA	36,000	1800 J		230 J		
2-Butanone	VOC	140		NA		R				
1,1,1-Trichloroethane	VOC	1 J	1 J	NA	2400	3800	940 J	360 J		
Carbon Tetrachloride	VOC			NA						
Vinyl Acetate	VOC			NA						
Bromodichloromethane	VOC			NA						
1,2-Dichloropropane	VOC			NA						
cis-1,3-Dichloropropene	VOC			NA						
Trichloroethene	VOC	2 J	1 J	NA	36,000	23,000	2100	2200		
Dibromochloromethane	VOC			NA						
1,1,2-Trichloroethane	VOC			NA						
Benzene	VOC		16	NA	9900	2900		780 J		
trans-1,3-Dichloropropene	VOC			NA						
Bromoform	VOC			NA						
4-Methyl-2-Pentanone	VOC		17	NA		12,000				
2-Hexanone	VOC			NA						
Tetrachloroethene	VOC		1 J	NA		5300				
1,1,2,2-Tetrachloroethane	VOC			NA						
Toluene	VOC		4 J	NA	16,000	72,000	2400	3500		
Chlorobenzene	VOC		150	NA						
Ethylbenzene	VOC			NA		480 J	420 J	310 J		
Styrene	VOC			NA						
Total Xylenes	VOC			NA	1400	3200	2300	1400		

All results reported in µg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
NA - Not Analyzed

R - Compound rejected due to blank contamination.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-13A	URS-8S	URS-8SRE	URS-8S	URS-9S	URS-9SRE	URS-9S	URS-14S
COLLECTION DATE		8/31/90	8/30/90	8/30/90	2/22/91	8/28/90	8/28/90	2/19/91	2/22/91
PARAMETER	TYPE								
Chloromethane	VOC			NA			NA		
Bromomethane	VOC			NA			NA		
Vinyl Chloride	VOC			NA			NA		
Chloroethane	VOC			NA			NA		
Methylene Chloride	VOC			NA			NA	R	R
Acetone	VOC			NA			NA	R	R
Carbon Disulfide	VOC			NA			NA		
1,1-Dichloroethene	VOC			NA			NA		
1,1-Dichloroethane	VOC	6		NA			NA		
1,2-Dichloroethene (Total)	VOC	96		NA			NA		
Chloroform	VOC			NA			NA		
1,2-Dichloroethane	VOC	2 J		NA			NA		
2-Butanone	VOC			NA			NA	2 J	
1,1,1-Trichloroethane	VOC			NA			NA		
Carbon Tetrachloride	VOC			NA			NA		
Vinyl Acetate	VOC			NA			NA		
Bromodichloromethane	VOC			NA			NA		
1,2-Dichloropropane	VOC			NA			NA		
cis-1,3-Dichloropropene	VOC			NA			NA		
Trichloroethene	VOC	5		NA			NA		
Dibromochloromethane	VOC			NA			NA		
1,1,2-Trichloroethane	VOC			NA			NA		
Benzene	VOC	0.7 J		NA			NA		
trans-1,3-Dichloropropene	VOC			NA			NA		
Bromoform	VOC			NA			NA		
4-Methyl-2-Pentanone	VOC			NA			NA		
2-Hexanone	VOC			NA			NA		
Tetrachloroethene	VOC			NA			NA		
1,1,2,2-Tetrachloroethane	VOC			NA			NA		
Toluene	VOC			NA	1 J		NA		
Chlorobenzene	VOC			NA			NA		
Ethylbenzene	VOC			NA			NA		
Styrene	VOC			NA			NA		
Total Xylenes	VOC			NA			NA		

All results reported in μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
NA - Not Analyzed

R - Compound rejected due to blank contamination.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1S	GW-85-2S	GW-85-2S	GW-85-3S	GW-85-5S	GW-85-5S	GW-85-7S	GW-85-7S	GW-88-1A	GW-88-1ARE
COLLECTION DATE		8/31/90	8/28/90	2/19/91	8/30/90	8/27/90	2/19/91	8/28/90	2/19/91	8/30/90	8/30/90
PARAMETER	TYPE										
Phenol	SEMI			NA	15,000		NA		NA	DR	DR
bis(2-Chloroethyl)ether	SEMI			NA	82 J		NA		NA	DR	DR
2-Chlorophenol	SEMI			NA			NA		NA	DR	DR
1,3-Dichlorobenzene	SEMI			NA			NA		NA	DR	DR
1,4-Dichlorobenzene	SEMI			NA			NA		NA	DR	DR
Benzyl Alcohol	SEMI			NA	170 J		NA		NA	DR	DR
1,2-Dichlorobenzene	SEMI			NA			NA		NA	DR	DR
2-Methylphenol	SEMI			NA	780		NA		NA	DR	DR
Bis(2-chloroisopropyl)ether	SEMI			NA			NA		NA	DR	DR
4-Methylphenol	SEMI			NA	3300		NA		NA	DR	DR
n-Nitroso-di-n-propylamine	SEMI			NA			NA		NA	DR	DR
Hexachloroethane	SEMI			NA			NA		NA	DR	DR
Nitrobenzene	SEMI			NA			NA		NA	DR	DR
Isophorone	SEMI			NA			NA		NA	DR	DR
2-Nitrophenol	SEMI			NA			NA		NA	DR	DR
2,4-Dimethylphenol	SEMI			NA	17 J		NA		NA	DR	DR
Benzoic Acid	SEMI			NA	980 J		NA		NA	DR	DR
Bis(2-chloroethoxy)methane	SEMI			NA	110 J		NA		NA	DR	DR
2,4-Dichlorophenol	SEMI			NA			NA		NA	DR	DR
1,2,4-Trichlorobenzene	SEMI			NA			NA		NA	DR	DR
Naphthalene	SEMI			NA			NA		NA	DR	DR
4-Chloroaniline	SEMI			NA			NA		NA	DR	DR
Hexachlorobutadiene	SEMI			NA			NA		NA	DR	DR
4-Chloro-3-methylphenol	SEMI			NA			NA		NA	DR	DR
2-Methylnaphthalene	SEMI			NA			NA		NA	DR	DR
Hexachlorocyclopentadiene	SEMI			NA			NA		NA	DR	DR
2,4,6-Trichlorophenol	SEMI			NA			NA		NA	DR	DR
2,4,5-Trichlorophenol	SEMI			NA			NA		NA	DR	DR
2-Chloronaphthalene	SEMI			NA			NA		NA	DR	DR
2-Nitroaniline	SEMI			NA			NA		NA	DR	DR
Dimethylphthalate	SEMI			NA			NA		NA	DR	DR
Acenaphthylene	SEMI			NA			NA		NA	DR	DR
2,6-Dinitrotoluene	SEMI			NA			NA		NA	DR	DR

All results reported in µg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

NA - Not analyzed.
DR - Data review indicates that this data is non-compliant with ASP.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results—1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-2A	GW-88-4A	GW-88-4ARE	GW-88-8A	GW-88-10A	GW-88-11A	GW-88-11A	GW-88-12A	GW-88-12A
COLLECTION DATE		8/30/90	8/31/90	8/31/90	8/31/90	2/22/91	8/29/90	2/22/91	8/29/90	2/22/91
PARAMETER	TYPE									
Phenol	SEMI	NA			22 J	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	SEMI	NA			14 J	NA	NA	NA	NA	NA
2-Chlorophenol	SEMI	NA				NA	NA	NA	NA	NA
1,3-Dichlorobenzene	SEMI	NA				NA	NA	NA	NA	NA
1,4-Dichlorobenzene	SEMI	NA				NA	NA	NA	NA	NA
Benzyl Alcohol	SEMI	NA				NA	NA	NA	NA	NA
1,2-Dichlorobenzene	SEMI	NA				NA	NA	NA	NA	NA
2-Methylphenol	SEMI	NA			320	NA	NA	NA	NA	NA
Bis(2-chloroisopropyl)ether	SEMI	NA				NA	NA	NA	NA	NA
4-Methylphenol	SEMI	NA			590	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	SEMI	NA				NA	NA	NA	NA	NA
Hexachloroethane	SEMI	NA				NA	NA	NA	NA	NA
Nitrobenzene	SEMI	NA	200	210		NA	NA	NA	NA	NA
Isophorone	SEMI	NA			28 J	NA	NA	NA	NA	NA
2-Nitrophenol	SEMI	NA				NA	NA	NA	NA	NA
2,4-Dimethylphenol	SEMI	NA			44 J	NA	NA	NA	NA	NA
Benzoic Acid	SEMI	NA				NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	SEMI	NA			5 J	NA	NA	NA	NA	NA
2,4-Dichlorophenol	SEMI	NA				NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	SEMI	NA				NA	NA	NA	NA	NA
Naphthalene	SEMI	NA			130	NA	NA	NA	NA	NA
4-Chloroaniline	SEMI	NA		8 J		NA	NA	NA	NA	NA
Hexachlorobutadiene	SEMI	NA				NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	SEMI	NA				NA	NA	NA	NA	NA
2-Methylnaphthalene	SEMI	NA			6 J	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	SEMI	NA				NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	SEMI	NA				NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	SEMI	NA				NA	NA	NA	NA	NA
2-Chloronaphthalene	SEMI	NA				NA	NA	NA	NA	NA
2-Nitroaniline	SEMI	NA				NA	NA	NA	NA	NA
Dimethylphthalate	SEMI	NA				NA	NA	NA	NA	NA
Acenaphthylene	SEMI	NA				NA	NA	NA	NA	NA
2,6-Dinitrotoluene	SEMI	NA				NA	NA	NA	NA	NA

All results reported in µg/L (ppb).
Only detected results are reported.

J – Indicates the result is less than the sample quantitation limit but greater than zero.

NA – Not analyzed.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-13A	URS-8S	URS-8SRE	URS-8S	URS-9S	URS-9SRE	URS-9S	URS-14S
COLLECTION DATE		8/31/90	8/30/90	8/30/90	2/22/91	8/28/90	8/28/90	2/19/91	2/22/91
PARAMETER	TYPE								
Phenol	SEMI				NA	DR	DR	NA	
bis(2-Chloroethyl)ether	SEMI				NA	DR	DR	NA	
2-Chlorophenol	SEMI				NA	DR	DR	NA	
1,3-Dichlorobenzene	SEMI				NA	DR	DR	NA	
1,4-Dichlorobenzene	SEMI	0.7 J			NA	DR	DR	NA	
Benzyl Alcohol	SEMI				NA	DR	DR	NA	
1,2-Dichlorobenzene	SEMI	1 J			NA	DR	DR	NA	
2-Methylphenol	SEMI				NA	DR	DR	NA	
Bis(2-chloroisopropyl)ether	SEMI				NA	DR	DR	NA	
4-Methylphenol	SEMI				NA	DR	DR	NA	
n-Nitroso-di-n-propylamine	SEMI				NA	DR	DR	NA	
Hexachloroethane	SEMI				NA	DR	DR	NA	
Nitrobenzene	SEMI				NA	DR	DR	NA	
Isophorone	SEMI				NA	DR	DR	NA	
2-Nitrophenol	SEMI				NA	DR	DR	NA	
2,4-Dimethylphenol	SEMI				NA	DR	DR	NA	
Benzoic Acid	SEMI				NA	DR	DR	NA	
Bis(2-chloroethoxy)methane	SEMI				NA	DR	DR	NA	
2,4-Dichlorophenol	SEMI				NA	DR	DR	NA	
1,2,4-Trichlorobenzene	SEMI	0.4 J			NA	DR	DR	NA	
Naphthalene	SEMI				NA	DR	DR	NA	
4-Chloroaniline	SEMI				NA	DR	DR	NA	
Hexachlorobutadiene	SEMI				NA	DR	DR	NA	
4-Chloro-3-methylphenol	SEMI				NA	DR	DR	NA	
2-Methylnaphthalene	SEMI				NA	DR	DR	NA	
Hexachlorocyclopentadiene	SEMI				NA	DR	DR	NA	
2,4,6-Trichlorophenol	SEMI				NA	DR	DR	NA	
2,4,5-Trichlorophenol	SEMI				NA	DR	DR	NA	
2-Chloronaphthalene	SEMI				NA	DR	DR	NA	
2-Nitroaniline	SEMI				NA	DR	DR	NA	
Dimethylphthalate	SEMI				NA	DR	DR	NA	
Acenaphthylene	SEMI				NA	DR	DR	NA	
2,6-Dinitrotoluene	SEMI				NA	DR	DR	NA	

All results reported in µg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

NA - Not analyzed.

