DECISION DOCUMENT FOR THE REMEDIATION OF

Glacier Vandervell, Inc. (GVI)

Noble County, Ohio

prepared by

THE OHIO ENVIRONMENTAL PROTECTION AGENCY

May 3, 2004

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: [signature] Date 5-5-04

DECLARATION

SITE NAME AND LOCATION

Glacier Vandervell, Inc (GVI)
Caldwell, Ohio

STATEMENT OF BASIS AND PURPOSE

This Decision Document presents the selected remedial action for the Glacier Vandervell Site in Caldwell, Ohio, chosen in accordance with the policies of the Ohio Environmental Protection Agency, statutes and regulations of the State of Ohio, and the National Contingency Plan, 40 CFR Part 300.

ASSESSMENT OF THE SITE

Actual and threatened releases of industrial solvents and heavy metals from historical operations and waste disposal at the Site, if not addressed by implementing the remedial action selected in the Decision Document, constitute a substantial threat to public health or safety and are causing or contributing to ground water pollution and soil contamination.

DESCRIPTION OF THE SELECTED REMEDY

- Excavation and consolidation of wetland sediments, Western Disposal Area soils, and Plant Area soils - construction of an impervious cap over these soils in the Western Disposal Area. The cap will meet the standards provided in Subtitle C of the Resource Conservation and Recovery Act (RCRA).
- Long-term monitoring of Duck Creek sediments to detect potential increases in site-related contaminants.
- Use of deed restrictions, institutional controls, and engineering controls to address SO Line soils, Vapor Degreaser soils, and soils beneath the loading dock area.
- Reduction of groundwater contamination in primary source areas, through expanded groundwater recovery and treatment.
- Implementation of an expanded groundwater monitoring plan to assess natural attenuation processes, and to provide sufficient monitoring to ensure the protection of potential off-site receptors.

STATUTORY DETERMINATIONS

The selected remedial action is protective of human health and the environment, complies with legally applicable state and federal requirements, is responsive to public participation and input and is cost-effective. The remedy utilizes permanent solutions and treatment technologies to the maximum extent practicable to reduce toxicity, mobility and volume of hazardous substances at the Site. The effectiveness of the remedy will be reviewed regularly.

Christopher Jones, Director — 5-3-04 (Date)

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for Glacier Vandervell, Inc. (GVI)
Noble County, Ohio

1.0 SITE BACKGROUND

1.1 Site Description and History

GVI is located at 17226 County Road 57 in Olive Township, Noble County, Ohio, approximately 0.75 mile south of the Village of Caldwell, as shown on Figure 1. The Site lies on a 41-acre parcel of land and is an active industrial property with manufacturing occurring within the plant building. Industrial properties lie to the north and south of the Site. A small residential community lies across Route 821 to the east of the Site. Approximately 10 homes are located in a development about 2,000 feet southeast of the Site. Duck Creek borders the Site on the west and is paralleled by Interstate 77. A limited number of residential dwellings are located approximately 0.2 mile west of the Site across Duck Creek and Interstate 77.

Paved parking areas are present on the north, northeast and southeast sides of the facility building, and asphalt loading docks and roadways exist on the north and south sides of the building. Other areas lying north and east of the facility are covered with lawn (primarily bluegrass and other turf species). The area west of the plant (i.e., Western Disposal Area) is covered primarily with herbaceous vegetation, with a few shrubs and sparse trees. Three sparsely vegetated zones are located within this area. An emergent wetland is present in the northern/northwestern portion of the Site. Wetland vegetation consists of cattails, scrub/shrub vegetation and trees. A site map illustrating the various areas and facility features is presented on Figure 2.

The original manufacturing facility was constructed in 1952. Several additions have expanded the facility to approximately 210,000 square feet. The plant was originally owned and operated by Cleveland Graphite Bronze Company, which in 1969 became part of Gould, Inc. (Gould). Gould subsequently operated the facility until 1981, when Imperial Clevite Industries purchased the operations and the property. Clevite Industries acquired the facility through a merger with Imperial Clevite Industries in 1986. J.P. Industries, Inc. (JPI) purchased the Site in 1987. JPI was acquired by T&N PLC in August 1990. In the spring of 1998, T&N PLC was acquired by Federal Mogul Corporation. However, the Federal Trade Commission (FTC) required Federal Mogul to divest its interest in the facility, and under the FTC ruling it was sold to Dana Corporation. The Caldwell facility continues to operate under the name Dana Glacier Vandervell Inc.(GVI). All interests in the facility, including the property, structures, and manufacturing operations, are currently owned by Dana Corporation.

The GVI facility has manufactured the same type of products since production began in 1952. Products include a variety of small machined parts, including bimetal bushings and washers. Processes involved in the manufacturing of the parts include casting, milling, rolling, annealing, slitting, blank forming, coining, plating and finishing.

Historically, solvents have been used at the facility to clean and degrease equipment and structures. These solvents include trichloroethene (TCE), 1,1,1-trichloroethane, and trans-1,2-dichloroethene. Areas of the Site that would have been associated with these contaminants include soils beneath the plant (soluble oil line and vapor degreaser areas), the loading dock area, Western Disposal Area, and waste water treatment area.

As a result of manufacturing operations, the facility generated industrial waste water which was treated and discharged into the local publicly owned treatment works (POTW). Prior to final discharge of this water, settled sludge was drawn off and discharged into sludge dewatering beds, also known as sand filter beds, with filtrate recycled to an on-Site treatment plant. The filter beds were used for sludge dewatering since 1952. Waste discharged to these units included electroplating waste as well as oil and grease from degreasing operations. These wastes are designated as F006 listed hazardous waste under the Resource Conservation and Recovery Act (RCRA). Prior to 1980, the waste generated from the filter beds and from other plant operations was disposed of on the Site by Gould and others.

Several environmental investigations have been conducted at the Site to investigate past releases and waste management practices. A chronological review of these investigations is provided below.

- In 1987, a Preliminary Site Investigation (PSI) determined that metal hydroxide sludge, corn cob deburring media waste, and lead-bearing sludge were disposed of at the Site. Additionally, chlorinated solvents may have been spilled or leaked from the loading dock area or from an old railroad siding. Indications were that trichloroethene (TCE) and 1,1,1-trichloroethane may have been stored on the loading dock. Soil borings indicated the presence of lead in the soil, with concentrations as high as 100,000 ppm. Groundwater samples indicated the presence of several chlorinated solvents at concentrations significantly higher than drinking water standards.

- In April 1987, Ohio EPA conducted a RCRA inspection of the Site pursuant to Ohio Revised Code (ORC) Section 3734.07. Subsequently, Clayton Environmental Consultants (Clayton) prepared a RCRA Closure Plan for the sand filter beds and for conducting a groundwater monitoring program. The Closure Plan was approved on February 17, 1988. As part of the closure, 500 tons of soil were removed from the area of the filter beds. Clayton installed one upgradient and four downgradient monitoring wells to evaluate groundwater conditions. Wells were monitored on a quarterly basis in 1988 and on a semiannual basis from July 1989 to February 1991.

- In June 1987, Environmental Management Control (EMC) excavated and removed a gasoline underground storage tank (UST) in the area southwest of the facility. In an attempt to remove any remaining product from the subsurface, Groundwater Technology, Inc. (GTI) installed a recovery well and scavenger pump. However, very little product was recovered due to the low yield of the water-bearing zone.

- During the fall of 1987, Dames and Moore conducted a soil gas investigation to determine the general extent of soil contamination. The investigation determined that the area to the west of the southwest loading dock and an additional area approximately 300 feet west of the north wall of the plant had elevated soil gas levels of volatile organic compounds (VOCs). Clayton conducted a second investigation of the former UST area in October 1988. Groundwater contamination was identified in the area of the former UST and surficial staining was observed in the nearby drainage culvert.

- In December 1990, Kemron Environmental Services (Kemron) installed five groundwater monitoring wells and four soil borings in an area north of the facility. VOC contamination was identified in the four borings and some of the monitoring wells.

- On three occasions from 1989 to 1991, Quantum Environmental (Quantum) sampled the monitoring wells associated with the closed filter beds. Quantum proposed corrective measures in a Groundwater Quality Assessment Plan dated October 14, 1991.

- Ohio EPA issued a Consent Order on December 11, 1991. On April 27, 1992, Site Respondents Gould and Glacier Vandervell, Inc. submitted a proposed Remedial Investigation Work Plan. The Site Respondents implemented field work for the Remedial Investigation (RI) in July 1992. This work included sampling and analysis of soil, groundwater, and Duck Creek surface water and sediments. Subsequently, the Site Respondents conducted additional field work for the RI at the request of Ohio EPA. The additional sampling focused on the evaluation of contamination underlying the facility, in Duck Creek, and areas northwest and south of the facility.

- The Site Respondents installed an interim groundwater recovery and treatment system in January 1997, which is currently operating at the Site. The system consists of three pumping wells (MW-7, MW-10, and MW-18) located in the area of highest VOC concentration and an activated carbon system to treat VOC-contaminated groundwater.

- The Site Respondents submitted the RI Report to Ohio EPA on December 11, 1998. Ohio EPA issued final approval on March 29, 1999.

- In accordance with the Consent Order, monthly progress reports are submitted by the Site Respondents to Ohio EPA to document activities related to the Site.

1.2 Summary of the Remedial Investigation

The Remedial Investigation, performed by the Site Respondents with Ohio EPA oversight, included a number of tasks to identify the nature and extent of Site-related chemical contaminants. The tasks included sampling of surface and subsurface soil, sediments, surface water, and groundwater.

The RI field work was completed in three phases. From July 1992 through May 1993, field work for the "initial RI" was conducted. At the request of Ohio EPA, two supplemental RIs were conducted to further evaluate the presence and extent of contamination underlying the plant, in Duck Creek, and in areas located to the northwest and south of the plant. From September 1994 through December 1994, field work for the first supplemental RI was conducted. In June 1995, field work for the second supplemental RI was conducted. At the time of the RI, a Resource Conservation and Recovery Act (RCRA) investigation had been ongoing at the Site since 1987. Although most of the RCRA-related work was completed by June 1992, additional work was required to fulfill the RCRA requirements. Therefore, this remaining work was conducted concurrently with the RI work, and a final RCRA report was postponed until the RI work was completed. The RCRA report was then included as a stand-alone document as Appendix 1A of the RI report.

Investigative activities performed during the RI, supplemental RIs, and the RCRA investigation included the installation of 38 monitoring wells and the drilling of 91 soil borings. The data obtained from the investigation were used to conduct a Baseline Risk Assessment (BRA) and to determine the need to evaluate remedial alternatives. This Decision Document contains only a brief summary of the findings of the Remedial Investigation and Feasibility Study. Please refer to the Remedial Investigation and Feasibility Study reports for additional information.

The nature and extent of contamination in each environmental medium and the contaminants of concern attributable to the Site are described below. Figures 3 and 4 show the extent of metals impact in the WDA and Plant Area Soils, respectively. Figure 5 illustrates the extent of VOC impact to soils Site-wide.

1.2.1 Soil Contamination

1.2.1.1 Western Disposal Area Soils

The Western Disposal Area (WDA) was historically used to dispose of wastes generated in the production processes at the Site. These wastes included plating and grinding sludge, corn cob deburring media, waste oil, solvents, and waste water treatment sludge from the sand filter beds.

The RI found that elevated concentrations of heavy metals were present in the WDA soils. The metals consisted primarily of copper and lead and were most prevalent at the 0-2 feet below-ground-surface (bgs) sampling interval. The maximum concentration of copper was

140,000 milligrams per kilogram (mg/kg), compared to a Site background concentration of 34.5 mg/kg. The maximum concentration of lead was 52,000 mg/kg, compared to a background concentration of 22.5 mg/kg. Antimony was detected twice in the WDA at concentrations of 73 and 240 mg/kg , with a background concentration of less than 30 mg/kg. Arsenic was detected once at a concentration of 24 mg/kg, exceeding the background concentration of 18 mg/kg.