DR - Data review indicates that this da is non-compliant with ASP.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1S	GW-85-2S	GW-85-2S	GW-85-3S	GW-85-5S	GW-85-5S	GW-85-7S	GW-85-7S	GW-88-1A	GW-88-1ARE
COLLECTION DATE		8/31/90	8/28/90	2/19/91	8/30/90	8/27/90	2/19/91	8/28/90	2/19/91	8/30/90	8/30/90
PARAMETER	TYPE										
3-Nitroaniline	SEMI			NA			NA		NA	DR	DR
Acenaphthene	SEMI			NA			NA		NA	DR	DR
2,4-Dinitrophenol	SEMI			NA			NA		NA	DR	DR
4-Nitrophenol	SEMI			NA			NA		NA	DR	DR
Dibenzofuran	SEMI			NA			NA		NA	DR	DR
2,4-Dinitrotoluene	SEMI			NA			NA		NA	DR	DR
Diethylphthalate	SEMI	R		NA			NA		NA	DR	DR
4-Chlorophenyl-phenyl Ether	SEMI			NA			NA		NA	DR	DR
Fluorene	SEMI			NA			NA		NA	DR	DR
4-Nitroaniline	SEMI			NA			NA		NA	DR	DR
4,6-Dinitro-2-methylphenol	SEMI			NA			NA		NA	DR	DR
n-Nitrosodiphenylamine	SEMI			NA			NA		NA	DR	DR
4-Bromophenyl-phenyl Ether	SEMI			NA			NA		NA	DR	DR
Hexachlorobenzene	SEMI			NA			NA		NA	DR	DR
Pentachlorophenol	SEMI			NA			NA		NA	DR	DR
Phenanthrene	SEMI			NA			NA		NA	DR	DR
Anthracene	SEMI			NA			NA		NA	DR	DR
Di-n-butylphthalate	SEMI			NA			NA		NA	DR	DR
Fluoranthene	SEMI			NA			NA		NA	DR	DR
Pyrene	SEMI			NA			NA		NA	DR	DR
Butylbenzylphthalate	SEMI			NA			NA		NA	DR	DR
3,3'-Dichlorobenzidine	SEMI			NA			NA		NA	DR	DR
Benzo(a)anthracene	SEMI			NA			NA		NA	DR	DR
Chrysene	SEMI			NA			NA		NA	DR	DR
bis(2-Ethylhexyl)phthalate	SEMI	R	R	NA	38 J B	R	NA		NA	DR	DR
Di-n-octylphthalate	SEMI	R		NA			NA		NA	DR	DR
Benzo(b)fluoranthene	SEMI			NA			NA		NA	DR	DR
Benzo(k)fluoranthene	SEMI			NA			NA		NA	DR	DR
Benzo(a)pyrene	SEMI			NA			NA		NA	DR	DR
Indeno(1,2,3-cd)pyrene	SEMI			NA			NA		NA	DR	DR
Dibenz(a,h)anthracene	SEMI			NA			NA		NA	DR	DR
Benzo(g,h,i)perylene	SEMI			NA			NA		NA	DR	DR

All results reported in µg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
B - Analyte detected in associated method blank.
R - Compound rejected due to blank contamination.

NA - Not analyzed.
DR - Data review indicates that this data is non-compliant with ASP.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-2A	GW-88-4A	GW-88-4ARE	GW-88-8A	GW-88-10A	GW-88-11A	GW-88-11A	GW-88-12A	GW-88-12A
COLLECTION DATE		8/30/90	8/31/90	8/31/90	8/31/90	2/22/91	8/29/90	2/22/91	8/29/90	2/22/91
PARAMETER	TYPE									
3-Nitroaniline	SEMI	NA				NA	NA	NA	NA	NA
Acenaphthene	SEMI	NA				NA	NA	NA	NA	NA
2,4-Dinitrophenol	SEMI	NA				NA	NA	NA	NA	NA
4-Nitrophenol	SEMI	NA				NA	NA	NA	NA	NA
Dibenzofuran	SEMI	NA				NA	NA	NA	NA	NA
2,4-Dinitrotoluene	SEMI	NA				NA	NA	NA	NA	NA
Diethylphthalate	SEMI	NA			R	NA	NA	NA	NA	NA
4-Chlorophenyl-phenyl Ether	SEMI	NA				NA	NA	NA	NA	NA
Fluorene	SEMI	NA				NA	NA	NA	NA	NA
4-Nitroaniline	SEMI	NA				NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	SEMI	NA				NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	SEMI	NA				NA	NA	NA	NA	NA
4-Bromophenyl-phenyl Ether	SEMI	NA				NA	NA	NA	NA	NA
Hexachlorobenzene	SEMI	NA				NA	NA	NA	NA	NA
Pentachlorophenol	SEMI	NA				NA	NA	NA	NA	NA
Phenanthrene	SEMI	NA			1 J	NA	NA	NA	NA	NA
Anthracene	SEMI	NA				NA	NA	NA	NA	NA
Di-n-butylphthalate	SEMI	NA	0.9 J	R	3 J	NA	NA	NA	NA	NA
Fluoranthene	SEMI	NA		0.6 J		NA	NA	NA	NA	NA
Pyrene	SEMI	NA		0.8 J		NA	NA	NA	NA	NA
Butylbenzylphthalate	SEMI	NA		2 J		NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	SEMI	NA				NA	NA	NA	NA	NA
Benzo(a)anthracene	SEMI	NA				NA	NA	NA	NA	NA
Chrysene	SEMI	NA				NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	SEMI	NA	33 B	R	R	NA	NA	NA	NA	NA
Di-n-octylphthalate	SEMI	NA	R	R	R	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	SEMI	NA				NA	NA	NA	NA	NA
Benzo(k)fluoranthene	SEMI	NA				NA	NA	NA	NA	NA
Benzo(a)pyrene	SEMI	NA				NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	SEMI	NA				NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	SEMI	NA				NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	SEMI	NA				NA	NA	NA	NA	NA

All results reported in μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
B - Analyte detected in associated method blank.

NA - Not analyzed.
R - Compound rejected due to blank contamination.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-13A	URS-8S	URS-8SRE	URS-8S	URS-9S	URS-9SRE	URS-9S	URS-14S
COLLECTION DATE		8/31/90	8/30/90	8/30/90	2/22/91	8/28/90	8/28/90	2/19/91	2/22/91
PARAMETER	TYPE								
3-Nitroaniline	SEMI				NA	DR	DR	NA	
Acenaphthene	SEMI				NA	DR	DR	NA	
2,4-Dinitrophenol	SEMI				NA	DR	DR	NA	
4-Nitrophenol	SEMI				NA	DR	DR	NA	
Dibenzofuran	SEMI				NA	DR	DR	NA	
2,4-Dinitrotoluene	SEMI				NA	DR	DR	NA	
Diethylphthalate	SEMI	R			NA	DR	DR	NA	
4-Chlorophenyl-phenyl Ether	SEMI				NA	DR	DR	NA	
Fluorene	SEMI				NA	DR	DR	NA	
4-Nitroaniline	SEMI				NA	DR	DR	NA	
4,6-Dinitro-2-methylphenol	SEMI				NA	DR	DR	NA	
n-Nitrosodiphenylamine	SEMI				NA	DR	DR	NA	
4-Bromophenyl-phenyl Ether	SEMI				NA	DR	DR	NA	
Hexachlorobenzene	SEMI				NA	DR	DR	NA	
Pentachlorophenol	SEMI				NA	DR	DR	NA	
Phenanthrene	SEMI				NA	DR	DR	NA	
Anthracene	SEMI				NA	DR	DR	NA	
Di-n-butylphthalate	SEMI	0.6 J			NA	DR	DR	NA	
Fluoranthene	SEMI				NA	DR	DR	NA	
Pyrene	SEMI				NA	DR	DR	NA	
Butylbenzylphthalate	SEMI				NA	DR	DR	NA	
3,3'-Dichlorobenzidine	SEMI				NA	DR	DR	NA	
Benzo(a)anthracene	SEMI				NA	DR	DR	NA	
Chrysene	SEMI				NA	DR	DR	NA	
bis(2-Ethylhexyl)phthalate	SEMI	R	R	R	NA	DR	DR	NA	R
Di-n-octylphthalate	SEMI	R			NA	DR	DR	NA	
Benzo(b)fluoranthene	SEMI				NA	DR	DR	NA	
Benzo(k)fluoranthene	SEMI				NA	DR	DR	NA	
Benzo(a)pyrene	SEMI				NA	DR	DR	NA	
Indeno(1,2,3-cd)pyrene	SEMI				NA	DR	DR	NA	
Dibenz(a,h)anthracene	SEMI				NA	DR	DR	NA	
Benzo(g,h,i)perylene	SEMI				NA	DR	DR	NA	

All results reported in μg/L (ppb).
Only detected results are reported.

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B - Analyte detected in associated method blank.

R - Compound rejected due to blank contamination.
NA - Not analyzed.
DR - Data review indicates that this data is non-compliant with ASP.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1S	GW-85-2S	GW-85-2S	GW-85-3S	GW-85-5S	GW-85-5S	GW-85-7S	GW-85-7S	GW-88-1A	GW-88-1ARE
COLLECTION DATE		8/31/90	8/28/90	2/19/91	8/30/90	8/27/90	2/19/91	8/28/90	2/19/91	8/30/90	8/30/90
PARAMETER	TYPE										
alpha-BHC	PST			NA			NA		NA	NA	NA
beta-BHC	PST			NA			NA		NA	NA	NA
delta-BHC	PST			NA			NA		NA	NA	NA
gamma-BHC (Lindane)	PST			NA			NA		NA	NA	NA
Heptachlor	PST			NA			NA		NA	NA	NA
Aldrin	PST			NA			NA		NA	NA	NA
Heptachlor Epoxide	PST			NA			NA		NA	NA	NA
Endosulfan I	PST			NA			NA		NA	NA	NA
Dieldrin	PST			NA			NA		NA	NA	NA
4,4'-DDE	PST			NA			NA		NA	NA	NA
Endrin	PST			NA			NA		NA	NA	NA
Endosulfan II	PST			NA			NA		NA	NA	NA
4,4'-DDD	PST			NA			NA		NA	NA	NA
Endosulfan Sulfate	PST			NA			NA		NA	NA	NA
4,4'-DDT	PST			NA			NA		NA	NA	NA
Methoxychlor	PST			NA			NA		NA	NA	NA
Endrin Ketone	PST			NA			NA		NA	NA	NA
alpha-Chlordane	PST			NA			NA		NA	NA	NA
gamma-Chlordane	PST			NA			NA		NA	NA	NA
Toxaphene	PST			NA			NA		NA	NA	NA
Aroclor-1016	PCB			NA			NA		NA	NA	NA
Aroclor-1221	PCB			NA			NA		NA	NA	NA
Aroclor-1232	PCB			NA			NA		NA	NA	NA
Aroclor-1242	PCB			NA			NA		NA	NA	NA
Aroclor-1248	PCB			NA			NA		NA	NA	NA
Aroclor-1254	PCB			NA			NA		NA	NA	NA
Aroclor-1260	PCB			NA			NA		NA	NA	NA

All results reported in µg/L (ppb).

NA - Not Analyzed

Only detected results are reported.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-2A	GW-88-4A	GW-88-4ARE	GW-88-8A	GW-88-10A	GW-88-11A	GW-88-11A	GW-88-12A	GW-88-12A
COLLECTION DATE		8/30/90	8/31/90	8/31/90	8/31/90	2/22/91	8/29/90	2/22/91	8/29/90	2/22/91
PARAMETER	TYPE									
alpha-BHC	PST			NA		NA	NA	NA	NA	NA
beta-BHC	PST			NA		NA	NA	NA	NA	NA
delta-BHC	PST			NA		NA	NA	NA	NA	NA
gamma-BHC (Lindane)	PST			NA		NA	NA	NA	NA	NA
Heptachlor	PST			NA		NA	NA	NA	NA	NA
Aldrin	PST			NA		NA	NA	NA	NA	NA
Heptachlor Epoxide	PST			NA		NA	NA	NA	NA	NA
Endosulfan I	PST			NA		NA	NA	NA	NA	NA
Dieldrin	PST			NA		NA	NA	NA	NA	NA
4,4'-DDE	PST			NA		NA	NA	NA	NA	NA
Endrin	PST			NA		NA	NA	NA	NA	NA
Endosulfan II	PST			NA		NA	NA	NA	NA	NA
4,4'-DDD	PST			NA		NA	NA	NA	NA	NA
Endosulfan Sulfate	PST			NA		NA	NA	NA	NA	NA
4,4'-DDT	PST			NA		NA	NA	NA	NA	NA
Methoxychlor	PST			NA		NA	NA	NA	NA	NA
Endrin Ketone	PST			NA		NA	NA	NA	NA	NA
alpha-Chlordane	PST			NA		NA	NA	NA	NA	NA
gamma-Chlordane	PST			NA		NA	NA	NA	NA	NA
Toxaphene	PST			NA		NA	NA	NA	NA	NA
Aroclor-1016	PCB			NA		NA	NA	NA	NA	NA
Aroclor-1221	PCB			NA		NA	NA	NA	NA	NA
Aroclor-1232	PCB			NA		NA	NA	NA	NA	NA
Aroclor-1242	PCB			NA		NA	NA	NA	NA	NA
Aroclor-1248	PCB			NA		NA	NA	NA	NA	NA
Aroclor-1254	PCB			NA		NA	NA	NA	NA	NA
Aroclor-1260	PCB			NA		NA	NA	NA	NA	NA

All results reported in µg/L (ppb).
Only detected results are reported.

NA - Not Analyzed

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results—1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-13A	URS-8S	URS-8SRE	URS-8S	URS-9S	URS-9SRE	URS-9S	URS-14S
COLLECTION DATE		8/31/90	8/30/90	8/30/90	2/22/91	8/28/90	8/28/90	2/19/91	2/22/91
PARAMETER	TYPE								
alpha-BHC	PST			NA	NA		NA	NA	
beta-BHC	PST			NA	NA		NA	NA	
delta-BHC	PST			NA	NA		NA	NA	
gamma-BHC (Lindane)	PST			NA	NA		NA	NA	
Heptachlor	PST			NA	NA		NA	NA	
Aldrin	PST			NA	NA		NA	NA	
Heptachlor Epoxide	PST			NA	NA		NA	NA	
Endosulfan I	PST			NA	NA		NA	NA	
Dieldrin	PST			NA	NA		NA	NA	
4,4'-DDE	PST			NA	NA		NA	NA	
Endrin	PST			NA	NA		NA	NA	
Endosulfan II	PST			NA	NA		NA	NA	
4,4'-DDD	PST			NA	NA		NA	NA	
Endosulfan Sulfate	PST			NA	NA		NA	NA	
4,4'-DDT	PST			NA	NA		NA	NA	
Methoxychlor	PST			NA	NA		NA	NA	
Endrin Ketone	PST			NA	NA		NA	NA	
alpha-Chlordane	PST			NA	NA		NA	NA	
gamma-Chlordane	PST			NA	NA		NA	NA	
Toxaphene	PST			NA	NA		NA	NA	
Aroclor-1016	PCB			NA	NA		NA	NA	
Aroclor-1221	PCB			NA	NA		NA	NA	
Aroclor-1232	PCB			NA	NA		NA	NA	
Aroclor-1242	PCB			NA	NA		NA	NA	
Aroclor-1248	PCB			NA	NA		NA	NA	
Aroclor-1254	PCB			NA	NA		NA	NA	
Aroclor-1260	PCB			NA	NA		NA	NA	

All results reported in µg/L (ppb).