In the WDA, twenty-nine soil samples were submitted for VOC analysis during the RI. Ten VOCs were detected in samples from two borings, at depths ranging from ground surface to 22 feet bgs. TCE was the primary compound detected, at a maximum concentration of 2.9 mg/kg.

1.2.1.2 Plant Area Soils

Plant Area Soils are those shallow (0-2 feet below ground surface) soils found in the general outdoor portions of the facility, including the former RCRA closure unit, the former UST area, the southwest loading dock area, and upland areas near the wetland. Lead represents the primary chemical of concern in the Plant Area Soils. The distribution of lead was identified during Pre-RI investigations, which indicated elevated concentrations in surface soils to the north and south of the western side of the building. The origin of the lead is presumed to be primarily from airborne distribution from the casting operations at the facility. The maximum isoconcentration line for lead based on contouring of soil data was 2,500 mg/kg and was located to the north of the plant building. Elevated concentrations of copper were detected in one RI boring outside the southwest loading dock. VOCs were detected only occasionally in Plant Area Soils, and were primarily limited to detections of toluene, xylenes, and TCE in the vicinity of the former gasoline UST and the southwest loading dock area.

1.2.1.3 Soluble Oil Line/Vapor Degreaser Soils

The Soluble Oil (SO) Line, located beneath the facility building, was historically used to transport spent solvents to a concrete holding tank for further treatment. The line is no longer in use. The VOCs TCE and/or PCE were detected in twelve (12) RI borings drilled to investigate potential contamination from the SO Line. TCE and PCE were detected at maximum concentrations of 210 mg/kg and 92 mg/kg, respectively, in soil from 8 to 12 feet below ground surface. One RI boring drilled near Vapor Degreaser #1 contained TCE at 1.5 mg/kg and PCE at 2.5 mg/kg in soil at 5 feet below ground surface. Based upon the RI data, the SO Line area appears to be the largest and most significant area of VOC-contaminated soil at the Site. It is also likely that this area is a significant past and/or current contributor to VOC contamination in groundwater.

1.2.2 Ground Water Contamination

Groundwater at the Site is found in both unconfined alluvial deposits and in bedrock, and is typically encountered between 10 and 15 feet bgs. The alluvium is composed primarily of clay, silt, and fine sand, and has a low hydraulic conductivity. The bedrock is composed of shale, with the upper portions characterized as soft, weathered, and clayey, and also demonstrates low hydraulic conductivity. It is likely that groundwater flow within the bedrock is controlled by joint and fracture density and orientation.

During the RI and other Site investigations, nested monitoring wells were installed to screen the alluvium, the alluvium/bedrock interface, and the bedrock. Potentiometric data suggest that these units are in hydraulic communication. The letters "a" , "b", and "a/b" are used as qualifiers in the identification of monitoring wells to denote wells screened within alluvium, bedrock, or at the interface, respectively.

1.2.2.1 Alluvium

Groundwater sampling of alluvium wells and alluvium/bedrock interface wells was performed on various occasions during the RI, and again in May 2000 prior to preparation of the FS report. Based upon the recent FS sampling, the following VOCs were detected in alluvium groundwater at concentrations exceeding USEPA Maximum Contaminant Levels (MCLs) or Action Levels:

- TCE (MCL = 5 ug/l)
- Cis- 1,2 dichloroethene (MCL = 70 ug/l)
- PCE (MCL = 5 ug/l)
- Vinyl Chloride (MCL = 2 ug/l)
- Benzene (MCL = 5 ug/l)

Concentrations of TCE ranged to as high as 190 ug/l, while cis-1,2-DCE ranged to as high as 240 ug/l. The other contaminants were present in lesser concentration and/or extent, but nonetheless exceeded the respective MCLs. Similar to the RI findings, VOC concentrations were highest in wells near or downgradient of the former sand filter beds and SO Line areas. Comparing the RI data from 1993 and 1994 to the 2000 FS data, total VOC concentrations in the alluvium decreased, on average, approximately 89%. Of the VOC contaminants in groundwater, TCE and cis-1, 2-DCE appear to be the most dominant (i.e. highest concentration) overall. Comparing the RI data to the FS data for these individual compounds reveals an average decrease in concentration of approximately 86% for TCE and 74% for cis-1, 2-DCE. Figures 6 and 7 illustrate the 2000 FS sampling data showing the extent and concentration of TCE and cis-1,2-DCE, respectively, in groundwater within the alluvium at the Site.

During RI sampling in 1994, benzene was detected in three alluvium wells, and concentrations exceeded the MCL of 5 ug/l at MW-9 and MW-15. During FS sampling, benzene was detected in two of the alluvium wells; however, only the concentration in MW-9 (720 ug/l) was above the MCL. Semi-volatile organic compounds (SVOCs) were detected in two alluvium wells - MW-5 and MW-9; however, the compounds detected do not have established MCLs.

Groundwater flow within the alluvium is generally to the west-northwest toward the wetland area, and southwest toward Duck Creek. A comparison of the 2000 FS data to the 1994 RI data indicate that the areal extent of the VOC plume within the alluvium has not changed appreciably over time. Based upon this comparison, as well as the above-noted decrease in plume concentrations, the alluvium VOC plume would not be expected to migrate beyond the current areas of impact.

1.2.2.2 Bedrock

Based upon the 2000 FS sampling, the following VOCs were detected in bedrock groundwater at concentrations exceeding USEPA MCLs or Action Levels:

- TCE (MCL = 5 ug/l)
- Cis- 1,2 dichloroethene (MCL = 70 ug/l)
- PCE (MCL = 5 ug/l)
- Vinyl Chloride (MCL = 2 ug/l)
- Benzene (MCL = 5 ug/l)
- 1,1 Dichloroethene (MCL = 7 ug/l)

VOC concentrations in bedrock groundwater were highest in wells located near or downgradient of the southwest loading dock, former sand filter beds, and SO Line areas. Compared to alluvium, contaminants were present in significantly greater concentrations in the bedrock, with concentrations of TCE, cis-1,2-DCE, and vinyl chloride ranging to as high as 4,300 ug/l, 4,400 ug/l, and 410 ug/l, respectively.

Comparing the 1994 RI data to the 2000 FS data, total VOC concentrations in bedrock decreased, on average, approximately 57%. Of the VOC contaminants in the groundwater, TCE and cis-1,2-DCE appear to be the most dominant overall. A comparison of the RI data to the FS data for wells in the most contaminated zone reveals an average decrease in concentration of approximately 53% for TCE and 34% for cis-1, 2-DCE. Figures 8 and 9 illustrate the FS sampling data, showing the extent and concentration of TCE and cis-1,2-DCE, respectively, within bedrock at the Site.

During FS sampling, benzene was detected in seven of the bedrock wells; however, only concentrations in two of the wells - MW-7 (9.7 ug/l) and MW-10 (160 ug/l) - were above the MCL. Both wells are downgradient from the former gasoline UST area. One SVOC, bis(2-ethylhexyl) phthalate, was detected in three bedrock wells - MW-6, MW-7, and MW-11; however, this compound does not have an established MCL.

Like the alluvium, groundwater flow within the bedrock is generally to the west and southwest, toward the wetland area and Duck Creek. Findings of the RI estimated a horizontal hydraulic conductivity of 1.23 ft/day for bedrock, with a horizontal flow velocity estimated at 0.58 ft/day (211 ft/year). A comparison of the 2000 FS data to the 1994 RI data indicate that the areal extent of the VOC plume within bedrock has not changed appreciably in that time, with the exception of a slight plume extension down gradient of the former filter beds in the vicinity of well MW-22. Based upon this comparison, as well as the above-noted decrease in average plume concentrations, the bedrock VOC plume would not be expected to migrate or expand appreciably beyond the current areas of impact.

1.2.3 Surface Water/Sediment Contamination

The Site is located within the Ohio River Drainage Basin. The primary surface water feature is Duck Creek (West Fork), which borders the Site on the west and regionally flows from north to south. Surface water from the Site drains to Duck Creek, which has an average width of approximately 35 feet, and also drains to the wetland area.

During the RI, seven sediment and surface water samples were collected from Duck Creek at 200-foot intervals along the Site boundary. All sediment samples were analyzed for VOCs, copper, lead, and tin to detect any impact from the Site. The surface water samples were analyzed for VOCs, metals, and hardness. One sediment sample and one surface water sample were analyzed for the priority pollutant metals.

No VOCs were detected in either the sediment or surface water samples collected from Duck Creek.

Arsenic, beryllium, cadmium, chromium, copper, lead, nickel and zinc were each detected in at least one sediment sample. Concentrations of arsenic, cadmium and nickel exceeded the USEPA Ecotox Thresholds for sediment, while all other metals were below the Ecotox Thresholds (Ecotox thresholds are critical concentrations of contaminants above which wildlife may be harmed). As part of the FS, additional Duck Creek sediment sampling was performed for analysis of arsenic, cadmium, and nickel to better characterize the extent of metals impacts and to establish a background concentration. The sampling results indicated only minor exceedances (less than 2x) of the background concentrations for arsenic and nickel. Cadmium did not exceed background levels.

Chromium, copper, mercury and zinc were detected in Duck Creek surface water samples collected during the RI. All concentrations were below the USEPA Region 9 Preliminary Risk Goals (PRGs; see Section 2.1 below) for drinking water, which were used for screening in the Baseline Human Health Risk Assessment (BHHRA). The concentrations were also compared to the Ohio EPA surface water quality criteria for the Ohio River Drainage Basin. None of the concentrations exceeded the applicable water quality criteria. Therefore, surface water did not warrant further evaluation in the FS.

1.2.4 Wetland Sediment Contamination

A six-acre emergent wetland is located in the northern/northwestern portion of the Site, as shown on Figure 2. Approximately three acres of the wetland are covered by cattail vegetation. Surface water from the northwestern portion of the property, including the WDA, flows toward and into the wetland.

A field delineation and wetland functionality assessment was conducted at the Site in July 1999 by representatives of Advanced Geoservices Corp. (AGC) as part of the FS Work Plan preparation. The assessment utilized the Hydrogeomorphic (HGM) scheme to classify the wetland. Based upon this assessment, the area was classified as a slope wetland, implying unidirectional movement of water downslope, albeit at a very slow rate. The assessment also found that the wetland area, as a whole, appears to primarily retain surface water. Therefore, primary ecological receptors of concern are wetland-associated communities. PRGs based on these receptors are therefore more appropriate than benchmarks based on stream benthic fauna. As determined during FS preparation, the muskrat is considered to be a representative species for the cattail and open-water wetland areas, while the meadow vole is the representative species for the non-cattail wetland areas.

During the RI and supplemental RI investigations, a total of 14 surface soil samples were collected in and around the wetland area and were analyzed to determine metals concentrations. The primary metals detected above background concentrations were copper, lead, and tin. Copper concentrations ranged to a maximum of 3,500 mg/kg, lead ranged to a maximum of 3,800 mg/kg, and tin ranged to a maximum of 3,300 mg/kg. Thirteen of the wetland area samples contained concentrations of copper, lead, and/or tin which exceeded the respective Ecological Risk-Based Concentrations (ERBC) of these contaminants for the muskrat. Two of the samples exceeded the respective ERBCs for the meadow vole. Figure 10 illustrates the locations of the wetland sediment samples and the approximate area of wetland sediment requiring removal to meet the ERBCs for these receptors.

1.2.5 Impacts to Biological Resources

To date there has been no observed, documented impact to Site biological resources. However, as indicated in Section 2.2, the Ecological Risk Assessment identified various risks to biological receptors on-Site, including the muskrat, meadow vole, American robin, red-tailed hawk, American woodcock, and great blue heron. It is also important to note that any impacts to biological resources are expected to be long-term and chronic in nature and, therefore, more difficult to observe.

1.3 Interim or Removal Actions Taken to Date

An interim remedial measure (IRM) was installed in January 1997 and is currently operating at the Site. The IRM consists of pumping groundwater from three monitoring wells installed into shallow bedrock and located in the areas of highest VOC contamination. The wells being utilized for the IRM are the shallow bedrock wells MW-7, MW-10, and MW-18. Groundwater is pumped from the wells using submersible pneumatic pumps and is routed through a carbon treatment system to remove VOCs. The treated water is then combined with the plant waste water stream, which is subsequently discharged to the POTW.