NA - Not Analyzed

Only detected results are reported.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1S	GW-85-2S	GW-85-2S	GW-85-3S	GW-85-5S	GW-85-5S	GW-85-7S	GW-85-7S	GW-88-1A	GW-88-1ARE
COLLECTION DATE		8/31/90	8/28/90	2/19/91	8/30/90	8/27/90	2/19/91	8/28/90	2/19/91	8/30/90	8/30/90
PARAMETER	TYPE										
Aluminum	MCP	120 B N		1880		114 B	26,600	241	319	NA	NA
Antimony	MCP		32.4 B	79		31.6 B	50.4 B		88.6	NA	NA
Arsenic	MCP		1.2 B W		11.6 B S	2.6 B W	4.5 BW	2.6 B W	1.5 B	NA	NA
Barium	MCP	13.9 B	13.6 B	24.4 BE	11.5 B	10.5 B	137 BE	9.1 B		NA	NA
Beryllium	MCP						2.9 B			NA	NA
Cadmium	MCP									NA	NA
Calcium	MCP	290,000	414,000	414,000	407,000	386,000	465,000	430,000	446,000	NA	NA
Chromium	MCP				148,000		62.9		15.3	NA	NA
Cobalt	MCP				6.7 B		13.1 B			NA	NA
Copper	MCP	4.9 B			9.5 B		31.4			NA	NA
Iron	MCP	1300	868	2430	106	575	33,200	1540	1410	NA	NA
Lead	MCP		1.9 B	5			24.2 S			NA	NA
Magnesium	MCP	104,000	290,000	306,000	69,500	947,000	1,130,000	911,000	772,000	NA	NA
Manganese	MCP	13.6 B	121	166 E	26.2	95	1380 E	201	382 E	NA	NA
Mercury	MCP									NA	NA
Nickel	MCP	11.3 B			258	8 B	31.7 B	21.8 B		NA	NA
Potassium	MCP	2950 B	3360 B	3360 B	63,200	2780 B	9180	5500	4880 B	NA	NA
Selenium	MCP				2.9 B N W					NA	NA
Silver	MCP									NA	NA
Sodium	MCP	54,800	54,000	52,800	1,450,000	378,000	417,000	333,000	296,000	NA	NA
Thallium	MCP									NA	NA
Vanadium	MCP	42.8 B	35.1 B	12 B		2.4 B	56.9	3.5 B		NA	NA
Zinc	MCP	44.3	18 B	47.5			160		13.1 B	NA	NA
Cyanide	MCP	13.5	NA	15.6	1040					NA	NA
Chromium, Hexavalent	MCP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenols (mg/L)	MCP				42.6	0.006		0.007		0.007	NA

All results reported in µg/L (ppb) unless otherwise stated.

Only detected results are reported.

N – Spike sample % recovery out of control limits.

NA – Not Analyzed

B – Less than quantitation limit but greater than or equal to instrument detection limit.

W – Post-digestion spike is out of control limits.

S – The reported value was determined by the Method of Standard Additions (MSA).

E – Value is estimated due to interference.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-2A	GW-88-4A	GW-88-4ARE	GW-88-8A	GW-88-10A	GW-88-11A	GW-88-11A	GW-88-12A	GW-88-12A
COLLECTION DATE		8/30/90	8/31/90	8/31/90	8/31/90	2/22/91	8/29/90	2/22/91	8/29/90	2/22/91
PARAMETER	TYPE									
Aluminum	MCP	NA	320 N	NA	360 N	233	NA		NA	1460
Antimony	MCP	NA	33.2 B	NA		29.2 B	NA	34.7 B	NA	70
Arsenic	MCP	NA	5.2 B N	NA	32.6 N S	5.0 B	NA	4.6 BW	NA	1.1 BW
Barium	MCP	NA	217	NA	13.9 B	18.6 B	NA	25.3 B	NA	41.9 B
Beryllium	MCP	NA		NA			NA		NA	
Cadmium	MCP	NA		NA	12		NA		NA	
Calcium	MCP	NA	202,000	NA	239,000	372,000 E	NA	516,000 E	NA	446,000 E
Chromium	MCP	NA		NA	7770	870 E	NA	9.2 BE	NA	20.2 E
Cobalt	MCP	NA	4.5 B	NA	6.1 B	6.2 B	NA	9.7 B	NA	
Copper	MCP	NA		NA	4.7 B		NA		NA	22.4 B*
Iron	MCP	NA	4300	NA	460	579	NA	22,200	NA	2280
Lead	MCP	NA	6	NA	1.1 B	1.7 B	NA	1.3 B	NA	7.2
Magnesium	MCP	NA	108,000	NA	20,600	1690 BE	NA	68,000 E	NA	495,000 E
Manganese	MCP	NA	1030	NA	106	17.1	NA	1190	NA	250
Mercury	MCP	NA		NA			NA		NA	
Nickel	MCP	NA	52.5	NA	43.6	58.9	NA	173	NA	13.6 B
Potassium	MCP	NA	10,600	NA	48,100	28,900 E	NA	18,500 E	NA	2370 BE
Selenium	MCP	NA		NA	2 B N W	1.7 BWN	NA		NA	
Silver	MCP	NA		NA			NA		NA	
Sodium	MCP	NA	117,000	NA	290,000	72,300	NA	149,000	NA	152,000
Thallium	MCP	NA		NA	N W		NA		NA	
Vanadium	MCP	NA	79.1	NA	143		NA		NA	11.3 B
Zinc	MCP	NA	74.8	NA	11 B	18.5 B	NA	17.7 B	NA	22.3
Cyanide	MCP	NA		NA	525	98	NA		NA	
Chromium, Hexavalent	MCP	NA	NA	NA	NA	0.59	NA		NA	
Phenols (mg/L)	MCP	NA	0.042		6.68	2.5		0.349		

N - Spike sample % recovery out of control limits.
NA - Not Analyzed
B - Less than quantitation limit but greater than or equal to instrument detection limit.
W - Post-digestion spike is out of control limits.
E - Value is estimated due to interference.

All results reported in µg/L (ppb) unless otherwise stated.
Only detected results are reported.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-13A	URS-8S	URS-8SRE	URS-8S	URS-9S	URS-9SRE	URS-9S	URS-14S
COLLECTION DATE		8/31/90	8/30/90	8/30/90	2/22/91	8/28/90	8/28/90	2/19/91	2/22/91
PARAMETER	TYPE								
Aluminum	MCP	6730 N	536	NA	1510	225	NA	225	2280
Antimony	MCP	36.3 B	65.4	NA	47.4 B	46.5 B	NA	75.6	32.5 B
Arsenic	MCP	5 B N W		NA		2.1 B	NA		7.9 B
Barium	MCP	89.3 B	13.6 B	NA	20.7 B	13.3 B	NA	11.7 B	27.6 B
Beryllium	MCP			NA			NA		
Cadmium	MCP	6.5		NA			NA		
Calcium	MCP	373,000	376,000	NA	424,000 E	388,000	NA	411,000	89,200 E
Chromium	MCP	68.1		NA	12.5 E	9.6 B	NA		6.0 BE
Cobalt	MCP	5.5 B		NA			NA		
Copper	MCP	82.5		NA		8.5 B	NA		
Iron	MCP	15,800	505	NA	2170	528	NA	578	2180
Lead	MCP	8.9	1.4 B W	NA	2.5 BW		NA		3.2 B
Magnesium	MCP	247,000	621,000	NA	713,000 E	660,000	NA	676,000	82,000 E
Manganese	MCP	471	967	NA	161	435	NA	320 E	321
Mercury	MCP			NA			NA		
Nickel	MCP	69.4		NA	3340 BE	35.8 B	NA	1590	
Potassium	MCP	4630 B	4020 B	NA		4330 B	NA	4180 B	5030 E
Selenium	MCP			NA			NA		
Silver	MCP			NA			NA		
Sodium	MCP	255,000	218,000	NA	269,000	208,000	NA	217,000	38,200
Thallium	MCP			NA			NA		
Vanadium	MCP	187	152	NA			NA	7.1 B	9.0 B
Zinc	MCP	68.2		NA	10 B		NA		26.5
Cyanide	MCP			NA			NA		
Chromium, Hexavalent	MCP	NA	NA	NA	NA	NA	NA	NA	
Phenols (mg/L)	MCP	0.008	0.079	NA					

All results reported in µg/L (ppb) unless otherwise stated.
Only detected results are reported.

N - Spike sample % recovery out of control limits.
NA - Not Analyzed
B - Less than quantitation limit but greater than or equal to instrument detection limit.
W - Post-digestion spike is out of control limits.
E - Value is estimated due to interference.

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1S	GW-85-2S	GW-85-2S	GW-85-3S	GW-85-5S	GW-85-5S	GW-85-7S	GW-85-7S	GW-88-1A	GW-88-1ARE
COLLECTION DATE		8/31/90	8/28/90	2/19/91	8/30/90	8/27/90	2/19/91	8/28/90	2/19/91	8/30/90	8/30/90
PARAMETER	TYPE										
Bicarbonate, as CaCO3	MISC	NA	NA		399	479		NA		NA	NA
BOD	MISC	NA	NA		920	32		NA		NA	NA
COD	MISC	NA	NA		1240	53.7		NA		NA	NA
Chloride	MISC	NA	NA		902	189		NA		NA	NA
Hardness, as CaCO3	MISC	NA	NA		1540	5400		NA		NA	NA
Ammonia, as N	MISC	NA	NA		19.3	0.1		NA		NA	NA
Total Kjeldahl Nitrogen, as N	MISC	NA	NA		20.5	1.57		NA		NA	NA
Alkalinity, as CaCO3	MISC	NA	NA		402	479		NA		NA	NA
Acidity, as CaCO3	MISC	NA	NA		32.7	206		NA		NA	NA
Nitrate-Nitrogen	MISC	NA	NA		1.16			NA		NA	NA
Phosphate	MISC	NA	NA					NA		NA	NA
Oil and Grease	MISC	NA	NA		22.5	3		1.1		2.48	NA
TOC	MISC	NA	NA		941	6.78		NA		NA	NA
TSS	MISC	NA	NA		73.6	2060		NA		NA	NA
TDS	MISC	NA	NA		8030	7830		NA		NA	NA
Sulfate	MISC	NA	NA		3470	4290		NA		NA	NA
Sulfide	MISC	NA	NA					NA		NA	NA
pH (SU)	MISC	NA	NA					NA		NA	NA
Specific Conductance	MISC	NA	NA					NA		NA	NA

All results reported in mg/L (ppm) unless otherwise stated.

Only detected results are reported.

NA - Not Analyzed

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-2A	GW-88-4A	GW-88-4ARE	GW-88-8A	GW-88-10A	GW-88-11A	GW-88-11A	GW-88-12A	GW-88-12A
COLLECTION DATE		8/30/90	8/31/90	8/31/90	8/31/90	2/22/91	8/29/90	2/22/91	8/29/90	2/22/91
PARAMETER	TYPE									
Bicarbonate, as CaCO3	MISC	NA	487	NA	102		NA		NA	
BOD	MISC	NA	17	NA			NA		NA	
COD	MISC	NA	224	NA	349		NA		NA	
Chloride	MISC	NA	553	NA	504		NA		NA	
Hardness, as CaCO3	MISC	NA	1380	NA	924		NA		NA	
Ammonia, as N	MISC	NA	7.29	NA	15.8		NA		NA	
Total Kjeldahl Nitrogen, as N	MISC	NA	14.4	NA	42		NA		NA	
Alkalinity, as CaCO3	MISC	NA	487	NA	104		NA		NA	
Acidity, as CaCO3	MISC	NA	368	NA	27.5		NA		NA	
Nitrate-Nitrogen	MISC	NA		NA			NA		NA	
Phosphate	MISC	NA		NA			NA		NA	
Oil and Grease	MISC	NA	21	NA	21.3		NA		NA	
TOC	MISC	NA	169	NA	330		NA		NA	
TSS	MISC	NA	169	NA	60		NA		NA	
TDS	MISC	NA	2320	NA	2320		NA		NA	
Sulfate	MISC	NA	467	NA	1110		NA		NA	
Sulfide	MISC	NA		NA			NA		NA	
pH (SU)	MISC	NA		NA			NA		NA	
Specific Conductance	MISC	NA		NA			NA		NA	

All results reported in mg/L (ppm)
unless otherwise stated.
Only detected results are reported.