From the 1997 startup of the groundwater removal system through the end of 2001, a total of approximately 586,000 gallons of groundwater had been pumped from the shallow bedrock unit, with a total mass removal of approximately 13 lbs of VOCs. The combined output of the wells averaged approximately 0.2 gpm during this period. The decrease in VOC concentrations in the bedrock aquifer, as noted in Section 1.2.2.2, may be attributable to the groundwater pumping activities.

2.0 SUMMARY OF SITE RISKS

A baseline risk assessment (BRA) was conducted to evaluate current and potential risks to human health and to ecological receptors associated with contaminants present at the Site. The results demonstrated that the existing concentration of contaminants in environmental media pose risks to human and ecological receptors at a level sufficient to trigger the need for remedial actions. A detailed discussion of the analyses and methods used to determine risk can be found in the Remedial Investigation Report.

2.1 Risks to Human Health

The primary objectives of the Human Health Risk Assessment were to:

- Identify constituents that pose a significant risk to receptors (Data Evaluation)
- Identify the pathways and media of concern (Exposure Assessment)
- Determine toxicity levels of constituents in relevant media (Toxicity Assessment)
- Determine the likelihood and magnitude of any expected impact or threat (Risk Characterization)

2.1.1 Data Evaluation

For the purposes of the BRA, a chemical was classified as a chemical of potential concern (COPC) if it was detected in at least 5% of samples in a particular medium and if its maximum concentration was greater than one-tenth of the USEPA Region 9 PRG based upon residential use. A chemical was also retained as a COPC if a PRG was not available for the chemical.

2.1.2 Exposure Assessment

All pathways by which humans could be exposed to COPCs were evaluated and quantified for both current and future exposure scenarios.

The following receptors were identified and evaluated for the current use scenario:

- Grounds workers
- Construction workers
- Off-Site residents
- School-aged trespassers
- Children using Duck Creek for recreation
- Office employees

Future site scenarios evaluated in the risk assessment included continued industrial use of the property and residential use. Exposure scenarios for continued industrial use are similar to those under current use unless groundwater is used for drinking water. Hence, risks under a continued industrial use scenario are expected to be the same as for current use.

Under future land use, homes or other buildings may be constructed on-Site. The following population is associated with this scenario:

- Future construction workers
- Future adult residents
- Future child residents

2.1.3 Toxicity Assessment

Following the evaluation of current and future receptors and exposure pathways, the concentrations of COPCs in each medium were estimated from sampling results and mathematical modeling, and the potential human exposure levels were calculated. The estimate of human exposure (intake) was calculated as the average amount of a chemical taken into the body per unit of body weight per day (mg/kg/day).

The toxicity of each COPC was assessed by identifying the adverse health effects associated with exposure to each contaminant. Toxicity values for many frequently occurring chemicals have been developed by the USEPA for use in risk assessments. Separate toxicity values for carcinogenic (cancer-causing) and non-carcinogenic health effects have been developed. The "slope factor" represents the excess cancer risk per unit intake of a chemical over a lifetime (mg/kg/day). For non-cancer risk, a "reference dose" represents the acceptable chemical intake level (mg/kg/day) that is not expected to result in adverse health effects.

2.1.4 Risk Characterization

Risk characterization was conducted following the evaluation of all exposure and toxicity information. Both carcinogenic and non-carcinogenic risks were characterized. Lead risk is addressed separately and is described in the following sections.

Excess lifetime cancer risk (ELCR) is defined as the probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen(s) present at the Site, *in addition* to the probability of cancer risks from all other causes. ELCRs were calculated by multiplying projected intakes by chemical-specific slope factors (CSF). For pathways involving multiple chemicals, Total ELCRs were calculated by summing individual ELCRs.

As a benchmark in developing clean-up goals at contaminated sites, an acceptable ELCR range from one in one million (1 in 1,000,000) to one in ten thousand (1 in 10,000) has been established, with one in one million being the "point of departure". The point of departure represents the starting point and the initial goal for all remedial objectives. This risk goal can be "departed from" with good reason. Such reasons include, but are not limited to, technical infeasibility, engineering impracticality, and high cost. However, cost is not a primary consideration for making this determination.

The Hazard Quotient (HQ) was used to determine the severity of non-cancerous hazards posed by the Site. The HQ is calculated as the ratio of projected intake levels to acceptable intake levels (reference dose) for each COPC. If the HQ is less than or equal to 1, then the estimated exposure to a substance is judged to be below the threshold that can result in a toxic effect. If the HQ is greater than 1, there exists a potential for toxic non-cancerous effects.

To assess the overall potential for non-cancerous effects posed by multiple chemicals, a hazard index (HI) was calculated by summing the individual HQs for each pathway.

A summary of estimated ELCRs and HIs for all pathways is presented in Table 1 and is discussed in the following sections. These estimates represent the current and future risks associated with the Site assuming no remedial actions are taken.

2.1.4.1 Current Land Use

For the current land use scenario, hazard indices exceed the target level (e.g., greater than one) for grounds workers exposed to Site-wide soil 0-2 feet bgs. The primary risk drivers are potential dermal contact with and ingestion of antimony and copper. Hazard indices associated with construction workers, office workers, off-Site residents, and school-aged trespassers/recreational users are below the target level.

For grounds workers (ELCR = 2 in 100,000) the driver of cancer risk is for potential dermal contact and ingestion of arsenic in Site-wide soil 0-2 feet bgs. For trespassers and recreational users (ELCR = 5 in 1,000,000) the drivers of cancer risk are potential ingestion of arsenic in WDA soil and Duck Creek sediment and potential dermal contact with arsenic in Duck Creek sediment. The ELCRs for these receptors exceed the point of departure, but are within the acceptable risk range.

For the current or continued commercial/industrial use scenario, a blood lead concentration of 16.9 ug/dl (micrograms per deciliter or micrograms per 100 cubic centimeters) is predicted for women workers of childbearing age due to continuous exposure to Site-wide soil 0-2 feet bgs, exceeding the USEPA target level of 10 ug/dl. The primary contributor to this predicted blood lead concentration is soil in the WDA.

2.1.4.2 Future Land Use

Under future land use scenarios, including the possibility of residential use, hazard indices exceed the target level for construction workers and on-Site adult and child residents exposed to Site-wide soil 0-10 feet bgs. The primary risk driver for soil is potential dermal contact with antimony and thallium; however, antimony has been detected only twice and thallium only once in Site soils. For potential groundwater ingestion, hazard indices also exceed the target level for on-Site adult and child residents; the primary risk drivers for groundwater ingestion are benzene, TCE, and PCE.

All ELCRs are within the acceptable risk range except when considering the potential use of groundwater. For on-Site adult and child residents without groundwater use, risks exceed the point of departure, but are within the acceptable range (1 in 100,000 and 2 in 100,000, respectively). The primary risk driver for this case is potential dermal contact with, and ingestion of, arsenic in soil. For future on-Site adult and child residents, the ELCRs (7 in 10,000 and 4 in 10,000, respectively) associated with the ingestion of groundwater are unacceptable. The primary cancer risk drivers in groundwater are benzene, TCE, PCE, and arsenic. The BRA disclosed that potable use of groundwater is clearly the controlling factor for risk in the future use scenario (other than lead, discussed below).

For future residential use, an average blood lead concentration of 103 ug/dl is predicted for children aged 6 months to 7 years if continuously exposed to WDA soils 0-2 feet bgs. This exceeds the Center for Disease Control (CDC) Level of Concern of 10 ug/dl. For the stained soil/drainage culvert area, a blood lead concentration of 41.3 ug/dl was predicted for children aged 6 months to 7 years. This level also exceeds the 10 ug/dl Level of Concern. Excluding the WDA and stained soil/drainage culvert areas, which could be considered Site hot spots, the predicted blood lead concentration for the remaining Site-wide soils was 2.0 ug/dl for children aged 6 months to 7 years. This level is below the 10 ug/dl Level of Concern.

2.2 Risks to Ecological Receptors

An Ecological Risk Assessment (ERA) was performed for the Site to estimate the potential for adverse impacts to ecological receptors as a result of past disposal practices.

The ERA was based upon the following components:

- Site Characterization and Potential Receptors
- Selection of Chemicals, Species, and Endpoints for Risk Assessment
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization

The complete documentation of these components and the evaluation process can be found in Section 9.0 of the RI Report. The following paragraphs summarize the risks associated with various receptors in various ecological environments present on Site.

For the upland soils (i.e., 0-2 feet bgs in the WDA) concentrations of antimony, arsenic, copper, and lead exceeded Ecological Risk-Based Concentrations (ERBCs) for the meadow vole. Beryllium, chromium, copper, lead, tin, and zinc concentrations also exceeded ERBCs for the American robin in upland soils, and concentrations of lead exceeded the ERBC for the red-tailed hawk. Exceedances of the ERBCs are influenced primarily by elevated contaminant concentrations in soils of the WDA.

For wetland area sediments in cattail areas, concentrations of copper, lead, and tin exceeded ERBCs for the muskrat. Lead and tin concentrations exceeded ERBCs for the American woodcock and great blue heron. Ecotox Thresholds (taken as a Site-specific benchmark for the green frog) were exceeded for copper and lead by factors of over 20.

For Duck Creek surface water, copper and zinc concentrations exceeded Ecotox Thresholds. In Duck Creek sediment, arsenic concentrations exceeded the ERBC for the muskrat; arsenic, cadmium, and nickel concentrations exceeded Ecotox Thresholds.

3.0 FEASIBILITY STUDY

A Feasibility Study was conducted by the Site Respondents in order to define and analyze appropriate remediation alternatives. The Feasibility Study was conducted with oversight by Ohio EPA, and was approved on August 15, 2001. The Remedial Investigation and Feasibility Study were the basis for Ohio EPA's selected alternative.

3.1 Development of Preliminary Remediation Goals

PRGs are target cleanup concentrations for each contaminant in a given medium. The Site Respondents evaluated whether PRGs developed by USEPA Region 9 could be used as target cleanup concentrations for the contaminants and media found at the Site. Region 9's PRGs were evaluated because Region 5 has not developed PRGs. Region 9's PRGs are generic, risk-based concentrations for direct contact exposures. Region 9's PRGs may not address conditions and/or indirect exposure pathways existing at a particular site. Therefore, the Site Respondents also evaluated PRGs based on applicable or relevant and appropriate requirements (ARARs), ecological benchmarks for representative species, and background concentrations at the Site before establishing final cleanup concentrations. The final cleanup concentrations are based upon established risk goals for exposure pathways that have been identified at the Site.

PRGs for all affected media at the Site were developed in the FS Work Plan. The following is a summary of this process. Table 2 provides a summary of the PRGs for each contaminant in each medium.

3.1.1 Site Soils PRGs

Ohio EPA required the Respondents to propose VOC and SVOC leach-based PRGs for soils beneath the Plant Area, the WDA, the former UST area, the RCRA unit, and for soils at the edge of the wetlands. Ohio EPA also required the Respondents to propose PRGs for metals for the WDA and the Plant Area. During the development of the PRG values for metals, Ohio EPA agreed that leach-based PRGs for metals in soils are not required because the RI concluded that metals have not been detected in Site groundwater. Therefore, the PRGs selected for metals will be the lowest risk-based concentrations which are considered protective of both human receptors and ecological receptors, unless those concentrations are lower than Site background levels. If Site background levels are higher than the concentrations which are considered protective of both human and ecological receptors, the background levels will be selected as the PRGs. Similarly, the final PRGs selected for VOC and SVOC contaminants for which leach-based values are available, as well as risk-based values for human and ecological receptors, are the lowest of those values, unless those values are lower than Site background levels.