NA - Not Analyzed

TABLE A-5: SHALLOW GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-13A	URS-8S	URS-8SRE	URS-8S	URS-9S	URS-9SRE	URS-9S	URS-14S
COLLECTION DATE		8/31/90	8/30/90	8/30/90	2/22/91	8/28/90	8/28/90	2/19/91	2/22/91
PARAMETER	TYPE								
Bicarbonate, as CaCO3	MISC	346	305	NA		322	NA		358
BOD	MISC	9	11	NA		6	NA		
COD	MISC	29.8		NA			NA		10.7
Chloride	MISC	86.1	153	NA		52	NA		139
Hardness, as CaCO3	MISC	2470	4100	NA		3800	NA		575
Ammonia, as N	MISC	0.059		NA		0.07	NA		0.048
Total Kjeldahl Nitrogen, as N	MISC	0.66	0.86	NA		0.745	NA		0.811
Alkalinity, as CaCO3	MISC	346	305	NA		323	NA		359
Acidity, as CaCO3	MISC	121	131	NA		133	NA		69.9
Nitrate-Nitrogen	MISC			NA			NA		
Phosphate	MISC		0.23	NA			NA		33
Oil and Grease	MISC	1.2		NA		4.7	NA		4.2
TOC	MISC	8.06	68.1	NA		4.2	NA		
TSS	MISC	254	190	NA		51.4	NA		620
TDS	MISC	4080	6120	NA		5710	NA		4.19
Sulfate	MISC	2560	4270	NA		3860	NA		168
Sulfide	MISC			NA			NA		
pH (SU)	MISC			NA			NA		
Specific Conductance	MISC			NA			NA		

All results reported in mg/L (ppm)
unless otherwise stated.
Only detected results are reported.

NA - Not Analyzed

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1R	GW-85-2R	GW-85-2R	GW-85-5R	GW-85-5R	GW-85-7R	GW-85-7R	GW-88-10B	GW-88-10C
COLLECTION DATE		8/31/90	8/28/90	2/21/91	8/27/90	2/20/91	8/28/90	2/25/91	2/25/91	2/25/91
PARAMETER	TYPE									
Chloromethane	VOC									
Bromomethane	VOC									
Vinyl Chloride	VOC									
Chloroethane	VOC									
Methylene Chloride	VOC		R							
Acetone	VOC		R	R	R			R	R	R
Carbon Disulfide	VOC								R	
1,1-Dichloroethene	VOC									
1,1-Dichloroethane	VOC									
1,2-Dichloroethene (Total)	VOC									
Chloroform	VOC		11							2J
1,2-Dichloroethane	VOC									
2-Butanone	VOC								3 J	
1,1,1-Trichloroethane	VOC									
Carbon Tetrachloride	VOC									
Vinyl Acetate	VOC									
Bromodichloromethane	VOC		5							
1,2-Dichloropropane	VOC									
cis-1,3-Dichloropropene	VOC									
Trichloroethene	VOC									
Dibromochloromethane	VOC									
1,1,2-Trichloroethane	VOC									
Benzene	VOC	2 J			15		6			
trans-1,3-Dichloropropene	VOC									
Bromoform	VOC									
4-Methyl-2-Pentanone	VOC				2 J					3 J
2-Hexanone	VOC									
Tetrachloroethene	VOC								3 J	
1,1,2,2-Tetrachloroethane	VOC				2 J					
Toluene	VOC							1 J	3 J	0.8 J
Chlorobenzene	VOC									
Ethylbenzene	VOC									
Styrene	VOC									
Total Xylenes	VOC								3 J	

All results reported in μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
B - Analyte detected in associated method blank.

R - Compound rejected due to blank contamination.

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-11B	GW-88-11B	GW-88-11C	GW-88-11C	GW-88-12C	GW-88-12C	GW-URS-8I	GW-URS-8I	GW-URS-9I	GW-URS-9I	GW-URS-14I
COLLECTION DATE		8/30/90	2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/29/90	2/21/91	8/27/90	2/20/91	2/25/91
PARAMETER	TYPE											
Chloromethane	VOC											
Bromomethane	VOC											
Vinyl Chloride	VOC											
Chloroethane	VOC											
Methylene Chloride	VOC				R				R			
Acetone	VOC		R		R			R	R	R	R	
Carbon Disulfide	VOC		R									
1,1-Dichloroethene	VOC											
1,1-Dichloroethane	VOC	10	8	6	6							
1,2-Dichloroethene (Total)	VOC	110	65	2 J	5							
Chloroform	VOC											
1,2-Dichloroethane	VOC											
2-Butanone	VOC											
1,1,1-Trichloroethane	VOC	7	5									
Carbon Tetrachloride	VOC											
Vinyl Acetate	VOC											
Bromodichloromethane	VOC											
1,2-Dichloropropane	VOC											
cis-1,3-Dichloropropene	VOC											
Trichloroethene	VOC	29	32	23	25							
Dibromochloromethane	VOC											
1,1,2-Trichloroethane	VOC											
Benzene	VOC	2 J	1 J		2 J				2 J			
trans-1,3-Dichloropropene	VOC											
Bromoform	VOC											
4-Methyl-2-Pentanone	VOC											
2-Hexanone	VOC											
Tetrachloroethene	VOC	130	150	110	110							
1,1,2,2-Tetrachloroethane	VOC											
Toluene	VOC	0.9 J		1 J	2 J				1 J	0.7 J		
Chlorobenzene	VOC											
Ethylbenzene	VOC											
Styrene	VOC											
Total Xylenes	VOC											

All results reported in $\mu g/L$ (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
B - Analyte detected in associated method blank.

R - Compound rejected due to blank contamination.

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1R	GW-85-2R	GW-85-2R	GW-85-5R	GW-85-5R	GW-85-7R	GW-85-7R	GW-88-10B	GW-88-10C
COLLECTION DATE		8/31/90	8/28/90	2/21/91	8/27/90	2/20/91	8/28/90	2/25/91	2/25/91	2/25/91
PARAMETER	TYPE									
Phenol	SEMI			NA		NA		NA	NA	NA
bis(2-Chloroethyl)ether	SEMI			NA		NA		NA	NA	NA
2-Chlorophenol	SEMI			NA		NA		NA	NA	NA
1,3-Dichlorobenzene	SEMI			NA		NA		NA	NA	NA
1,4-Dichlorobenzene	SEMI			NA		NA		NA	NA	NA
Benzyl Alcohol	SEMI			NA		NA		NA	NA	NA
1,2-Dichlorobenzene	SEMI			NA		NA		NA	NA	NA
2-Methylphenol	SEMI			NA		NA		NA	NA	NA
Bis(2-chloroisopropyl)ether	SEMI			NA		NA		NA	NA	NA
4-Methylphenol	SEMI			NA		NA		NA	NA	NA
n-Nitroso-di-n-propylamine	SEMI			NA		NA		NA	NA	NA
Hexachloroethane	SEMI			NA		NA		NA	NA	NA
Nitrobenzene	SEMI			NA		NA		NA	NA	NA
Isophorone	SEMI			NA		NA		NA	NA	NA
2-Nitrophenol	SEMI			NA		NA		NA	NA	NA
2,4-Dimethylphenol	SEMI			NA		NA		NA	NA	NA
Benzoic Acid	SEMI			NA		NA		NA	NA	NA
Bis(2-chloroethoxy)methane	SEMI			NA		NA		NA	NA	NA
2,4-Dichlorophenol	SEMI			NA		NA		NA	NA	NA
1,2,4-Trichlorobenzene	SEMI			NA		NA		NA	NA	NA
Naphthalene	SEMI			NA		NA		NA	NA	NA
4-Chloroaniline	SEMI			NA		NA		NA	NA	NA
Hexachlorobutadiene	SEMI			NA		NA		NA	NA	NA
4-Chloro-3-methylphenol	SEMI			NA		NA		NA	NA	NA
2-Methylnaphthalene	SEMI			NA		NA		NA	NA	NA
Hexachlorocyclopentadiene	SEMI			NA		NA		NA	NA	NA
2,4,6-Trichlorophenol	SEMI			NA		NA		NA	NA	NA
2,4,5-Trichlorophenol	SEMI			NA		NA		NA	NA	NA
2-Chloronaphthalene	SEMI			NA		NA		NA	NA	NA
2-Nitroaniline	SEMI			NA		NA		NA	NA	NA
Dimethylphthalate	SEMI			NA		NA		NA	NA	NA
Acenaphthylene	SEMI			NA		NA		NA	NA	NA
2,6-Dinitrotoluene	SEMI			NA		NA		NA	NA	NA

All results reported in µg/L (ppb).
Only detected results are reported.

NA - Not Analyzed

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-11B	GW-88-11B	GW-88-11C	GW-88-11C	GW-88-12C	GW-88-12C	GW-URS-8I	GW-URS-8I	GW-URS-9I	GW-URS-9I	GW-URS-14I
COLLECTION DATE		8/30/90	2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/29/90	2/21/91	8/27/90	2/20/91	2/25/91
PARAMETER	TYPE											
Phenol	SEMI		NA		NA		NA		NA		NA	NA
bis(2-Chloroethyl)ether	SEMI		NA		NA		NA		NA		NA	NA
2-Chlorophenol	SEMI		NA		NA		NA		NA		NA	NA
1,3-Dichlorobenzene	SEMI		NA		NA		NA		NA		NA	NA
1,4-Dichlorobenzene	SEMI		NA		NA		NA		NA		NA	NA
Benzyl Alcohol	SEMI		NA		NA		NA		NA		NA	NA
1,2-Dichlorobenzene	SEMI		NA		NA		NA		NA		NA	NA
2-Methylphenol	SEMI		NA		NA		NA		NA		NA	NA
Bis(2-chloroisopropyl)ether	SEMI		NA		NA		NA		NA		NA	NA
4-Methylphenol	SEMI		NA		NA		NA		NA		NA	NA
n-Nitroso-di-n-propylamine	SEMI		NA		NA		NA		NA		NA	NA
Hexachloroethane	SEMI		NA		NA		NA		NA		NA	NA
Nitrobenzene	SEMI		NA		NA		NA		NA		NA	NA
Isophorone	SEMI		NA		NA		NA		NA		NA	NA
2-Nitrophenol	SEMI		NA		NA		NA		NA		NA	NA
2,4-Dimethylphenol	SEMI		NA		NA		NA		NA		NA	NA
Benzoic Acid	SEMI		NA		NA		NA		NA		NA	NA
Bis(2-chloroethoxy)methane	SEMI		NA		NA		NA		NA		NA	NA
2,4-Dichlorophenol	SEMI		NA		NA		NA		NA		NA	NA
1,2,4-Trichlorobenzene	SEMI		NA		NA		NA		NA		NA	NA
Naphthalene	SEMI		NA		NA		NA		NA		NA	NA
4-Chloroaniline	SEMI		NA		NA		NA		NA		NA	NA
Hexachlorobutadiene	SEMI		NA		NA		NA		NA		NA	NA
4-Chloro-3-methylphenol	SEMI		NA		NA		NA		NA		NA	NA
2-Methylnaphthalene	SEMI		NA		NA		NA		NA		NA	NA
Hexachlorocyclopentadiene	SEMI		NA		NA		NA		NA		NA	NA
2,4,6-Trichlorophenol	SEMI		NA		NA		NA		NA		NA	NA
2,4,5-Trichlorophenol	SEMI		NA		NA		NA		NA		NA	NA
2-Chloronaphthalene	SEMI		NA		NA		NA		NA		NA	NA
2-Nitroaniline	SEMI		NA		NA		NA		NA		NA	NA
Dimethylphthalate	SEMI		NA		NA		NA		NA		NA	NA
Acenaphthylene	SEMI		NA		NA		NA		NA		NA	NA
2,6-Dinitrotoluene	SEMI		NA		NA		NA		NA		NA	NA

All results reported in µg/L (ppb).
Only detected results are reported.