Concentrations provided in *Ohio EPA Derived Leach-Based Soil Values Technical Guidance Document* dated July 1996 were proposed as the leach-based PRGs for VOC and SVOC contaminants detected in Site soils. For those organic contaminants that do not have leach-based PRGs listed in the above-referenced document, the Ohio EPA approved use of a Weight-of-Evidence method for determining whether leach-based PRGs are necessary. The Weight-of-Evidence method was used to conclude that, if a contaminant was detected in soil but not groundwater, it had been demonstrated that the contaminant was not leaching; therefore, a leach-based PRG was not necessary for that contaminant. Leach-based PRGs were found to be necessary for four contaminants (bis(2-ethylhexyl)phthalate, di-n-octylphthalate, dichlorodifluoromethane, dichloromethane) that did not have PRGs established in the above-referenced Ohio EPA guidance. Leach-based PRGs are necessary for those contaminants because they were detected in groundwater. Ohio EPA approved the use of the Pennsylvania Act 2 soil-to-groundwater pathway concentrations as leach-based PRGs for those contaminants.

3.1.2 Groundwater PRGs

As directed by Ohio EPA, PRGs for Site groundwater are the USEPA MCLs or Action Levels for each contaminant.

3.1.3 Duck Creek Sediment PRGs

Of the metals detected in Duck Creek Sediments during RI sampling (arsenic, beryllium, cadmium, chromium, copper, lead, nickel, and zinc), only concentrations of arsenic, cadmium, and nickel exceeded the Ecotox Thresholds. In order to determine the background concentrations of these metals in Duck Creek sediment, additional sampling was performed for the FS. The PRG was then established as the higher of the background concentration or the respective Ecotox Threshold.

3.1.4 Wetland Area Sediment PRGs

Based on the wetland assessment, PRGs based on target ecological receptors are most appropriate for establishing cleanup levels in the cattail and non-cattail portions of the wetlands. During the FS approval process (as detailed in Appendix G of the FS Report), the muskrat and meadow vole were determined to be representative species for the cattail and non-cattail wetland habitats, respectively. Therefore, the PRGs for contaminants in these sediments are the ERBCs for the muskrat and meadow vole.

4.0 REMEDIAL ACTION OBJECTIVES

As part of the remedial investigation/feasibility study (RI/FS) process, remedial action objectives (RAOs) were developed in accordance with the National Contingency Plan, 40 CFR Part 300 (NCP) which was promulgated under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended , and USEPA guidance. The intent of the remedial action objectives is to set goals that a remedy should achieve in order to ensure the protection of human health and the environment. The goals are designed specifically to mitigate the potential adverse effects of Site contaminants present in environmental media. For environmental media, remediation levels were developed for a range of potential residual carcinogenic risk levels (i.e., 1 in 100,000, 1 in 1,000,000 etc.) and using a non-cancer hazard index of 1.0 for potentially exposed receptors, including:

- Grounds workers
- Construction workers
- Off-Site residents
- School-aged trespassers
- Children using Duck Creek for recreation
- Office employees
- Future construction workers
- Future adult residents
- Future child residents

Table 1 identifies the exposure pathways and media affecting each of these receptors, and summarizes the risk levels associated with each pathway. Carcinogenic risks are estimated as the unitless probability of an individual developing cancer over a lifetime as the result of exposure to the potential carcinogens related to the Site. Note that for any individual in the exposed population, this risk is in excess of the risk imparted to that individual by factors not related to the Site. (See Section 8.0 of the RI report for further discussion of Site-specific risks).

The remediation levels for human health were developed to ensure that remedial actions reduce the projected risk to humans to acceptable levels. The USEPA, through the NCP, defines acceptable Site remediation goals for known or suspected carcinogens to be concentration levels that represent an upper bound excess lifetime cancer risk, above that of the background, to an individual between 1 in 10,000 and 1 in 1,000,000 using information on the relationship between dose and response, with the 1 in 1,000,000 risk level as the point of departure. Likewise, noncarcinogenic risks are also to be reduced to an acceptable level. In a similar manner, ecological resources (e.g. wetlands, waters of the state, indicator (modeled) species) will also be protected.

The RAOs developed for the Site are as follows:

- Remediate or contain soil to prevent the migration of contaminants into groundwater;

- Remediate or contain upland soils to prevent the direct contact, ingestion, or inhalation of contaminants at levels which exceed human health or ecological risk-based levels;

- Remediate wetland sediment to prevent the direct contact or ingestion of contaminants at levels which exceed ecological risk-based levels;

- Prevent further expansion or off-Site migration of the groundwater contaminant plume and reduce contaminant concentrations in groundwater to achieve established cleanup goals;

- Monitor Duck Creek surface water and sediment to ensure that Site-related contaminants remain at levels below human health or ecological risk-based levels.

5.0 SUMMARY OF REMEDIAL ALTERNATIVES

A total of seventeen alternatives to address five separate media of concern were considered in the Feasibility Study (FS). A brief description of each medium and the major components of each remedial alternative are summarized in the following sections. More detailed information about these alternatives can be found in the Feasibility Study.

5.1 Western Disposal Area (WDA) and Plant Area Soils

The WDA soils contain elevated concentrations of lead, copper, and antimony which exceed PRGs. Although isolated detections of TCE above its PRG are present in the WDA, it is not considered the primary contaminant in this area. The Plant Area soils contain elevated lead concentrations which exceed the PRG. The following remedial alternatives were evaluated for the WDA and Plant Area soils.

5.1.1 No Action - FS Alternative 1 WDA/PA

- No remedial action planned for the WDA/Plant Area Soils; evaluated as a baseline scenario.

5.1.2 Institutional Controls - FS Alternative 2 WDA/PA

- Install security fence around the WDA;
- Add deed restrictions to prevent future construction or other activities in the WDA, and enforce current deed restrictions for the Site.

5.1.3 On-Site Containment - FS Alternative 3 WDA/PA

- Remove/excavate Plant Area soils which exceed the PRGs for metals and/or VOCs, and stained soils south of plant;
- Sample WDA soils to determine removal/capping limits for metals and TCE contamination;
- Transport and consolidate excavated soils and WDA soils within the WDA; grade soils to construct an optimized containment cell footprint in preparation for capping;
- Cap the WDA and other soils with a RCRA Subtitle C Hazardous Waste Cap; install fence to secure the capped area; maintain cap per regulations;
- Restore excavated plant areas;
- Add deed restrictions for prevention of future construction or other destructive activity in the WDA; enforce current deed restrictions.

5.1.4 Removal, On-Site Treatment, Off-Site Disposal - FS Alternative 5 WDA/PA

- Sample WDA soils to determine removal limits for metals and TCE contamination exceeding PRGs;
- Remove/excavate WDA and Plant Area soils exceeding PRGs for metals; excavate stained soils south of plant; restore excavated areas;
- For soils exceeding PRGs for metals, ex situ stabilization to non-hazardous levels as measured by Toxicity Characteristic Leaching Procedure (TCLP) analysis;
- Dispose of stabilized WDA soils and stained soils off-Site at a Subtitle C landfill, provided that Land Disposal Requirement (LDR) values are met;
- Dispose of Plant Area soils at a Subtitle D landfill provided LDR values are met;
- Enforce current deed restrictions.

5.2 Duck Creek Sediment

Sampling of Duck Creek sediment performed for the FS indicated that the mean concentrations of arsenic, cadmium, and nickel do not exceed the established PRGs. While some individual samples contained slightly elevated concentrations of arsenic and nickel, these values are not significantly greater than the corresponding PRGs. The following remedial alternatives were evaluated for Duck Creek sediment.

5.2.1 No Action - FS Alternative 1 DC

- No remedial action planned for Duck Creek sediment; evaluated as a baseline scenario.

5.2.2 Long-Term Monitoring - FS Alternative 2 DC

- Semi-annual sediment sampling for years 0-2, annual sampling for years 3-5;
- Semi-annual surface water sampling for years 0-2,annual sampling for years 3-5;
- Decision for further monitoring based on results of first five years of sediment and surface water sampling.

5.3 Wetland Sediments

Wetland area sediments contain elevated concentrations of copper, lead, and tin. The wetland contains both cattail and non-cattail areas. The PRGs for these areas were selected based upon the muskrat and meadow vole, respectively, as the target (indicator) species. The following remedial alternatives were evaluated for the wetland sediments.

5.3.1 No Action - FS Alternative 1 Wetland

- No remedial action planned for wetland sediments; evaluated as a baseline scenario.

5.3.2 Removal, On-Site Disposal within WDA - FS Alternative 3 Wetland

- Sample wetland sediment to determine removal limits;
- Excavate, dewater, and transport sediments for consolidation within the WDA;
- Restore and re-establish vegetation in excavated areas.

5.3.3 Removal, Off-Site Disposal - FS Alternative 4 Wetland

- Sample wetland sediment to determine removal limits;
- Excavate, dewater, and transport sediments to an off-Site landfill;
- Restore and reestablish vegetation in excavated areas.

5.4 Soluble Oil (SO) Line and Vapor Degreaser Soils

These soils are located beneath the GVI facility building and contain elevated concentrations of VOCs (primarily TCE, PCE). The PRGs were established using leach-based soil concentrations.

The Feasibility Study identified and screened several potential in situ remedial technologies for addressing the SO Line and Vapor Degreaser Soils, as described below.

Methane injection and co-metabolism is a process intended to promote and accelerate the aerobic degradation of VOCs via co-metabolic microbial processes. The process is innovative, and current technical literature has documented successful applications of this technology at some sites under favorable conditions. However, the injection of gas into the low-permeability soil might not prove successful at this site. The process also presents significant safety issues, involving the injection of an explosive gas beneath an operating facility. Based upon these limitations, this technology was not retained for further evaluation.

Soil vapor extraction (SVE) was also screened for potential application to these soils. Through the use of vacuum-extraction wells installed within or near an impacted soil area, SVE can remove VOC-laden soil vapor and promote additional volatilization of VOCs from the soil to the vapor phase. SVE is generally limited, however, by the ability of the soil to allow air flow through the pore space - a property known as intrinsic permeability. The RI indicated that soil permeability for the Site soils is in the range of 2.0×10^{-6} to 2.7×10^{-7} cm/sec, which indicates conditions that would severely restrict the flow of air. Based upon a review of USEPA guidance, this range of permeability was considered unfavorable for effective application of SVE. In addition, the added difficulties of installing and constructing an effective system within the confines of the active manufacturing areas were considered. Based upon these issues, SVE was not retained for further evaluation.

The third technology identified and screened in the FS was the application of a hydrogen-release compound to stimulate anaerobic microbial activity which, in turn, can produce reductive dechlorination and breakdown of VOCs. The compound is typically injected under pressure as a slurry or semi-viscous liquid. With the low permeability soils present beneath the facility, the effective delivery of this compound into the target areas would likely require an extensive array of injection points. The installation of such an array would prove difficult or non-attainable, given the areas involved and the potential impact to the manufacturing line and other facility operations. There would also be a potential for the injection process and the resulting hydraulic head to provide a driving force capable of mobilizing additional VOCs from the soil medium to the underlying groundwater. Because of the difficulties presented, this alternative was not retained for further evaluation.

As described above, three in situ technologies were evaluated for addressing the SO Line and Vapor Degreaser Soils. Unfavorable soil characteristics, safety concerns, and general accessibility issues posed by the active facility resulted in these alternatives being eliminated from further evaluation. An additional alternative for addressing SO Line and Vapor Degreaser Soils was evaluated by Ohio EPA during the process of preparing the Preferred Plan and Decision Document. The alternative consists of the excavation and off-Site disposal of soils that exceed the leaching-based PRGs. The alternative was included to provide an active remedial option for addressing these soils.

The following alternatives were retained for additional evaluation. Each alternative is described in more detail in Section 6.

5.4.1 No Action - FS Alternative 1 SO/VD

- No remedial action planned for SO Line and Vapor Degreaser Soils; evaluated as a baseline scenario.

5.4.2 Institutional Controls - FS Alternative 2 SO/VD

- Enforce current deed restrictions;
- Add deed restrictions regarding the performance of a Focused Feasibility Study (FFS) when the building is removed;
- Monitor groundwater for potential future impact from contaminated soils.

5.4.3 Excavation and Off-Site Disposal - Alternative 3 SO/VD

- Enforce current deed restrictions;

- Utilize the GVI facility building and loading dock as temporary control measures to prevent exposure and leaching of VOCs from soil at the SO Line, Vapor Degreaser, and loading dock areas;

- Upon future removal of the facility building and/or loading dock, excavate and remove soils that exceed leaching-based PRGs; alternatively, evaluate and potentially implement other remediation technologies or actions that will achieve the RAO's and equally protect the environment.

- Dispose of the excavated soils at a Subtitle C landfill, provided that Land Disposal Requirement (LDR) values are met.

5.5 Groundwater

Groundwater, present in both alluvium and bedrock at the Site, contains concentrations of VOCs above PRGs. The following remedial alternatives were evaluated for groundwater.

5.5.1 No Action - FS Alternative 1 GW

- No remedial action planned; evaluated as a baseline scenario.

- Discontinue operation of interim groundwater recovery and treatment system;

- Enforce current deed restrictions.

5.5.2 Continued Operation of Interim System - FS Alternative 2 GW

- Continue pumping from on-Site wells, as well as monthly operation, maintenance, and performance sampling of treatment system;

- Sample select monitoring wells on an annual basis;

- Install and operate additional recovery pumps in existing wells, for additional removal efficiency, if necessary;

- Periodically evaluate effectiveness of pumping system to determine long-term benefits and determine if natural attenuation is sufficient to attain long-term goals;

- Enforce current deed restrictions.

5.5.3 Enhanced Monitoring with Interim System - FS Alternative 3GW

- Implement expanded groundwater natural attenuation monitoring plan, to determine the rate at which contaminants are undergoing biodegradation;

- Continue operation, maintenance, and performance monitoring of current interim system;
- Enforce current deed restrictions.

5.5.4 Enhanced Monitoring with Expanded System - FS Alternative 3a GW

- Implement expanded groundwater natural attenuation monitoring plan;
- Install additional groundwater pumping components (e.g., additional wells) as determined during the design phase;
- Continue operation, maintenance, and monitoring of the expanded pumping system;
- Discontinue pumping system operation after an acceptable time frame;
- Enforce current deed restrictions.

5.5.5 Enhanced Monitoring with Phytoremediation, Interim System - FS Alternative 4 GW

- Install a plot of poplar (or other appropriate) trees downgradient of the contaminant plume. The trees would be utilized for the high rates of groundwater uptake through the root systems, and would serve as additional protection to Duck Creek from potential seepage of VOC-impacted groundwater.
- Implement expanded groundwater natural attenuation monitoring plan;
- Continue operation, maintenance, and monitoring of the current pumping system;
- Discontinue pumping system operation after an acceptable time frame;
- Enforce current deed restrictions.

5.5.6 Enhanced Monitoring with In-Situ Enhancements, Interim System - FS Alternative 5 GW

- Injection of Hydrogen Release Compound (HRC™), or similar, to enhance anaerobic degradation of chlorinated VOCs;
- Implement expanded groundwater natural attenuation monitoring plan;
- Continue operation, maintenance, and monitoring of the current pumping system;
- Discontinue pumping system operation after an acceptable time frame;
- Enforce current deed restrictions.

6.0 COMPARISON AND EVALUATION OF ALTERNATIVES

6.1 Evaluation Criteria

In selecting the remedy for this Site, Ohio EPA considered the following eight criteria as outlined in U.S. EPA's National Contingency Plan (NCP) promulgated under CERCLA (40 CFR 300.430):

1. Overall protection of human health and the environment - Remedial alternatives shall be evaluated to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site;

2. Compliance with ARARs - Remedial alternatives shall be evaluated to determine whether a remedy will meet all of the applicable or relevant and appropriate requirements under State and Federal environmental laws;

3. Long-term effectiveness and permanence - Remedial alternatives shall be evaluated to determine the ability of a remedy to maintain reliable protection of human health and the environment over time, once pollution has been abated and RAOs have been met. This includes assessment of the residual risks remaining from untreated wastes, and the adequacy and reliability of controls such as containment systems and institutional controls;

4. Reduction of toxicity, mobility, or volume through treatment - Remedial alternatives shall be evaluated to determine the degree to which recycling or treatment is employed to reduce toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site;

5. Short-term effectiveness - Remedial alternatives shall be evaluated to determine the following: (1) Short-term risks that might be posed to the community during implementation of an alternative; (2) Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures; (3) Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and (4) Time until protection is achieved;

6. Implementability - Remedial alternatives shall be evaluated to determine the ease or difficulty of implementation and shall include the following as appropriate: (1) Technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy; (2) Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions); and (3) Availability of services

and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and the availability of prospective technologies;

7. Cost - Remedial alternatives shall evaluate costs and shall include the following: (1) Capital costs, including both direct and indirect costs; (2) Annual operation and maintenance costs (O&M); and (3) Net present value of capital and O&M costs; The cost estimates include only the direct costs of implementing an alternative at the Site and do not include other costs, such as damage to human health or the environment associated with an alternative. The cost estimates are based on figures provided by the Feasibility Study;

8. Community acceptance - Remedial alternatives shall be evaluated to determine which of their components interested persons in the community either support (accept), have reservations about, or oppose.

Evaluation Criteria 1 and 2 are threshold criteria required for acceptance of an alternative that is expected to accomplish the goal of protecting human health and the environment and comply with the law. Any acceptable remedy must comply with both of these criteria. Evaluation Criteria 3 through 7 are the balancing criteria for selecting the best remedial alternatives. Evaluation Criteria 8, community acceptance, was determined, in part, by written responses received during the public comment period and statements offered at the public meeting.

6.2 Analyses of Evaluation Criteria

This section examines how each of the evaluation criteria is applied to each of the remedial alternatives found in Section 5.0 and compares how the alternatives achieve the criteria.

6.2.1 Western Disposal Area (WDA) and Plant Area Soils

6.2.1.1 Overall Protection of Human Health and the Environment

This criteria can be met by the *On-Site Containment* and the *Removal, On-Site Treatment and Off-Site Disposal* alternatives. Both alternatives would serve to prevent direct contact with contaminants by human and ecological receptors. The *Institutional Controls* alternative would minimize direct human contact with contaminants in the WDA, but would not reduce the lead risks for women workers with potential exposure to Plant Area soils. The alternative also would not prevent exposure of the ecological receptors to metals found in the WDA and Plant Area soils. The *No Action* alternative does not meet this criteria, as it would not prevent human or ecological receptor contact with soils contaminated with metals above PRGs.

6.2.1.2 Compliance with Applicable Requirements

Both *On-Site Containment* and *Removal, On-Site Treatment and Off-Site Disposal* would comply with applicable Federal and State regulatory requirements. *On-Site Containment* would require a RCRA Subtitle C cap. *Removal, On-Site Treatment and Off-Site Disposal* would require disposal of contaminated soil in a Subtitle C facility - TCLP requirements would apply to the WDA and Plant Area soils for off-Site disposal, in order to meet LDRs.

For *Institutional Controls* and *No Action*, deed restrictions which govern future property use or activities within the areas of contamination must meet legal requirements for equitable servitudes and enforceability. However, these alternatives would not meet requirements for closure of waste disposal units.

6.2.1.3 Long-Term Effectiveness and Permanence

The *Removal, On-Site Treatment, and Off-Site Disposal* alternative permanently removes the contaminated materials from the Site, and does not require long term monitoring or maintenance to ensure effectiveness. *On-Site Containment* would provide an effective remedy, making use of a multi-media cap to prevent direct contact with contaminants and minimizing infiltration and the potential for contaminant leaching to groundwater. Properly designed and maintained caps have been used as a permanent remedy on a wide variety of sites, but require the appropriate long-term monitoring and maintenance. For consolidation and capping of soils within the WDA, adequate design and construction would be required to provide long-term erosion protection during flood events. *Institutional Controls,* through access and deed restrictions, would aid in restricting human exposure to contaminants, but would require an effective regulatory mechanism for ensuring compliance over the long term. Proper maintenance of the fencing preventing access to the WDA would be required. This alternative, however, would not prevent exposure of ecological receptors to WDA contaminants. The *No Action* alternative provides no long-term effectiveness or permanence.

6.2.1.4 Reduction of Toxicity, Mobility or Volume by Treatment

Removal, On-Site Treatment, and Off-Site Disposal is expected to reduce the mobility of contaminants through a soil stabilization process. Stabilization is a process which chemically binds, encapsulates, or otherwise alters contaminants to a more stable form which reduces the likelihood of contaminant release to the environment. There is no evidence, however, that this process would reduce the toxicity of the contaminants; there would also be an associated increase in volume of the soil materials. Neither *On-Site Containment* nor *Institutional Controls* would reduce toxicity, mobility or volume by treatment.

6.2.1.5 Short-Term Effectiveness

The *No Action* alternative would have no short-term risks for Site workers, the general public, or the environment. For the implementation of *Institutional Controls*, there would be some short-term risk for workers installing fencing around the WDA, involving potential contact with surface soils containing metals above PRGs. Due to the limited time frame required for installation of fencing, this alternative can quickly achieve short-term effectiveness in terms of preventing access and direct contact with WDA soils.

The estimated time frame for implementation of *On-Site Containment* is 4 to 6 months. During this time, excavation and consolidation of soils would create the potential for fugitive dust emissions, thus increasing short-term human health risks. In addition, the disturbance of soils and increased exposure to precipitation and flooding would create the potential for off-Site releases of contaminants. Potential short-term impacts associated with this alternative could be addressed through the appropriate controls for worker health and safety, water and sediment pollution, and air pollution.

The *Removal, On-Site Treatment, and Off-Site Disposal* alternative could be implemented in less than one year, yet has a greater level of short-term health risk than *On-Site Containment*, due to the additional handling required for mixing of soils and stabilizing agents. These activities create a greater potential for airborne as well as water-borne releases of contaminants. Off-Site transportation also has inherent risks of vehicular accidents and spills, as well as other safety risks related to noise and increased traffic volume. Potential short-term impacts associated with this alternative could be addressed through the appropriate controls for worker health and safety, water and sediment pollution, and air pollution.

6.2.1.6 Implementability

The *No Action* alternative is considered as a baseline for comparison with other alternatives, and has no remedial elements to be implemented. However, it does include the continuation of existing deed restrictions, and would require that these restrictions be effectively enforced. *Institutional Controls* would also require the enforcement of access and deed restrictions and, in addition, would require the installation of fencing around the WDA to prevent physical access and direct contact with contaminated soils. The installation of fencing can easily be implemented from a construction standpoint.

On-Site Containment would require the construction of a RCRA Subtitle C cap over the consolidated WDA and Plant Area soils. This alternative is readily implemented. Numerous qualified vendors are available for design and construction of the cap. The potential for flooding and wetlands protection would require special engineering consideration, including a hydraulic analysis of the flood plain, but should be adequately addressed by the appropriate design and erosion protection.

Removal, On-Site Treatment and Off-Site Disposal would require the performance of a treatability study to determine the effectiveness and optimum mixture for the stabilizing reagents. Ex situ stabilization is a proven technology for metals-contaminated soils, and is typically performed using a pugmill or other commercially available, ancillary equipment. There are many qualified vendors capable of implementing this process option, and the implementation time would likely be less than one year.

6.2.1.7 Cost

The net present worth costs, including capital and long-term operation and maintenance, for each of the four alternatives for WDA and Plant Area soils, are summarized as follows:

- No Action - $0;
- Institutional Controls - $372,000
- On-Site Containment - $1,316,900
- Removal, On-Site Treatment, Off-Site Disposal - $2,657,900

6.2.2 Duck Creek Sediment

6.2.2.1 Overall Protection of Human Health and the Environment

Neither the *Long-Term Monitoring* nor the *No Action* alternatives would change the current conditions of Duck Creek sediment, in which concentrations of arsenic and nickel slightly exceed the PRGs. *Long-Term Monitoring* would serve to identify any future increases in contaminant concentrations in sediment and surface water, thus allowing assessment of potentially adverse effects, and implementation of additional measures, if necessary.

6.2.2.2 Compliance with Applicable Requirements

Neither *Long-Term Monitoring* nor *No Action* would include performance of remedial activities that would involve compliance with ARARs.