NA - Not Analyzed

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1R	GW-85-2R	GW-85-2R	GW-85-5R	GW-85-5R	GW-85-7R	GW-85-7R	GW-88-10B	GW-88-10C
COLLECTION DATE		8/31/90	8/28/90	2/21/91	8/27/90	2/20/91	8/28/90	2/25/91	2/25/91	2/25/91
PARAMETER	TYPE									
3-Nitroaniline	SEMI			NA		NA		NA	NA	NA
Acenaphthene	SEMI			NA		NA		NA	NA	NA
2,4-Dinitrophenol	SEMI			NA		NA		NA	NA	NA
4-Nitrophenol	SEMI			NA		NA		NA	NA	NA
Dibenzofuran	SEMI			NA		NA		NA	NA	NA
2,4-Dinitrotoluene	SEMI			NA		NA		NA	NA	NA
Diethylphthalate	SEMI	R		NA		NA		NA	NA	NA
4-Chlorophenyl-phenyl Ether	SEMI			NA		NA		NA	NA	NA
Fluorene	SEMI			NA		NA		NA	NA	NA
4-Nitroaniline	SEMI			NA		NA		NA	NA	NA
4,6-Dinitro-2-methylphenol	SEMI			NA		NA		NA	NA	NA
n-Nitrosodiphenylamine	SEMI			NA		NA		NA	NA	NA
4-Bromophenyl-phenyl Ether	SEMI			NA		NA		NA	NA	NA
Hexachlorobenzene	SEMI			NA		NA		NA	NA	NA
Pentachlorophenol	SEMI			NA		NA		NA	NA	NA
Phenanthrene	SEMI			NA		NA		NA	NA	NA
Anthracene	SEMI			NA		NA		NA	NA	NA
Di-n-butylphthalate	SEMI			NA		NA		NA	NA	NA
Fluoranthene	SEMI			NA		NA		NA	NA	NA
Pyrene	SEMI			NA		NA		NA	NA	NA
Butylbenzylphthalate	SEMI			NA		NA		NA	NA	NA
3,3'-Dichlorobenzidine	SEMI			NA		NA		NA	NA	NA
Benzo(a)anthracene	SEMI			NA		NA		NA	NA	NA
Chrysene	SEMI			NA		NA		NA	NA	NA
bis(2-Ethylhexyl)phthalate	SEMI	R	R	NA		NA		NA	NA	NA
Di-n-octylphthalate	SEMI			NA		NA		NA	NA	NA
Benzo(b)fluoranthene	SEMI			NA		NA		NA	NA	NA
Benzo(k)fluoranthene	SEMI			NA		NA		NA	NA	NA
Benzo(a)pyrene	SEMI			NA		NA		NA	NA	NA
Indeno(1,2,3-cd)pyrene	SEMI			NA		NA		NA	NA	NA
Dibenz(a,h)anthracene	SEMI			NA		NA		NA	NA	NA
Benzo(g,h,i)perylene	SEMI			NA		NA		NA	NA	NA

All results reported in μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
B - Analyte detected in associated method blank.
NA - Not Analyzed

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-11B	GW-88-11B	GW-88-11C	GW-88-11C	GW-88-12C	GW-88-12C	GW-URS-8I	GW-URS-8I	GW-URS-9I	GW-URS-9I	GW-URS-14I
COLLECTION DATE		8/30/90	2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/29/90	2/21/91	8/27/90	2/20/91	2/25/91
PARAMETER	TYPE											
3-Nitroaniline	SEMI		NA		NA		NA		NA		NA	NA
Acenaphthene	SEMI		NA		NA		NA		NA		NA	NA
2,4-Dinitrophenol	SEMI		NA		NA		NA		NA		NA	NA
4-Nitrophenol	SEMI		NA		NA		NA		NA		NA	NA
Dibenzofuran	SEMI		NA		NA		NA		NA		NA	NA
2,4-Dinitrotoluene	SEMI		NA		NA		NA		NA		NA	NA
Diethylphthalate	SEMI		NA	R	NA		NA		NA		NA	NA
4-Chlorophenyl-phenyl Ether	SEMI		NA		NA		NA		NA		NA	NA
Fluorene	SEMI		NA		NA		NA		NA		NA	NA
4-Nitroaniline	SEMI		NA		NA		NA		NA		NA	NA
4,6-Dinitro-2-methylphenol	SEMI		NA		NA		NA		NA		NA	NA
n-Nitrosodiphenylamine	SEMI		NA		NA		NA		NA		NA	NA
4-Bromophenyl-phenyl Ether	SEMI		NA		NA		NA		NA		NA	NA
Hexachlorobenzene	SEMI		NA		NA		NA		NA		NA	NA
Pentachlorophenol	SEMI		NA		NA		NA		NA		NA	NA
Phenanthrene	SEMI		NA		NA		NA		NA		NA	NA
Anthracene	SEMI		NA		NA		NA		NA		NA	NA
Di-n-butylphthalate	SEMI		NA	0.4 J	NA		NA		NA		NA	NA
Fluoranthene	SEMI		NA		NA		NA		NA		NA	NA
Pyrene	SEMI		NA		NA		NA		NA		NA	NA
Butylbenzylphthalate	SEMI		NA		NA		NA		NA		NA	NA
3,3'-Dichlorobenzidine	SEMI		NA		NA		NA		NA		NA	NA
Benzo(a)anthracene	SEMI		NA		NA		NA		NA		NA	NA
Chrysene	SEMI		NA		NA		NA		NA		NA	NA
bis(2-Ethylhexyl)phthalate	SEMI		NA	R	NA	R	NA		NA	R	NA	NA
Di-n-octylphthalate	SEMI		NA		NA		NA		NA		NA	NA
Benzo(b)fluoranthene	SEMI		NA		NA		NA		NA		NA	NA
Benzo(k)fluoranthene	SEMI		NA		NA		NA		NA		NA	NA
Benzo(a)pyrene	SEMI		NA		NA		NA		NA		NA	NA
Indeno(1,2,3-cd)pyrene	SEMI		NA		NA		NA		NA		NA	NA
Dibenz(a,h)anthracene	SEMI		NA		NA		NA		NA		NA	NA
Benzo(g,h,i)perylene	SEMI		NA		NA		NA		NA		NA	NA

All results reported in μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
B - Analyte detected in associated method blank.
NA - Not Analyzed

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1R	GW-85-2R	GW-85-2R	GW-85-5R	GW-85-5R	GW-85-7R	GW-85-7R	GW-88-10B	GW-88-10C
COLLECTION DATE		8/31/90	8/28/90	2/21/91	8/27/90	2/20/91	8/28/90	2/25/91	2/25/91	2/25/91
PARAMETER	TYPE									
alpha-BHC	PST			NA		NA		NA	NA	NA
beta-BHC	PST			NA		NA		NA	NA	NA
delta-BHC	PST			NA		NA		NA	NA	NA
gamma-BHC (Lindane)	PST			NA		NA		NA	NA	NA
Heptachlor	PST			NA		NA		NA	NA	NA
Aldrin	PST			NA		NA		NA	NA	NA
Heptachlor Epoxide	PST			NA		NA		NA	NA	NA
Endosulfan I	PST			NA		NA		NA	NA	NA
Dieldrin	PST			NA		NA		NA	NA	NA
4,4'-DDE	PST			NA		NA		NA	NA	NA
Endrin	PST			NA		NA		NA	NA	NA
Endosulfan II	PST			NA		NA		NA	NA	NA
4,4'-DDD	PST			NA		NA		NA	NA	NA
Endosulfan Sulfate	PST			NA		NA		NA	NA	NA
4,4'-DDT	PST			NA		NA		NA	NA	NA
Methoxychlor	PST			NA		NA		NA	NA	NA
Endrin Ketone	PST			NA		NA		NA	NA	NA
alpha-Chlordane	PST			NA		NA		NA	NA	NA
gamma-Chlordane	PST			NA		NA		NA	NA	NA
Toxaphene	PST			NA		NA		NA	NA	NA
Aroclor-1016	PCB			NA		NA		NA	NA	NA
Aroclor-1221	PCB			NA		NA		NA	NA	NA
Aroclor-1232	PCB			NA		NA		NA	NA	NA
Aroclor-1242	PCB			NA		NA		NA	NA	NA
Aroclor-1248	PCB			NA		NA		NA	NA	NA
Aroclor-1254	PCB			NA		NA		NA	NA	NA
Aroclor-1260	PCB			NA		NA		NA	NA	NA

All results reported in μg/L (ppb).
Only detected results are reported.

NA - Not Analyzed

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-11B	GW-88-11B	GW-88-11C	GW-88-11C	GW-88-12C	GW-88-12C	GW-URS-8I	GW-URS-8I	GW-URS-9I	GW-URS-9I	GW-URS-14I
COLLECTION DATE		8/30/90	2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/29/90	2/21/91	8/27/90	2/20/91	2/25/91
PARAMETER	TYPE											
alpha-BHC	PST		NA		NA		NA		NA		NA	NA
beta-BHC	PST		NA		NA		NA		NA		NA	NA
delta-BHC	PST		NA		NA		NA		NA		NA	NA
gamma-BHC (Lindane)	PST		NA		NA		NA		NA		NA	NA
Heptachlor	PST		NA		NA		NA		NA		NA	NA
Aldrin	PST		NA		NA		NA		NA		NA	NA
Heptachlor Epoxide	PST		NA		NA		NA		NA		NA	NA
Endosulfan I	PST		NA		NA		NA		NA		NA	NA
Dieldrin	PST		NA		NA		NA		NA		NA	NA
4,4'-DDE	PST		NA		NA		NA		NA		NA	NA
Endrin	PST		NA		NA		NA		NA		NA	NA
Endosulfan II	PST		NA		NA		NA		NA		NA	NA
4,4'-DDD	PST		NA		NA		NA		NA		NA	NA
Endosulfan Sulfate	PST		NA		NA		NA		NA		NA	NA
4,4'-DDT	PST		NA		NA		NA		NA		NA	NA
Methoxychlor	PST		NA		NA		NA		NA		NA	NA
Endrin Ketone	PST		NA		NA		NA		NA		NA	NA
alpha-Chlordane	PST		NA		NA		NA		NA		NA	NA
gamma-Chlordane	PST		NA		NA		NA		NA		NA	NA
Toxaphene	PST		NA		NA		NA		NA		NA	NA
Aroclor-1016	PCB		NA		NA		NA		NA		NA	NA
Aroclor-1221	PCB		NA		NA		NA		NA		NA	NA
Aroclor-1232	PCB		NA		NA		NA		NA		NA	NA
Aroclor-1242	PCB		NA		NA		NA		NA		NA	NA
Aroclor-1248	PCB		NA		NA		NA		NA		NA	NA
Aroclor-1254	PCB		NA		NA		NA		NA		NA	NA
Aroclor-1260	PCB		NA		NA		NA		NA		NA	NA

All results reported in µg/L (ppb).
Only detected results are reported.

NA - Not Analyzed

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1R	GW-85-2R	GW-85-2R	GW-85-5R	GW-85-5R	GW-85-7R	GW-85-7R	GW-88-10B	GW-88-10C
COLLECTION DATE		8/31/90	8/28/90	2/21/91	8/27/90	2/20/91	8/28/90	2/25/91	2/25/91	2/25/91
PARAMETER	TYPE									
Aluminum	MCP	156 B N		131 B	214	37.8 B	277	265	26,700	235
Antimony	MCP		27.4 B			42.4 B	28.3 B		48.8 B	27.8 B
Arsenic	MCP	1.5 B N			1 B W		1.4 B	1.7 B	7.2 BS	13.2 BS
Barium	MCP	94.8 B	69.5 B	103 B	73.5 B	23.4 BE	91 B	143 B	218	22 B
Beryllium	MCP								3.0 B	
Cadmium	MCP	1.3 B	1.8 B							
Calcium	MCP	182,000	59,900	81,200 E	355,000	378,000	354,000	298,000 E	294,000 E	93,600 E
Chromium	MCP	4.2 B			7.5 B				85.9 E	274 E
Cobalt	MCP								16.1 B	
Copper	MCP		4.6 B	41.5 *					65.5 *	
Iron	MCP	538	800	1180	669	915	586	820	37,300	1700
Lead	MCP			1.5 B		1.2 B		2.6 B	31.7	1.1 B
Magnesium	MCP	48,500	4460 B	25,600 E	106,000	170,000	119,000	42,600 E	247,000 E	102,000 E
Manganese	MCP	12.9 B	7.3 B	10.2 B	40	57.5 E	40.5	31.5	1140	50.8
Mercury	MCP									
Nickel	MCP	33.4 B	6.2 B		48.1		7.4 B		72.2	69.8
Potassium	MCP	7380	6480	7200 E	60,700	6280	5540	5770 E	10,300 E	2910 BE
Selenium	MCP			1.3 BWN						
Silver	MCP									
Sodium	MCP	39,800	48,500	28,600	132,000	120,000	67,900	38,900	141,000	64,000
Thallium	MCP									
Vanadium	MCP	26.4 B	33 B		4 B				46.7 B	3.1 B
Zinc	MCP	201	26.4	27.6	12.9 B	17.6 B		21.5	144	16.6 B
Cyanide	MCP									
Phenols (mg/L)	MCP	0.011	0.011				0.01			

All results reported in μg/L (ppb) unless otherwise stated.
Only detected results are reported.

N - Spike sample % recovery out of control limits.
B - Less than quantitation limit but greater than or equal to instrument detection limit.
W - Post-digestion spike is out of control limits.

E - Value is estimated due to interference.
* - Duplicate analysis not within control limits.
S - The reported value was determined by the Methods of Standard Additions (MSA).

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-11B	GW-88-11B	GW-88-11C	GW-88-11C	GW-88-12C	GW-88-12C	GW-URS-8I	GW-URS-8I	GW-URS-9I	GW-URS-9I	GW-URS-14I
COLLECTION DATE		8/30/90	2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/29/90	2/21/91	8/27/90	2/20/91	2/25/91
PARAMETER	TYPE											
Aluminum	MCP	631 N	1960	3660	264	481	187 B		124 B	221	197 B	7140
Antimony	MCP	20.6 B	60.1	45.4 B	31 B	19.2 B	28 B	39.3 B	46.8 B			
Arsenic	MCP	1.2 BNW	2.0 BW	4.2 BW	3.8 B	10	12.3 BS		1.7 BW	1.7 B		7.2 BW
Barium	MCP	13.9 B	44 B	45.8 B	15.7 B	11.4 B	17.3 B	9.3 B	17.6 B	30.1 B	22.8 BE	115 B
Beryllium	MCP								1.9 B			1.2 B
Cadmium	MCP											
Calcium	MCP	326,000	392,000 E	207,000	182,000 E	62,600	68,500 E	334,000	359,000 E	106,000	143,000	73,900 E
Chromium	MCP		17.4 E	36		21	4.6 B		606 E	8.6 B	10.1	30.9 E
Cobalt	MCP							2.4 B	7.0 B			5.8 B
Copper	MCP		17.1 B*	13.3 B		4.2 B				12.7 B		18.5 B*
Iron	MCP	742	2600	5330	432	1530	1040	2230	46,600	1020	1170	10,400
Lead	MCP	1.2 B	3.3 B	7.2	1.6 B	1.5 B	1.2 BW	2.4 B	2.0 B		1.0 B	7.5
Magnesium	MCP	230,000	293,000 E	95,800	92,400 E	88,500	103,000 E	129,000	138,000 E	54,500	71,300	32,800 E
Manganese	MCP	201	313	347	140	45.4	37.8	115	144	67.5	80 E	484
Mercury	MCP											
Nickel	MCP	13.2 B	28 B	25.1 B		14.6 B		131	635	7.6 B		30.4 B
Potassium	MCP	4610 B	5690 E	4340 B	3660 BE	2520 B	3200 BE	4190 B	4730 BE	3910 B	4250 B	17,100 E
Selenium	MCP											
Silver	MCP											
Sodium	MCP	213,000	256,000	88,600	97,500	34,600	41,100	89,600	96,100	34,500	54,000	44,700
Thallium	MCP											
Vanadium	MCP	140	14.8 B	59.6		22.1 B	10 B	58.6	2.0 B		9.6 B	16.1 B
Zinc	MCP	12.5 B	18.5 B	44.8	14.7 B	10.1 B	15.7 B	18.9 B	23.3	19.3 B	34.6	52.3
Cyanide	MCP								12.6			
Phenols (mg/L)	MCP											

All results reported in µg/L (ppb) unless otherwise stated.
Only detected results are reported.