6.2.2.3 Long-Term Effectiveness and Permanence

Long-Term Monitoring would provide for some degree of long-term effectiveness and permanence, in that it would serve to identify future increases in contaminant concentrations, and allow for the assessment and remediation of potentially adverse effects. The *No Action* alternative would not satisfy this criteria.

6.2.2.4 Reduction of Toxicity, Mobility or Volume by Treatment

Neither the *Long-Term Monitoring* nor the *No Action* alternatives have treatment components; therefore, there would be no associated reductions of toxicity, mobility, or volume of contaminants.

6.2.2.5 Short-Term Effectiveness

For *Long-Term Monitoring*, current conditions would be maintained. Sediment and surface water sampling would require only normal safety considerations. *No Action* would also provide short-term effectiveness, since the current concentrations of metals in sediment do not appear to be adversely affecting human or ecological receptors.

6.2.2.6 Implementability

The *No Action* alternative is considered as a baseline for comparison with other alternatives, and has no remedial elements to be implemented. *Long-Term Monitoring* can be readily implemented, and has no special administrative or technical requirements. Only routine safety considerations would be required during collection of sediment and surface water samples.

6.2.2.7 Cost

The net present worth costs, including capital and long-term operation and maintenance, for each of the two alternatives for Duck Creek Sediment, are summarized as follows:

- No Action - $0;
- Long-Term Monitoring - $39,600

6.2.3 Wetland Sediment

6.2.3.1 Overall Protection of Human Health and the Environment

Both the *Removal and On-Site Disposal* and the *Removal and Off-Site Disposal* alternatives would meet this criteria equally well. Through removal activities, both alternatives meet the remedial objective of preventing direct contact exposure of ecological receptors to sediments contaminated with metals above the PRGs. PRGs were based upon ecological risk-based concentrations (ERBCs) modeled for the muskrat in cattail areas and the meadow vole in non-cattail areas. There are no current risks to human health posed by the contaminants in the wetland sediment.

The *No Action* alternative would not affect human health risks, since minimal human health risks currently exist. However, this alternative would allow continued exposure of ecological receptors to contaminated sediments and vegetation. This exposure is predicted to cause chronic, adverse effects on indicator species (muskrat and meadow vole) populations over time.

6.2.3.2 Compliance with Applicable Requirements

Both of the *Removal* alternatives would result in large scale disruption and damage to the existing wetlands. Since the wetlands appear to meet the definition of Category 2 wetlands, under OAC 3745-1-54, proper restoration would be required. The activities fall under Nationwide Permit (NWP) No. 38, Cleanup of Hazardous and Toxic Waste, of Section 404 of the Clean Water Act. Prior to performance of either remedial alternative, a Section 404 permit from the Army Corps of Engineers and a Section 401 certification from Ohio EPA would be required. The *No Action* alternative would not include performance of remedial activities that would involve compliance with ARARs.

6.2.3.3 Long-Term Effectiveness and Permanence

Both of the *Removal* alternatives would meet this criteria equally well by assuring the removal of wetland sediments with metals concentrations exceeding the PRGs for ecological receptors. In conjunction with the on-Site containment or off-Site disposal of the WDA soils, there would also be a permanent elimination of the WDA as a source of metals contamination to the wetland area.

The *No Action* alternative does not include the performance of remedial activities. There may be a long-term decrease in the average contaminant concentrations in the wetland sediments, due to the deposition of clean sediments from upgradient drainage areas. However, the overall mass, toxicity, and mobility of the contaminants would not be expected to change significantly in the short- or long-term, with continuing exposure of ecological receptors to metals concentrations exceeding the PRGs.

6.2.3.4 Reduction of Toxicity, Mobility or Volume by Treatment

Removal and Off-Site Disposal might require ex situ stabilization in order to meet requirements at the disposal facility. Soil stabilization is a process which chemically binds, encapsulates, or otherwise alters contaminants to a more stable form which reduces mobility and the likelihood of contaminant release to the environment. This process may or may not reduce toxicity of the contaminants, and the stabilization process would likely produce an increased volume of soil materials. Neither the *Removal and On-Site Disposal* nor *No Action* alternatives would reduce toxicity, mobility or volume by treatment.

6.2.3.5 Short-Term Effectiveness

The *No Action* alternative would have no short-term risks for Site workers or the general public. Risks to ecological receptors would remain, however. Both of the *Removal* alternatives would result in significant disruption and damage to the existing wetland habitat. However, it is expected that the cattail areas in particular would quickly revegetate and the ecological balance in those areas would recover. The *Removal* alternatives would not be expected to create health and safety risks other than those associated with the use of construction equipment and the coordination of activities at an active industrial facility. Because the excavated materials would be moist or wet, dust generation would be minimal and would not create a significant risk of airborne contaminant migration. It is estimated that sediment removal and wetland restoration activities could be completed within a 3 to 6 month time frame.

6.2.3.6 Implementability

Both of the *Removal* alternatives would require pre-design sampling of the wetland area to establish the appropriate removal limits. Excavation activities may require specialized amphibious or low ground pressure excavation equipment. Silt fence or silt curtains may also be required to prevent the movement of suspended sediments into non-excavation areas. Although wetland sediment excavation may present some technical challenges, these alternatives can be readily implemented by qualified, experienced contractors.

Removal and On-Site Disposal would require the construction of a RCRA Subtitle C cap over the consolidated WDA and Plant Area soils, with adequate area to incorporate the excavated wetland sediments. Numerous qualified vendors are available for design and construction of the cap. Additional activities that might be required include the dewatering or stabilization of sediments prior to placement and incorporation into the WDA containment area. *Removal and Off-Site Disposal* would also require sufficient dewatering or stabilization of sediments to meet the requirements of the off-Site disposal facility, as well as to enable transport off-Site.

The *No Action* alternative is considered as a baseline for comparison with other alternatives, and has no remedial elements to be implemented.

6.2.3.7 Cost

The net present worth costs, including capital and long-term operation and maintenance, for each of the three alternatives for wetland sediments, are summarized as follows:

- No Action - $0;
- Removal and On-Site Disposal - $539,000
- Removal and Off-Site Disposal - $654,500

6.2.4 Soluble Oil (SO) Line and Vapor Degreaser Soils

6.2.4.1 Overall Protection of Human Health and the Environment

Neither the *Institutional Control* nor the *No Action* alternatives would result in the removal of VOC-contaminated soils from beneath the building or the loading dock areas. The *Excavation and Off-Site Disposal* alternative would result in permanent removal of the impacted soils and placement in a permitted Subtitle C landfill, which would provide the appropriate protection of human health and the environment.

In their current condition, the soils pose minimal risk for direct exposure to current, on-Site human or ecological receptors. In addition, the existing building and dock structures serve to reduce leaching potential, provided they are not removed and/or significantly altered. During a construction scenario beneath the building (e.g., to replace or install a utility) short-term exposure to workers would occur. However, an evaluation of this scenario using soil data from 0-12 feet bgs showed that this potential exposure would not exceed acceptable levels (i.e., Hazard Index less than 1, ELCR less than 1 in 1,000,000). Theoretical risks from vapor emissions into the building were also shown to be below applicable thresholds.

The risks associated with direct contact with soils primarily would affect potential future residents at the Site. However, the property is presently deed-restricted to prohibit residential, non-industrial, and non-commercial use. The use of *Institutional Controls,* through a deed notice, could also notify prospective buyers of the presence, nature, and extent of soil contamination beneath the facility building. The *No Action* alternative would assume continued enforcement of the current deed restrictions, but would not provide the deed notifications.

The RI concluded that groundwater beneath the facility exists only in the bedrock unit and does not rise into the impacted soil unit, thereby eliminating the exposure pathway for leaching to groundwater. Ohio EPA believes that this data is inconclusive and that leaching of soil contaminants to groundwater continues to represent a viable exposure pathway. A deed restriction currently in place prohibits the potable use of groundwater at the Site. Under the *No Action* and *Institutional Controls* alternatives, this deed restriction would continue to be enforced and human health related to ingestion of groundwater would remain protected. However, neither of these alternatives addresses the leaching pathway in the event that the facility is demolished or the soils are otherwise exposed. The *Excavation and Off-Site Disposal* alternative would provide for removal and proper disposal of the soils to prevent leaching under this scenario. It is possible that other remedial technologies might be available at such time that this scenario develops - technologies that could equally prevent leaching without necessitating removal of these soils. Ohio EPA will consider such technologies or methods that are properly evaluated and proposed by the Respondents.

6.2.4.2 Compliance with Applicable Requirements

Neither the *No Action* nor *Institutional Controls* alternatives require performance of remedial activities. Therefore, compliance with applicable State and Federal environmental laws would not be an issue. *Excavation and Off-Site Disposal* would require disposal of contaminated soil at a Subtitle C facility - TCLP requirements would apply to the SO Line and Vapor Degreaser soils for off-Site disposal, in order to meet LDRs.

6.2.4.3 Long-Term Effectiveness and Permanence

As discussed above, the Ohio EPA believes that the leaching of soil contaminants to groundwater will continue to represent a potential exposure pathway. Both the *No Action* and *Institutional Control* alternatives would be expected to prevent the future potable use of groundwater through enforcement of the current deed restriction. The long-term effectiveness and permanence of these alternatives would depend upon a reliable mechanism for enforcement.

As long as the facility building and the loading dock remain intact, there would be limited potential for future direct contact or exposure to VOC-contaminated soils, as well as limited leaching potential. In the event of facility demolition, however, only the *Excavation and Off-Site Disposal* alternative would permanently address the leaching pathway via soil removal. Neither the *Institutional Controls* nor *No Action* alternatives would provide an equally effective long-term remedy.

6.2.4.4 Reduction of Toxicity, Mobility or Volume by Treatment

The *No Action, Institutional Controls,* and *Excavation and Off-Site Disposal* alternatives do not include treatment components; therefore, there are no associated reductions of toxicity, mobility, or volume of contaminants.

6.2.4.5 Short-Term Effectiveness

Neither the *No Action* nor *Institutional Controls* alternatives would result in short-term risks associated with implementation. The estimated time frame for implementation of the *Excavation and Off-Site Disposal* alternative is 2 to 3 months. This activity creates a greater potential for airborne as well as water-borne releases of contaminants. Off-Site transportation also has inherent risks of vehicular accidents and spills, as well as other safety risks related to noise and increased traffic volume. Potential short-term impacts associated with this alternative could be addressed through the appropriate controls for worker health and safety, water and sediment pollution, and air pollution.

6.2.4.6 Implementability

The *No Action* alternative is considered as a baseline for comparison with other alternatives, and has no remedial elements to be implemented. VOC-contaminated soils would remain in place beneath the facility building and loading dock area. This alternative would rely on the long-term enforcement of the existing deed restriction, which prohibits non-industrial or non-commercial use of the property and prohibits potable use of groundwater.

Institutional Controls would also rely on the continued enforcement of the existing deed restrictions, but would add additional deed notifications related to the presence, nature, and extent of contaminated soils in the SO Line, Vapor Degreaser, and loading dock areas. These notifications could be readily implemented. This alternative, as originally contemplated in the FS, would incorporate an additional requirement for a future evaluation of remedial alternatives for SO Line, Vapor Degreaser, and loading dock soils in the event of facility demolition. However, this requirement could not be implemented through a deed restriction; rather, an operation and maintenance (O&M) plan would be a more appropriate mechanism. An O&M plan would be necessary to ensure the performance of, and financial assurance for, the study and remedy implementation. While this alternative could provide for the eventual implementation of a permanent remedy, the timeframe needed to evaluate and select a remedy could also result in unwanted exposure and leaching of VOCs from these soils.

Excavation and Off-Site Disposal is readily implementable, and would utilize common equipment for excavating, loading, and transporting soils to an off-Site disposal facility. Once the facility structure was removed, this alternative would require limited preparation and planning efforts prior to implementation.

6.2.4.7 Cost

The net present worth costs, including capital and long-term operation and maintenance, for each of the alternatives for SO Line and Vapor Degreaser Soils, are summarized as follows:

- No Action - $0;
- Institutional Controls - $9,300 (does not include cost for evaluation of a phased remedy or future remedy implementation);
- Excavation and Off-Site Disposal - $5,914,000 (estimate for management, engineering, design, characterization, excavation, transportation, and disposal).