B - Less than quantitation limit but greater than or equal to instrument detection limit.
W - Post-digestion spike is out of control limits.
* - Duplicate analysis not within control limits.

E - Value estimated due to interference.
N - Spike sample % recovery out of control limits.
S - The reported value was determined by the Methods of Standard Additions (MSA).

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-85-1R	GW-85-2R	GW-85-2R	GW-85-5R	GW-85-5R	GW-85-7R	GW-85-7R	GW-88-10B	GW-88-10C
COLLECTION DATE		8/31/90	8/28/90	2/21/91	8/27/90	2/20/91	8/28/90	2/25/91	2/25/91	2/25/91
PARAMETER	TYPE									
Bicarbonate, as CaCO3	MISC	15	251	NA	121	NA	174	NA	NA	NA
BOD	MISC	21	2	NA	5	NA	6	NA	NA	NA
COD	MISC			NA		NA		NA	NA	NA
Chloride	MISC	30.2	4.95	NA	109	NA	105	NA	NA	NA
Hardness, as CaCO3	MISC	668	365	NA	1600	NA	1700	NA	NA	NA
Ammonia, as N	MISC	0.205	0.18	NA	0.57	NA	0.41	NA	NA	NA
Total Kjeldahl Nitrogen, as N	MISC	0.68	1.56	NA	2.97	NA	2.03	NA	NA	NA
Alkalinity, as CaCO3	MISC	16.6	253	NA	121	NA	174	NA	NA	NA
Acidity, as CaCO3	MISC		30.5	NA	44.9	NA	63	NA	NA	NA
Nitrate-Nitrogen	MISC			NA		NA		NA	NA	NA
Phosphate	MISC			NA		NA		NA	NA	NA
Oil and Grease	MISC	2	10.1	NA	4.3	NA	6.08	NA	NA	NA
TOC	MISC	2.42	6.3	NA	1.11	NA	5.04	NA	NA	NA
TSS	MISC	98.4	34.9	NA	57.3	NA	24.3	NA	NA	NA
TDS	MISC	1060	487	NA	2550	NA	2320	NA	NA	NA
Sulfate	MISC	663	179	NA	1500	NA	1380	NA	NA	NA
Sulfide	MISC			NA		NA	2.5	NA	NA	NA
pH (SU)	MISC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Specific Conductance	MISC	NA	NA	NA	NA		NA	NA	NA	NA

All results reported in mg/L (ppm) unless otherwise stated.
Only detected results are reported.

NA - Not Analyzed

TABLE A-6: INTERMEDIATE GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-11B	GW-88-11B	GW-88-11C	GW-88-11C	GW-88-12C	GW-88-12C	GW-URS-8I	GW-URS-8I	GW-URS-9I	GW-URS-9I	GW-URS-14I
COLLECTION DATE		8/30/90	2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/29/90	2/21/91	8/27/90	2/20/91	2/25/91
PARAMETER	TYPE											
Bicarbonate, as CaCO3	MISC	NA	NA	43.5	NA	310	NA	230	NA	190	NA	NA
BOD	MISC	NA	NA	5	NA	3	NA		NA	24	NA	NA
COD	MISC	NA	NA	37.4	NA	12.1	NA		NA	28.5	NA	NA
Chloride	MISC	NA	NA	67.1	NA	5.37	NA	138	NA	18.5	NA	NA
Hardness, as CaCO3	MISC	NA	NA	881	NA	561	NA	1480	NA	640	NA	NA
Ammonia, as N	MISC	NA	NA	0.15	NA	0.21	NA	0.43	NA	0.17	NA	NA
Total Kjeldahl Nitrogen, as N	MISC	NA	NA	0.75	NA	0.299	NA	1.17	NA	0.907	NA	NA
Alkalinity, as CaCO3	MISC	NA	NA	43.6	NA	311	NA	230	NA	190	NA	NA
Acidity, as CaCO3	MISC	NA	NA	15.2	NA	57.8	NA	78.2	NA	44.9	NA	NA
Nitrate-Nitrogen	MISC	NA	NA		NA		NA		NA		NA	NA
Phosphate	MISC	NA	NA		NA		NA	0.15	NA		NA	NA
Oil and Grease	MISC	NA	NA	2.6	NA	4.1	NA	5.24	NA	4.8	NA	NA
TOC	MISC	NA	NA	50.2	NA	11	NA	2.97	NA	1.4	NA	NA
TSS	MISC	NA	NA	4.5	NA	612	NA	36.5	NA	517	NA	NA
TDS	MISC	NA	NA	1540	NA	820	NA	2270	NA	1060	NA	NA
Sulfate	MISC	NA	NA	911	NA	421	NA	1320	NA	573	NA	NA
Sulfide	MISC	NA	NA		NA		NA		NA		NA	NA
pH (SU)	MISC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Specific Conductance	MISC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

All results reported in mg/L (ppm)
unless otherwise stated.
Only detected results are reported.

NA - Not Analyzed

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-10D	GW-88-11D	GW-88-11D	GW-88-12D	GW-88-12D	GW-URS-2D	GW-URS-2D
COLLECTION DATE		2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/28/90	2/21/91
PARAMETER	TYPE							
Chloromethane	VOC							
Bromomethane	VOC							
Vinyl Chloride	VOC							
Chloroethane	VOC						R	
Methylene Chloride	VOC						R	R
Acetone	VOC	R		R		6		
Carbon Disulfide	VOC			12				
1,1-Dichloroethene	VOC							
1,1-Dichloroethane	VOC					2 J		
1,2-Dichloroethene (Total)	VOC	11						
Chloroform	VOC	8						
1,2-Dichloroethane	VOC							
2-Butanone	VOC							
1,1,1-Trichloroethane	VOC							
Carbon Tetrachloride	VOC							
Vinyl Acetate	VOC							
Bromodichloromethane	VOC							
1,2-Dichloropropane	VOC							
cis-1,3-Dichloropropene	VOC							
Trichloroethene	VOC	49	4 J	7		6		
Dibromochloromethane	VOC							
1,1,2-Trichloroethane	VOC							
Benzene	VOC	12		2 J	1 J	0.9 J	4 J	
trans-1,3-Dichloropropene	VOC							
Bromoform	VOC							
4-Methyl-2-Pentanone	VOC							
2-Hexanone	VOC							
Tetrachloroethene	VOC	2 J	14	28				
1,1,2,2-Tetrachloroethane	VOC							
Toluene	VOC	2 J		1 J	R	13	R	
Chlorobenzene	VOC							
Ethylbenzene	VOC							
Styrene	VOC			2 J				
Total Xylenes	VOC							

All results reported in µg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
B - Analyte detected in associated method blank.
R - Compound rejected due to blank contamination.

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-URS-5D	GW-URS-5D	GW-URS-7D	GW-URS-7D	GW-URS-9D	GW-URS-9D	GW-URS-14D
COLLECTION DATE		8/27/90	2/21/91	8/28/90	2/25/91	8/27/90	2/20/91	2/20/91
PARAMETER	TYPE							
Chloromethane	VOC							
Bromomethane	VOC							
Vinyl Chloride	VOC							
Chloroethane	VOC							
Methylene Chloride	VOC		R					R
Acetone	VOC	250	R	120	R	R	R	
Carbon Disulfide	VOC			0.5 J				
1,1-Dichloroethene	VOC							
1,1-Dichloroethane	VOC							
1,2-Dichloroethene (Total)	VOC							
Chloroform	VOC					8		
1,2-Dichloroethane	VOC							
2-Butanone	VOC		R				6 J	
1,1,1-Trichloroethane	VOC							
Carbon Tetrachloride	VOC							
Vinyl Acetate	VOC							
Bromodichloromethane	VOC					4 J		
1,2-Dichloropropane	VOC							
cis-1,3-Dichloropropene	VOC							
Trichloroethene	VOC							
Dibromochloromethane	VOC					1 J		
1,1,2-Trichloroethane	VOC							
Benzene	VOC							
trans-1,3-Dichloropropene	VOC							
Bromoform	VOC							
4-Methyl-2-Pentanone	VOC							
2-Hexanone	VOC							
Tetrachloroethene	VOC							
1,1,2,2-Tetrachloroethane	VOC							
Toluene	VOC		1 J			0.6 J		
Chlorobenzene	VOC							
Ethylbenzene	VOC							
Styrene	VOC							
Total Xylenes	VOC		0.5 J					

All results reported in μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.
B - Analyte detected in associated method blank.
R - Compound rejected due to blank contamination.

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-10D	GW-88-11D	GW-88-11D	GW-88-12D	GW-88-12D	GW-URS-2D	GW-URS-2D
COLLECTION DATE		2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/28/90	2/21/91
PARAMETER	TYPE							
Phenol	SEMI	NA		NA		NA		NA
bis(2-Chloroethyl)ether	SEMI	NA		NA		NA		NA
2-Chlorophenol	SEMI	NA		NA		NA		NA
1,3-Dichlorobenzene	SEMI	NA		NA		NA		NA
1,4-Dichlorobenzene	SEMI	NA		NA		NA		NA
Benzyl Alcohol	SEMI	NA		NA		NA		NA
1,2-Dichlorobenzene	SEMI	NA		NA		NA		NA
2-Methylphenol	SEMI	NA		NA		NA		NA
Bis(2-chloroisopropyl)ether	SEMI	NA		NA		NA		NA
4-Methylphenol	SEMI	NA		NA		NA		NA
n-Nitroso-di-n-propylamine	SEMI	NA		NA		NA		NA
Hexachloroethane	SEMI	NA		NA		NA		NA
Nitrobenzene	SEMI	NA		NA		NA		NA
Isophorone	SEMI	NA		NA		NA		NA
2-Nitrophenol	SEMI	NA		NA		NA		NA
2,4-Dimethylphenol	SEMI	NA		NA		NA		NA
Benzoic Acid	SEMI	NA		NA		NA		NA
Bis(2-chloroethoxy)methane	SEMI	NA		NA		NA		NA
2,4-Dichlorophenol	SEMI	NA		NA		NA		NA
1,2,4-Trichlorobenzene	SEMI	NA		NA		NA		NA
Naphthalene	SEMI	NA		NA		NA		NA
4-Chloroaniline	SEMI	NA		NA		NA		NA
Hexachlorobutadiene	SEMI	NA		NA		NA		NA
4-Chloro-3-methylphenol	SEMI	NA		NA		NA		NA
2-Methylnaphthalene	SEMI	NA		NA		NA		NA
Hexachlorocyclopentadiene	SEMI	NA		NA		NA		NA
2,4,6-Trichlorophenol	SEMI	NA		NA		NA		NA
2,4,5-Trichlorophenol	SEMI	NA		NA		NA		NA
2-Chloronaphthalene	SEMI	NA		NA		NA		NA
2-Nitroaniline	SEMI	NA		NA		NA		NA
Dimethylphthalate	SEMI	NA		NA		NA		NA
Acenaphthylene	SEMI	NA		NA		NA		NA
2,6-Dinitrotoluene	SEMI	NA		NA		NA		NA

All results reported in µg/L (ppb).
Only detected results are reported.

NA - Not analyzed

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-URS-5D	GW-URS-5D	GW-URS-7D	GW-URS-7D	GW-URS-9D	GW-URS-9D	GW-URS-14D
COLLECTION DATE		8/27/90	2/21/91	8/28/90	2/25/91	8/27/90	2/20/91	2/20/91
PARAMETER	TYPE							
Phenol	SEMI		NA		NA		NA	
bis(2-Chloroethyl)ether	SEMI		NA		NA		NA	
2-Chlorophenol	SEMI		NA		NA		NA	
1,3-Dichlorobenzene	SEMI		NA		NA		NA	
1,4-Dichlorobenzene	SEMI		NA		NA		NA	
Benzyl Alcohol	SEMI		NA		NA		NA	
1,2-Dichlorobenzene	SEMI		NA		NA		NA	
2-Methylphenol	SEMI		NA		NA		NA	
Bis(2-chloroisopropyl)ether	SEMI		NA		NA		NA	
4-Methylphenol	SEMI		NA		NA		NA	
n-Nitroso-di-n-propylamine	SEMI		NA		NA		NA	
Hexachloroethane	SEMI		NA		NA		NA	
Nitrobenzene	SEMI		NA		NA		NA	
Isophorone	SEMI		NA		NA		NA	
2-Nitrophenol	SEMI		NA		NA		NA	
2,4-Dimethylphenol	SEMI		NA		NA		NA	
Benzoic Acid	SEMI		NA		NA		NA	
Bis(2-chloroethoxy)methane	SEMI		NA		NA		NA	
2,4-Dichlorophenol	SEMI		NA		NA		NA	
1,2,4-Trichlorobenzene	SEMI		NA		NA		NA	
Naphthalene	SEMI		NA		NA		NA	
4-Chloroaniline	SEMI		NA		NA		NA	
Hexachlorobutadiene	SEMI		NA		NA		NA	
4-Chloro-3-methylphenol	SEMI		NA		NA		NA	
2-Methylnaphthalene	SEMI		NA		NA		NA	
Hexachlorocyclopentadiene	SEMI		NA		NA		NA	
2,4,6-Trichlorophenol	SEMI		NA		NA		NA	
2,4,5-Trichlorophenol	SEMI		NA		NA		NA	
2-Chloronaphthalene	SEMI		NA		NA		NA	
2-Nitroaniline	SEMI		NA		NA		NA	
Dimethylphthalate	SEMI		NA		NA		NA	
Acenaphthylene	SEMI		NA		NA		NA	
2,6-Dinitrotoluene	SEMI		NA		NA		NA	

All results reported in µg/L (ppb).
Only detected results are reported.