6.2.5 Groundwater

6.2.5.1 Overall Protection of Human Health and the Environment

The groundwater contaminant plume at the Site currently exceeds PRGs for several VOCs. While natural attenuation appears to be limiting the migration of contaminants, there is the potential that the VOC plume could further migrate to downgradient receptors, including Duck Creek surface water, wetland waters, and off-Site human and ecological receptors. As presented in Section 5.5, six remedial alternatives were evaluated for addressing groundwater contamination at the Site. Each of these alternatives includes continued enforcement of the current deed restriction preventing potable use of Site groundwater.

The *No Action* alternative relies only on the enforcement of the ground water use restriction, and would include discontinuing the operation of the interim pump-and-treat system. While on-Site human health risks would be minimized through this use restriction, there would no longer be an active mechanism for plume containment or source reduction, and there would not be continued monitoring of the nature and extent of the plume. This alternative would not meet PRGs or provide protection of the environment.

The *Continued Operation of Interim System* and *Enhanced Monitoring with Interim System* alternatives would both rely on the existing pump-and-treat system to provide some hydraulic containment near the primary VOC source areas (SO Line, RCRA sand filter beds, UST areas). Both would utilize groundwater monitoring of sufficient frequency and scope to track the areal distribution of contaminants and the contaminant levels in individual wells. For the *Enhanced Monitoring with Interim System* alternative, the measurement and/or analysis of MNA parameters would be added to the sampling program. The installation of additional monitoring wells might also be required to collect data in the appropriate locations for accurately measuring natural attenuation processes. This alternative would provide a means to track contaminant levels and also would provide data that might be used to calculate degradation rates and projections for future plume concentration, extent, etc. Both alternatives would provide some degree of containment and monitoring. However, neither alternative would be expected to provide additional protection to off-Site human or ecological receptors, other than the monitoring of plume extent.

The alternatives for *Enhanced Monitoring with Expanded System* and *Enhanced Monitoring with Phytoremediation and Interim System* would each provide added removal of contaminants and additional protection to prevent or limit off-Site migration of contaminants to human or ecological receptors. The *Expanded System* would provide added source area removal through expansion of the recovery well network, while *Phytoremediation* would provide additional uptake of contaminated groundwater in areas with potential discharge to Duck Creek. However, the *Phytoremediation* component would provide a less effective mechanism during the winter season due to the dormant state of the trees.

The alternative for *Enhanced Monitoring with In-Situ Enhancements and Interim System* incorporates the addition or injection of compounds (e.g. HRC™) which can enhance the biodegradation rates for chlorinated compounds in groundwater. Under favorable conditions, the enhanced rates of biodegradation can be much more effective at source reduction than groundwater pumping, particularly in low permeability units where diffusion often becomes the limiting factor for contaminant removal through pumping. If effective, this alternative can provide added protection through source removal, reduction of contaminant plume concentrations, and the reduction in potential risks to off-Site human or ecological receptors. This alternative is the most likely to meet groundwater PRGs.

6.2.5.2 Compliance with Applicable Requirements

Of the six alternatives evaluated for groundwater, only two would require additional steps to be taken for compliance with applicable requirements. For the *Enhanced Monitoring with Expanded System* alternative, additional system components (e.g., recovery wells, piping, treatment) would be installed in accordance with State and Federal regulatory requirements, and the existing permit would be modified to include the new components. The alternative for *Enhanced Monitoring with In-Situ Enhancements and Interim System* would utilize the injection of HRC™ or similar compounds, and thus would require conformance with State regulations regarding injection into Class V wells.

6.2.5.3 Long-Term Effectiveness and Permanence

Alternatives which provide source control and removal, as well as long-term groundwater monitoring, would provide some degree of long-term effectiveness and permanence. The alternatives for *Continued Operation of Interim System, Enhanced Monitoring with Interim System, Enhanced Monitoring with Phytoremediation and Interim System, Enhanced Monitoring with Expanded System,* and *Enhanced Monitoring with In Situ Enhancements and Interim System* each would provide long-term groundwater monitoring to track the areal extent and concentrations within the VOC plume. Each of these five alternatives would continue the operation of the existing pump-and-treat system or an expanded system. While groundwater pumping serves to remove contaminants near source areas, the low conductivity of the alluvium and bedrock results in low pumping rates as well as a limited zone of capture around each recovery well. For the *Enhanced Monitoring with In Situ Enhancements and Interim System* alternative, the injection of HRC™ or similar compounds has the potential to achieve a relatively rapid reduction of contaminants in source areas through enhanced biodegradation. If the delivery process were to be proven effective, this alternative could provide a much higher degree of long-term effectiveness and permanence than other alternatives.

6.2.5.4 Reduction of Toxicity, Mobility or Volume by Treatment

With the exception of the *No Action* alternative, all groundwater alternatives result in some degree of reduction of toxicity, mobility, or volume by treatment. The five alternatives for utilizing the existing or an expanded pump-and-treat system would reduce toxicity and mobility by removing contaminated groundwater in source areas. A reduction in volume would also be provided by the concentration of contaminants within the activated carbon of the adsorption system. The carbon would either be disposed of or treated off-Site (via hazardous waste landfill or hazardous waste incinerator) or regenerated off-Site in accordance with applicable regulations.

The alternative for *Enhanced Monitoring with In Situ Enhancement and Interim System*, if effective, would provide additional reduction in toxicity, mobility, and volume through enhanced biodegradation and the resulting breakdown of VOCs to otherwise harmless by-products.

6.2.5.5 Short-Term Effectiveness

All groundwater alternatives rely upon the existing deed restriction to prevent potable use of groundwater at the Site. The *No Action* alternative involves no remedial activities, and would pose no short-term risks to the community, on-Site workers, or the environment. The *Continued Operation of Interim System* and *Enhanced Monitoring with Interim System* alternatives include future groundwater sampling to monitor the VOC plume, but the sampling activities would not require special health or safety considerations beyond those normally involved.

The alternative for *Enhanced Monitoring with Expanded System* would require additional remedial activities in the form of additional well installation, piping installation, and treatment system modification. These activities would create short-term concerns related to the health and safety of remediation contractors and GVI facility workers during implementation. The alternative for *Enhanced Monitoring with Phytoremediation and Interim System* would present a short-term impact to existing habitat related to clearing of trees and brush in preparation for planting of the poplar trees. The construction component of this alternative would also create short-term concerns related to health and safety of contractors and GVI workers during implementation. The alternative for *Enhanced Monitoring with In Situ Enhancements and Interim System* would require pilot and bench scale studies to determine the appropriate parameters for injection of compounds to enhance biodegradation. Implementation of this alternative would involve additional remedial activities, including injection point installation, which would present health and safety issues for contractors as well as GVI workers. However, these concerns would be manageable through an effective worker health and safety program.

6.2.5.6 Implementability

The *No Action* alternative for groundwater represents a baseline for comparison, and involves no implementation other than discontinuing operation of the interim system.

Under the *Continued Operation of Interim System* and *Enhanced Monitoring with Interim System* alternatives, the current conditions at the Site would be maintained. Operation and maintenance of the pump-and-treat system would continue on a monthly basis. Potential future malfunctions could be repaired and replacement parts would be readily available. Activated carbon adsorption is a proven technology, and the performance of these systems is predictable and requires minimal oversight. MNA is a passive process which involves no additional remedial activities for implementation. The Feasibility Study indicated that MNA processes are currently occurring at the Site, though the long-term degradation rates for chlorinated compounds are uncertain. Both the current and expanded sampling programs could be readily implemented.

The *Enhanced Monitoring with Expanded System* alternative would involve installation of additional wells, pumps, and treatment capacity to provide localized containment and removal of contaminant hot spots. Vendors, equipment, and materials to implement this alternative would be readily available. However, the ability of newly installed wells to remove adequate quantities of water is uncertain, due to the low hydraulic conductivity of the alluvium and bedrock units.

The alternative for *Enhanced Monitoring with Phytoremediation and Interim System* would involve planting of poplar trees to provide an enhancement to MNA and as an additional protection against VOC migration (via groundwater seepage) to Duck Creek. The vendors, equipment, and materials required to implement the alternative would be readily available. The clearing of existing trees and vegetation in the designated phytoremediation area could be readily accomplished. Planning considerations for this alternative would include determination of the specific spacing and number of trees to be utilized, as well as coordination with remedial activities occurring in the adjacent WDA. Continued operation of the interim pump-and-treat system would not be difficult to implement, as discussed above.

The alternative for *Enhanced Monitoring with In-Situ Enhancements and Interim System* would utilize a series of injection points for delivering compounds to enhance biodegradation of chlorinated VOCs. Pilot and bench scale studies would be required to determine the appropriate number of injection points, quantity and type of enhancement materials to achieve the remedial objectives. Due to the low conductivity of alluvium and bedrock materials, delivery and dispersion of the materials may be impeded and may require multiple rounds of injection. Proper pilot and design studies may be able to overcome these difficulties. Hydrogen Release Compound (HRC) is a proprietary polylactate ester that is available as an injectable, moderately fluid liquid or as an implantable hard gel. The use of this product or similar products is a proven technology for enhancing the biodegradation of chlorinated VOCs. Vendors, equipment, and materials for implementation of this alternative would be readily available.

6.2.5.7 Cost

The net present worth costs, including capital and long-term operation and maintenance, for each of the alternatives for groundwater, are summarized as follows:

- No Action - $0;
- Continued Operation of Interim System - $1,091,500;
- Enhanced Monitoring with Interim System - $1,264,800;
- Enhanced Monitoring with Expanded System - $1,330,200
- Enhanced Monitoring with Phytoremediation and Interim System - $1,355,600
- Enhanced Monitoring with In-Situ Enhancements and Interim System - $1,525,400

6.3 Community Acceptance

Ohio EPA received comments from interested parties during the public comment period and at the public meeting held at the Caldwell Public Library on October 2, 2003. Those comments and Ohio EPA's responses are included in the Responsiveness Summary.

7.0 SELECTED REMEDIAL ALTERNATIVE

The selected remedial alternative addresses contamination in surface and subsurface soils, wetland sediments, Duck Creek sediments, and groundwater.

The WDA and Plant Area soils, as well as wetland sediments, will be consolidated and covered in the WDA using a hazardous waste (RCRA) cap. This action includes the components of FS *Alternative 3 WDA/PA* and *Alternative 3 Wetland*. Using the elements of *Alternative 2 DC*, Duck Creek sediments will be the focus of long-term monitoring to detect potential increases in Site-related contaminants.

In addressing the impacted soils of the SO Line, Vapor Degreaser, and loading dock areas, an important factor is the presence of the Dana-Glacier Vandervell manufacturing line that currently operates at the facility. This operation and the associated equipment severely limit access to impacted areas of soil beneath the structure. In selecting an appropriate remedy for these soils, Ohio EPA has recognized the importance of minimizing both short-term and long-term impact to the manufacturing operations as well as addressing the leaching potential from contaminated soils.

Soils of the SO Line, Vapor Degreaser, and loading dock areas will be addressed using *Alternative 3 SO/VD* to provide a phased remedy. The initial phase will utilize the facility structure and loading dock as temporary engineering controls to prevent infiltration of precipitation and potential leaching of contaminants to groundwater. An operation and maintenance (O&M) plan will be implemented to monitor and maintain the effectiveness of these controls while the facility is actively used for industrial or commercial purposes. When the facility building and/or loading dock areas are removed in the future, the second phase of the remedy will require excavation and off-Site disposal of soils where contamination exceeds the leach-based cleanup level. Given the extended time frame that may be involved, it is conceivable that a technology for effective in situ treatment or remediation of the SO/VD soils could be developed prior to the "triggering" of the second phase. At such time, Ohio EPA is willing to examine other remedial options that may be evaluated and proposed by the Respondents. Due to the phased nature of this remedy, the Respondents will be required to provide an adequate level of financial assurance for future implementation of the second phase.