NA - Not analyzed.

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-10D	GW-88-11D	GW-88-11D	GW-88-12D	GW-88-12D	GW-URS-2D	GW-URS-2D
COLLECTION DATE		2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/28/90	2/21/91
PARAMETER	TYPE							
3-Nitroaniline	SEMI	NA		NA		NA		NA
Acenaphthene	SEMI	NA		NA		NA		NA
2,4-Dinitrophenol	SEMI	NA		NA		NA		NA
4-Nitrophenol	SEMI	NA		NA		NA		NA
Dibenzofuran	SEMI	NA		NA		NA		NA
2,4-Dinitrotoluene	SEMI	NA		NA		NA		NA
Diethylphthalate	SEMI	NA	0.5 J B	NA		NA		NA
4-Chlorophenyl-phenyl Ether	SEMI	NA		NA		NA		NA
Fluorene	SEMI	NA		NA		NA		NA
4-Nitroaniline	SEMI	NA		NA		NA		NA
4,6-Dinitro-2-methylphenol	SEMI	NA		NA		NA		NA
n-Nitrosodiphenylamine	SEMI	NA		NA		NA		NA
4-Bromophenyl-phenyl Ether	SEMI	NA		NA		NA		NA
Hexachlorobenzene	SEMI	NA		NA		NA		NA
Pentachlorophenol	SEMI	NA		NA		NA		NA
Phenanthrene	SEMI	NA		NA		NA		NA
Anthracene	SEMI	NA		NA		NA		NA
Di-n-butylphthalate	SEMI	NA		NA		NA		NA
Fluoranthene	SEMI	NA		NA		NA		NA
Pyrene	SEMI	NA		NA		NA		NA
Butylbenzylphthalate	SEMI	NA		NA		NA		NA
3,3'-Dichlorobenzidine	SEMI	NA		NA		NA		NA
Benzo(a)anthracene	SEMI	NA		NA		NA		NA
Chrysene	SEMI	NA		NA		NA		NA
bis(2-Ethylhexyl)phthalate	SEMI	NA	8 J B	NA		NA	6 J	NA
Di-n-octylphthalate	SEMI	NA	1 J	NA	5 J	NA		NA
Benzo(b)fluoranthene	SEMI	NA		NA		NA		NA
Benzo(k)fluoranthene	SEMI	NA		NA		NA		NA
Benzo(a)pyrene	SEMI	NA		NA		NA		NA
Indeno(1,2,3-cd)pyrene	SEMI	NA		NA		NA		NA
Dibenz(a,h)anthracene	SEMI	NA		NA		NA		NA
Benzo(g,h,i)perylene	SEMI	NA		NA		NA		NA

All results reported in μg/L (ppb).
Only detected results are reported.

NA - Not analyzed

J - Indicates the result is less than the sample quantitation limit but greater than zero.
B - Analyte detected in associated method blank.

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-URS-5D	GW-URS-5D	GW-URS-7D	GW-URS-7D	GW-URS-9D	GW-URS-9D	GW-URS-14D
COLLECTION DATE		8/27/90	2/21/91	8/28/90	2/25/91	8/27/90	2/20/91	2/20/91
PARAMETER	TYPE							
3-Nitroaniline	SEMI		NA		NA		NA	
Acenaphthene	SEMI		NA		NA		NA	
2,4-Dinitrophenol	SEMI		NA		NA		NA	
4-Nitrophenol	SEMI		NA		NA		NA	
Dibenzofuran	SEMI		NA		NA		NA	
2,4-Dinitrotoluene	SEMI		NA		NA		NA	
Diethylphthalate	SEMI		NA		NA		NA	
4-Chlorophenyl-phenyl Ether	SEMI		NA		NA		NA	
Fluorene	SEMI		NA		NA		NA	
4-Nitroaniline	SEMI		NA		NA		NA	
4,6-Dinitro-2-methylphenol	SEMI		NA		NA		NA	
n-Nitrosodiphenylamine	SEMI		NA		NA		NA	
4-Bromophenyl-phenyl Ether	SEMI		NA		NA		NA	
Hexachlorobenzene	SEMI		NA		NA		NA	
Pentachlorophenol	SEMI		NA		NA		NA	
Phenanthrene	SEMI		NA		NA		NA	
Anthracene	SEMI		NA		NA		NA	
Di-n-butylphthalate	SEMI		NA		NA		NA	
Fluoranthene	SEMI		NA		NA		NA	
Pyrene	SEMI		NA		NA		NA	
Butylbenzylphthalate	SEMI		NA		NA		NA	
3,3'-Dichlorobenzidine	SEMI		NA		NA		NA	
Benzo(a)anthracene	SEMI		NA		NA		NA	
Chrysene	SEMI		NA		NA		NA	
bis(2-Ethylhexyl)phthalate	SEMI	3 J	NA		NA		NA	R
Di-n-octylphthalate	SEMI		NA		NA		NA	5 J
Benzo(b)fluoranthene	SEMI		NA		NA		NA	
Benzo(k)fluoranthene	SEMI		NA		NA		NA	
Benzo(a)pyrene	SEMI		NA		NA		NA	
Indeno(1,2,3-cd)pyrene	SEMI		NA		NA		NA	
Dibenz(a,h)anthracene	SEMI		NA		NA		NA	
Benzo(g,h,i)perylene	SEMI		NA		NA		NA	

All results reported in μg/L (ppb).
Only detected results are reported.

J - Indicates the result is less than the sample quantitation limit but greater than zero.

NA - Not analyzed
R - Compound rejected due to blank contamina

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-10D	GW-88-11D	GW-88-11D	GW-88-12D	GW-88-12D	GW-URS-2D	GW-URS-2D
COLLECTION DATE		2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/28/90	2/21/91
PARAMETER	TYPE							
alpha-BHC	PST	NA		NA		NA		NA
beta-BHC	PST	NA		NA		NA		NA
delta-BHC	PST	NA		NA		NA		NA
gamma-BHC (Lindane)	PST	NA		NA		NA		NA
Heptachlor	PST	NA		NA		NA		NA
Aldrin	PST	NA		NA		NA		NA
Heptachlor Epoxide	PST	NA		NA		NA		NA
Endosulfan I	PST	NA		NA		NA		NA
Dieldrin	PST	NA		NA		NA		NA
4,4'-DDE	PST	NA		NA		NA		NA
Endrin	PST	NA		NA		NA		NA
Endosulfan II	PST	NA		NA		NA		NA
4,4'-DDD	PST	NA		NA		NA		NA
Endosulfan Sulfate	PST	NA		NA		NA		NA
4,4'-DDT	PST	NA		NA		NA		NA
Methoxychlor	PST	NA		NA		NA		NA
Endrin Ketone	PST	NA		NA		NA		NA
alpha-Chlordane	PST	NA		NA		NA		NA
gamma-Chlordane	PST	NA		NA		NA		NA
Toxaphene	PST	NA		NA		NA		NA
Aroclor-1016	PCB	NA		NA		NA		NA
Aroclor-1221	PCB	NA		NA		NA		NA
Aroclor-1232	PCB	NA		NA		NA		NA
Aroclor-1242	PCB	NA		NA		NA		NA
Aroclor-1248	PCB	NA		NA		NA		NA
Aroclor-1254	PCB	NA		NA		NA		NA
Aroclor-1260	PCB	NA		NA		NA		NA

All results reported in µg/L (ppb).
Only detected results are reported.

NA - Not Analyzed

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-URS-5D	GW-URS-5D	GW-URS-7D	GW-URS-7D	GW-URS-9D	GW-URS-9D	GW-URS-14D
COLLECTION DATE		8/27/90	2/21/91	8/28/90	2/25/91	8/27/90	2/20/91	2/20/91
PARAMETER	TYPE							
alpha-BHC	PST		NA		NA		NA	
beta-BHC	PST		NA		NA		NA	
delta-BHC	PST		NA		NA		NA	
gamma-BHC (Lindane)	PST		NA		NA		NA	
Heptachlor	PST		NA		NA		NA	
Aldrin	PST		NA		NA		NA	
Heptachlor Epoxide	PST		NA		NA		NA	
Endosulfan I	PST		NA		NA		NA	
Dieldrin	PST		NA		NA		NA	
4,4'-DDE	PST		NA		NA		NA	
Endrin	PST		NA		NA		NA	
Endosulfan II	PST		NA		NA		NA	
4,4'-DDD	PST		NA		NA		NA	
Endosulfan Sulfate	PST		NA		NA		NA	
4,4'-DDT	PST		NA		NA		NA	
Methoxychlor	PST		NA		NA		NA	
Endrin Ketone	PST		NA		NA		NA	
alpha-Chlordane	PST		NA		NA		NA	
gamma-Chlordane	PST		NA		NA		NA	
Toxaphene	PST		NA		NA		NA	
Aroclor-1016	PCB		NA		NA		NA	
Aroclor-1221	PCB		NA		NA		NA	
Aroclor-1232	PCB		NA		NA		NA	
Aroclor-1242	PCB		NA		NA		NA	
Aroclor-1248	PCB		NA		NA		NA	
Aroclor-1254	PCB		NA		NA		NA	
Aroclor-1260	PCB		NA		NA		NA	

All results reported in $\mu g/L$ (ppb).
Only detected results are reported.

NA - Not Analyzed

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-10D	GW-88-11D	GW-88-11D	GW-88-12D	GW-88-12D	GW-URS-2D	GW-URS-2D
COLLECTION DATE		2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/28/90	2/21/91
PARAMETER	TYPE							
Aluminum	MCP	611	508	81.1 B		172 B	235	132 B
Antimony	MCP	36.9 B	28.2 B	28.1 B	50.7 B	56.1 B		
Arsenic	MCP	1.1 BW		1.0 B		1.3 BW		1.0 B
Barium	MCP	12.6 B	9.3 B	10.5 B	2.9 B	7.9 B	33.7 B	77 B
Beryllium	MCP							
Cadmium	MCP							
Calcium	MCP	288,000 E	248,000	268,000 E	464,000	623,000 E	56,400	50,100 E
Chromium	MCP	36.9 E		5.8 BE	7.6 B	27.8 E	10.4	7.3 BE
Cobalt	MCP							
Copper	MCP						11.2 B	
Iron	MCP	1380	748	230	168	250	441	218
Lead	MCP	2.7 B	2.4 B			1.8 BW	1.9 B	1.1 B
Magnesium	MCP	99,500 E	82,600	95,100 E	109,000	199,000 E	23,800	3140 BE
Manganese	MCP	62.4	32.6	19.6	33.9	696	17.8	4.7 B
Mercury	MCP							
Nickel	MCP	43.4	12.4 B		11.5 B	25.5 B	7.6 B	
Potassium	MCP	3950 BE	3540 B	3310 BE	5310	12,000 E	5080	8860 E
Selenium	MCP							
Silver	MCP							
Sodium	MCP	46,300	32,500	32,000	66,400	474,000	28,400	87,500
Thallium	MCP							
Vanadium	MCP		23.9 B		51.6	2.4 B	20.7 B	
Zinc	MCP	22.1	24.5	9.8 B	7.9 B		10.3 B	26.2
Cyanide	MCP							
Phenols (mg/L)	MCP	0.032		0.026	0.006	0.02		

All results reported in µg/L (ppb) unless otherwise stated.

Only detected results are reported.

B - Less than quantitation limit but greater than or equal to instrument detection limit.

W - Post-digestion spike is out of control limits.

E - Value is estimated due to interference

NA - Not analyzed

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-URS-5D	GW-URS-5D	GW-URS-7D	GW-URS-7D	GW-URS-9D	GW-URS-9D	GW-URS-14D
COLLECTION DATE		8/27/90	2/21/91	8/28/90	2/25/91	8/27/90	2/20/91	2/20/91
PARAMETER	TYPE							
Aluminum	MCP			167 B	52.5 B	128 B	64.2	99.8 B
Antimony	MCP		31.5 B	20.5 B	36.3 B		28 B	32.1 B
Arsenic	MCP	1.3 B W	1.0 BW			1.6 B		2.0 B
Barium	MCP	224	71.1 B	20.3 B	47.2 B	110 B	38.2 BE	25.5 BE
Beryllium	MCP							
Cadmium	MCP							
Calcium	MCP	387,000	407,000 E	277,000	333,000 E	56,500	146,000	255,000
Chromium	MCP	3 B						10.3
Cobalt	MCP							
Copper	MCP					5.2 B		
Iron	MCP	188	143	387	283	127	506	357
Lead	MCP		1.3 B					1.1 BW
Magnesium	MCP	33,300	2450 BE	96,200	115,000 E	29,900	70,200	75,200
Manganese	MCP	8.8 B	3.5 B	71.2	140	20.1	25.5 E	30.8 E
Mercury	MCP							
Nickel	MCP	11.4 B		23.5 B		15.3 B		
Potassium	MCP	22,700	16,900 E	5990	8550 E	9880	4170 B	4250 B
Selenium	MCP							
Silver	MCP							
Sodium	MCP	192,000	194,000	82,700	68,900	27,400	37,000	40,700
Thallium	MCP							
Vanadium	MCP	3.8 B		4.2 B	6.7 B	10.7 B		
Zinc	MCP	19.9 B	14.7 B	5.6 B	12.2 B	50.5	16.7 B	26.8
Cyanide	MCP							
Phenols (mg/L)	MCP	0.005	0.018	0.008	0.023	0.006	0.013	

All results reported in μg/L (ppb) unless otherwise stated.

Only detected results are reported.

B – Less than quantitation limit but greater than or equal to instrument detection limit.

W – Post-digestion spike is out of control limits.

E – Value is estimated due to interference

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-88-10D	GW-88-11D	GW-88-11D	GW-88-12D	GW-88-12D	GW-URS-2D	GW-URS-2D
COLLECTION DATE		2/25/91	8/30/90	2/26/91	8/29/90	2/26/91	8/28/90	2/21/91
PARAMETER	TYPE							
Bicarbonate, as CaCO3	MISC	NA	174	NA	197	NA	249	NA
BOD	MISC	NA	1	NA	12	NA	2	NA
COD	MISC	NA		NA	21	NA	12.1	NA
Chloride	MISC	NA	40.4	NA	173	NA	15.3	NA
Hardness, as CaCO3	MISC	NA	1180	NA	1890	NA	618	NA
Ammonia, as N	MISC	NA	0.24	NA	0.44	NA	0.17	NA
Total Kjeldahl Nitrogen, as N	MISC	NA	0.62	NA	1.86	NA	1.12	NA
Alkalinity, as CaCO3	MISC	NA	174	NA	197	NA	250	NA
Acidity, as CaCO3	MISC	NA	61.2	NA	83.8	NA	49.1	NA
Nitrate-Nitrogen	MISC	NA		NA		NA		NA
Phosphate	MISC	NA		NA		NA	0.68	NA
Oil and Grease	MISC	NA	2.08	NA	8.84	NA	12.9	NA
TOC	MISC	NA	1.56	NA	8.49	NA	5.22	NA
TSS	MISC	NA	31.3	NA	9.3	NA	9.7	NA
TDS	MISC	NA	1660	NA	2780	NA	865	NA
Sulfate	MISC	NA	1050	NA	1630	NA	418	NA
Sulfide	MISC	NA	5.4	NA	16.4	NA	2.3	NA
pH (SU)	MISC	NA	NA	NA	NA	NA	NA	NA
Specific Conductance	MISC	NA	NA	NA	NA	NA	NA	NA

All results reported in mg/L (ppm)
unless otherwise stated.
Only detected results are reported.

NA - Not Analyzed

TABLE A-7: DEEP GROUNDWATER
Analytical Results--1st and 2nd Rounds
Frontier Chemical

SAMPLE-ID		GW-URS-5D	GW-URS-5D	GW-URS-7D	GW-URS-7D	GW-URS-9D	GW-URS-9D	GW-URS-14D
COLLECTION DATE		8/27/90	2/21/91	8/28/90	2/25/91	8/27/90	2/20/91	2/20/91
PARAMETER	TYPE							
Bicarbonate, as CaCO3	MISC	142	NA	170	NA	167	NA	253
BOD	MISC	9	NA	5	NA	6	NA	16
COD	MISC	12.1	NA	10.9	NA	10.9	NA	56.7
Chloride	MISC	68.4	NA	86.7	NA	32.3	NA	75.3
Hardness, as CaCO3	MISC	1360	NA	1380	NA	340	NA	940
Ammonia, as N	MISC	0.1	NA	0.38	NA	0.17	NA	0.044
Total Kjeldahl Nitrogen, as N	MISC	1.36	NA	0.683	NA	0.943	NA	0.602
Alkalinity, as CaCO3	MISC	143	NA	170	NA	168	NA	253
Acidity, as CaCO3	MISC	13.7	NA	50.3	NA	27.3	NA	84.2
Nitrate-Nitrogen	MISC		NA		NA		NA	
Phosphate	MISC		NA	1.81	NA	3.02	NA	
Oil and Grease	MISC	6.8	NA	7.4	NA	9.6	NA	2.8
TOC	MISC	6.9	NA	5.16	NA	7.9	NA	1.36
TSS	MISC	31	NA	9.6	NA	5.2	NA	19
TDS	MISC	2340	NA	2000	NA	509	NA	1390
Sulfate	MISC	1350	NA	1180	NA	378	NA	755
Sulfide	MISC		NA	1.2	NA		NA	22.1
pH (SU)	MISC	NA	NA	NA	NA	NA	NA	
Specific Conductance	MISC	NA	NA	NA	NA	NA	NA	

All results reported in mg/L (ppm) unless otherwise stated.
Only detected results are reported.

NA - Not Analyzed

TABLE A-8: SURFACE SOIL--DIOXIN
Analytical Results

SAMPLE ID	SPS-11	SPS-12	SPS-12D
SAMPLE TYPE	SOIL	SOIL	SOIL
COLLECTION DATE	3/14/91	3/14/91	3/14/91
DIOXINS			
Total TCDD			
Total PeCDD			
Total HxCDD			
Total HpCDD	17	28.9	59.3
OCDD	41.8	69.8	107
FURANS			
Total TCDF			
Total PeCDF			
Total HxCDF			
Total HpCDF			
OCDF			

All results reported in ng/kg (ppt).
Only detected results are reported.

TABLE A-9: TANK SAMPLE

Analytical Results

SAMPLE ID		FC-TK-1	REGULATORY
COLLECTION DATE		2/14/91	LIMIT
PARAMETER	TYPE		
Benzene	TCLP	0.120 J	0.5
Carbon Tetrachloride	TCLP		
Chlorobenzene	TCLP		
Chloroform	TCLP		
2-Butanone	TCLP	5 BT	200
Tetrachloroethene	TCLP		
Trichloroethene	TCLP		
Vinyl Chloride	TCLP		
1,2-Dichloroethane	TCLP		
1,1-Dichloroethene	TCLP		
1,4-Dichlorobenzene	TCLP		
Hexachloroethane	TCLP		
Nitrobenzene	TCLP		
2,4,6-Trichlorophenol	TCLP		
2,4,5-Trichlorophenol	TCLP		
2,4-Dinitrotoluene	TCLP		
Hexachlorobenzene	TCLP		
Pentachlorophenol	TCLP		
2-Methylphenol	TCLP	2.4 J	200
3&4-Methylphenol (total)	TCLP		
Pyridine	TCLP	92	5
Hexachloro-1,3-butadiene	TCLP		
gamma-BHC (Lindane)	TCLP		
Heptachlor	TCLP		
Heptachlor epoxide	TCLP		
Endrin	TCLP		
Methoxychlor	TCLP		
Toxaphene	TCLP		
Tech. Chlordane	TCLP		
2,4-D	TCLP		
2,4,5-TP (Silvex)	TCLP		
Arsenic	TCLP		
Barium	TCLP	.129 B+	100
Cadmium	TCLP		
Chromium	TCLP		
Lead	TCLP		
Mercury	TCLP		
Selenium	TCLP	0.0395	1
Silver	TCLP		

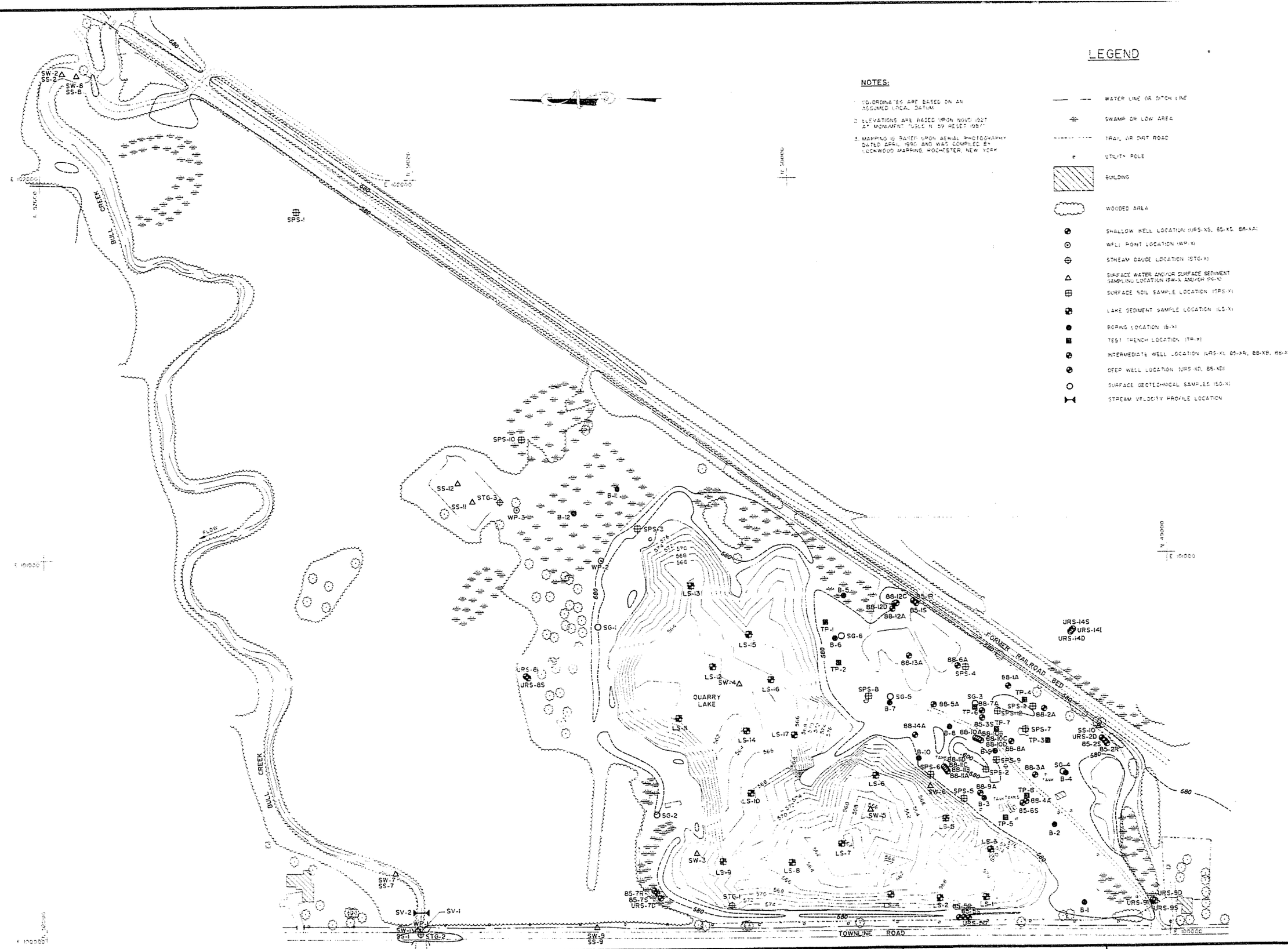
All results reported in mg/L (ppm).
Only detected results are reported.

J - The reported value is less than the sample quantitation limit but greater than the instrument detection limit.

B - Detected in associated method blank.

T - Detected in TCLP extraction blank.

B+ - The reported value is less than the sample quantitation limit but greater than the instrument detection limit.



LEGEND

- WATER LINE OR DITCH LINE
- SWAMP OR LOW AREA
- TRAIL OR DIRT ROAD
- UTILITY POLE
- BUILDING
- WOODED AREA
- SHALLOW WELL LOCATION (URS-XS, BS-XS, BR-XA)
- WELL POINT LOCATION (WP-X)
- STREAM GAUGE LOCATION (STG-X)
- SURFACE WATER AND/OR SURFACE SEDIMENT SAMPLING LOCATION (SW-X AND/OR SS-X)
- SURFACE SOIL SAMPLE LOCATION (SPS-X)
- LAKE SEDIMENT SAMPLE LOCATION (LS-X)
- BORING LOCATION (B-X)
- TEST TRENCH LOCATION (TP-X)
- INTERMEDIATE WELL LOCATION (URS-XI, BS-XA, BR-XB, BR-XC)
- DEEP WELL LOCATION (URS-XD, BS-XD)
- SURFACE GEOTECHNICAL SAMPLES (SG-X)
- STREAM VELOCITY PROFILE LOCATION

NOTES:

1. COORDINATES ARE BASED ON AN ASSUMED LOCAL DATUM.
2. ELEVATIONS ARE BASED UPON NGVD (1929) AT MONUMENT "USLE N 59 RESET 1967".
3. MAPPING IS BASED UPON AERIAL PHOTOGRAPHY DATED APRIL 1990 AND WAS COMPILED BY LOCKWOOD MAPPING, ROCHESTER, NEW YORK.

REVISIONS					
NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

DESIGNED BY: B.J.P.
DRAWN BY: K.A.H.
CHECKED BY: B.J.P.
PROJ. ENGR: C.W.H.

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NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SITE NO. 9-32-043

WORK ASSIGNMENT NO. D002340-4

FRONTIER CHEMICAL
PENDLETON SITE

TOWN OF PENDLETON NIAGARA COUNTY

SAMPLING LOCATIONS

SCALE: 1"=100' | DATE: JAN 91 | PLATE 1