Groundwater contamination will be addressed using *Alternative 3a GW*. The remedy will utilize an expanded groundwater recovery system to provide for additional source control or removal. USEPA's OSWER Directive 9200.4-17P, "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites", emphasizes the importance of source controls to ensure timely attainment of remediation objectives. For this Site, Ohio EPA considers the expansion of the groundwater recovery system in key areas of the plume to be an appropriate level of effort for affecting source reduction. The remedy will also include an expanded groundwater monitoring plan to measure natural attenuation parameters, and will require the enforcement of existing deed restrictions preventing potable use of on-Site groundwater. SO Line soils, Vapor Degreaser soils, and additional soils beneath the loading dock will be addressed as contaminant source areas through future excavation and off-Site disposal, if they become exposed and/or subject to leaching.

Brief descriptions of the remedial alternatives selected for each medium are presented below.

7.1 Surface Soils

Ohio EPA's selected alternative for addressing metals and VOC contamination in surface soils is On-Site Containment. Under this alternative, Plant Area soils and additional areas of isolated soil contamination which exceed PRGs for metals and VOCs will be excavated and transported to the WDA. WDA soils will be sampled and analyzed for metals and TCE to determine removal and capping limits. All soils consolidated within the WDA will be graded to the appropriate contours, and a RCRA Subtitle C Hazardous Waste Cap will be constructed over the soils. Excavated plant areas will be properly restored and a security fence will be installed to secure the capped area. Additional deed restrictions will be imposed to prevent future construction or other destructive activities on the capped area.

Performance Standards

- To excavate, consolidate, and contain, through capping, WDA and Plant Area soils that exceed either human or ecological PRGs for metals and TCE, and to provide confirmatory sampling to document achievement of this standard.
- To minimize impact to the existing wetland area, both during and following construction of the containment cell, using best available engineering methods and construction practices.
- To construct a RCRA Subtitle C Hazardous Waste Cap which will meet the appropriate regulatory standards of design and construction, including a 24-inch layer of compacted clay with maximum permeability of 1×10^{-7} cm/sec (or equivalent geosynthetic clay liner), as well as a flexible membrane liner with a minimum 40 mil thickness. Ensure that all components of cap design and installation are approvable by Ohio EPA.
- To implement a long-term O&M program which will preserve the integrity of the cap, such that the cap will successfully pass regularly scheduled inspections during the O&M period.

7.2 Subsurface Soils

As discussed above, Ohio EPA's remedial alternative for subsurface soils has been selected with the goal of minimizing impact to ongoing manufacturing operations at the Site while addressing the leaching pathway. The selected alternative will utilize the facility structure and loading dock as temporary engineering controls to prevent infiltration of precipitation and leaching of VOCs from the SO Line, Vapor Degreaser, and loading dock soils to groundwater. An operation and maintenance (O&M) plan will be implemented to ensure the continued protectiveness of the remedy. The O&M plan will stipulate that, if the facility building and/or loading dock are removed at a future time, the second phase of the remedy will be implemented to excavate and dispose of the underlying soils at an Ohio EPA-approved off-Site facility. Alternatively, as discussed in Section 7.0, Ohio EPA will be open to the consideration of other remedial options that may be technically feasible and equally effective at that time.

Performance Standards

- To utilize the facility building and loading dock areas as engineering controls for preventing exposure of soils where contaminants exceed the PRGs for leaching to groundwater.

- To implement an O&M program for providing periodic inspection and evaluation of the engineering controls, reporting, and taking appropriate corrective action, when needed.

- In the event of removal of the facility building or loading dock, implement the second phase of the remedy for removal and off-Site disposal of all soils where contaminants exceed the PRGs for leaching to groundwater.

- Record at the Noble County Recorder's office a declaration that serves to notify prospective buyers of the property of the presence of soil contamination beneath the facility building and loading dock areas.

7.3 Wetland Sediments

Ohio EPA's selected alternative for wetland sediments is Removal and On-Site Disposal in the WDA. Under this alternative, wetland area sediments impacted by copper, lead, and tin will be sampled to establish removal limits based upon the ERBCs for the muskrat and meadow vole as representative ecological receptors. Sediments will be excavated, transported to the WDA, and consolidated with Plant Area and WDA soils. The consolidated materials will be contained using a RCRA Subtitle C Hazardous Waste Cap as described in Section 7.1. Excavated wetland areas will be restored and vegetation re-established.

Performance Standards

- To excavate and remove wetland sediments containing copper, lead, and tin that exceed the ERBCs for the muskrat and meadow vole (as documented in the Feasibility Study), and to provide confirmatory sampling to document achievement of this standard.

- To restore vegetation and surface water features in excavated areas to pre-remediation conditions.

7.4 Duck Creek Sediments

Ohio EPA's selected alternative for Duck Creek sediments is Long-Term Monitoring. This alternative will include the sampling of surface water and sediments from the portion of Duck Creek adjacent to the Site, as well as from background locations. Sampling will be performed semiannually for the first two years of implementation, followed by annual sampling for the next three years. Samples will be analyzed for the metals antimony, arsenic, cadmium, copper, lead, nickel, and tin. If metals concentrations adjacent to the Site remain at levels less than two times the background concentrations, additional sampling (beyond five years) will not be required.

Performance Standards

- To sample surface water and sediments in Duck Creek on a semiannual basis for years 0-2, and an annual basis for years 3-5. Semi-annual events will be performed during April and October. Annual events will be performed during October.

- Analyze all samples for antimony, arsenic, cadmium, copper, lead, nickel, and tin.

- To provide sampling summary reports, including analytical and statistical data, to Ohio EPA.

7.5 Groundwater

Ohio EPA's selected alternative for VOC-contaminated groundwater at the Site includes an Expanded Groundwater Recovery System, consisting of additional recovery wells, to provide additional removal and treatment of contaminants near the core of the groundwater plume. Coupled with this increase in mass removal will be an Enhanced Monitoring program that will not only assess contaminant concentrations within the plume, but will also measure key parameters necessary to determine the effectiveness and rate of the natural attenuation process.

Performance Standards

- To substantially increase the removal rate of contaminated groundwater near the higher-concentration areas of the plume. At this Site, a "substantial increase" is considered to be a minimum one order of magnitude increase in the pumping rate currently achieved by the interim pumping system (0.2 gpm). It is expected that this increase can be affected through the installation of 6-8 additional groundwater recovery wells of a design that is optimized for the Site-specific hydrogeology and plume configuration.

- To implement an expanded groundwater monitoring program of sufficient scope to track and assess natural attenuation at the Site. This monitoring will provide analytical data showing the extent and concentration of VOC contaminants within the groundwater plume, as well as additional chemical or hydraulic data relevant to determining plume characteristics. Monitoring will be performed from a quarterly to semiannual frequency for the initial 5 years of implementation, and will be performed no less than annually for subsequent years thereafter. Annual groundwater monitoring reports will be required to document the progress of the remedy. Additional details and scope of the monitoring program will be developed during the remedial design phase.

- To provide effective long-term monitoring and enforcement of the current deed restriction that prevents potable use of Site groundwater.
- To ensure that groundwater along any portion of the downgradient property line continuously meets MCLs for any Site-related contaminant of concern.
- To achieve MCLs for Site-wide groundwater, as measured by any and all on-Site or off-Site monitoring wells, within 30 years.

8.0 GLOSSARY

Aquifer -	An underground geological formation capable of holding and yielding water.
Baseline Risk Assessment -	An evaluation of the risks to humans and the environment posed by a site.
Carcinogen -	A chemical that causes cancer.
CERCLA -	Comprehensive Environmental Response, Compensation and Liability Act. A federal law that governs cleanup of hazardous materials sites under the Superfund Program.
CFR -	Code of Federal Regulations.
Decision Document -	A statement issued by the Ohio Environmental Protection Agency giving the Director's selected remedy for a site and the reasons for its selection.
Ecological Receptor -	Animals or plant life exposed to chemicals released from a site.
Exposure Pathway -	Route by which a chemical is transported from the site to a human or ecological receptor.
Feasibility Study -	A study conducted to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented to a decision-maker and an appropriate remedy selected.
Hazardous Substance -	A chemical that may cause harm to humans or the environment.
Hazardous Waste -	A waste product, listed or defined by the RCRA, which may cause harm to humans or the environment.
Human Receptor -	A person exposed to chemicals released from a site.
NCP -	National Contingency Plan. The framework for remediation of hazardous materials sites specified in CERCLA.

O&M -	Operations and Maintenance. Those long-term measures taken at a site, after the initial remedial actions, to assure that a remedy remains protective of human health and the environment.
Preferred Plan -	The plan chosen by the Ohio EPA to remediate the site in a manner that best satisfies the evaluation criteria.
RCRA -	Resource Conservation and Recovery Act. A federal law that regulates the handling of hazardous wastes.
Remedial Action Objectives -	Specific goals of the remedy for reducing risks posed by the site.
Remedial Investigation -	A study conducted to collect information necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives.
Responsiveness Summary-	A summary of all comments received concerning the Preferred Plan and the Ohio EPA's response to all issues raised in those comments.
Water Quality Criteria -	Chemical and thermal standards that define whether a body of surface water is unacceptably contaminated. These standards are intended to ensure that a body of water is safe for fishing, swimming and as a drinking water source.
TCE -	Trichloroethylene. A common industrial solvent and cleaner.
PCE -	Perchloroethylene. A common industrial solvent and cleaner, often used for dry cleaning.

9.0 RESPONSIVENESS SUMMARY

for Glacier Vandervell, Inc.
Noble County, Ohio

(comments in italics, responses in plain text)

COMMENTS FROM GOULD ELECTRONICS, INC.

1 <u>ON-SITE CONTAINMENT - 3 WDA/PA</u>

a. <u>3 WDA/PA meets both OEPA's threshold criteria and the balancing criteria:</u> Gould concurs with Ohio Environmental Protection Agency's (OEPA) assessment of the on-Site containment remedial alternative for WDA and Plant Area soils and wetland sediments (3 WDA/PA) in Sections 8.2.1 and 8.2.3 of the Preferred Plan. This remedy is protective of human health and the environment and complies with applicable Federal and State regulatory requirements, including waste classification and management regulations, as confirmed by OEPA in Section 8.2.1.2 of the Preferred Plan.

The On-Site containment remedy meets the first remedial action objective (RAO) in the Preferred Plan, specifically to "[remediate or contain soil to prevent the migration of contaminants into groundwater." The primary contaminants of concern in the WDA are copper and lead. These compounds have not been detected in groundwater at the Site during the Remedial Investigation (RI) sampling. Once the waste is contained under an impermeable cover which meets RCRA Subtitle C requirements, potential leaching of heavy metals to groundwater will be further reduced. The engineered cap will be more protective than the current condition, which is not impacting groundwater or Duck Creek surface water. Although capping is not considered treatment, the containment remedy will result in a reduction of contaminant mobility.

In its proposed location, long-term effectiveness and permanence could be ensured through the design and implementation of engineered protective measures (e.g., rock armoring, erosion mats, gabion baskets). These measures would be designed to withstand a flood event typical of that portion of the Site. In addition to the long-term protectiveness afforded by the engineered protective measures, operation and maintenance (O&M) procedures would be established to ensure that the measures are inspected periodically and repaired as necessary. Episodic flooding events which may cause Duck Creek to encroach temporarily onto the WDA cap are not expected to mobilize any contaminants to groundwater or surface water. Gould would also support the relocation of the capped area to a location outside the flood plain, provided that such an alternate location does not materially increase the overall cost or regulatory burdens associated with the remedy.

<u>Ohio EPA Response</u> - No response necessary.

b. <u>OEPA has understated the advantages of on-Site containment compared to removal, treatment and off-Site disposal:</u> *In the last paragraph of Section 8.2.1.5, OEPA states, "The Removal, On-Site Treatment, and Off-Site Disposal alternative...has a somewhat greater level of short-term health risk than On-Site Containment, due to the additional handling required for mixing of soils and stabilizing agents." Gould believes that "somewhat" under emphasizes the potential short-term risks associated with the off-Site alternative. Fugitive dust emission generation may be generated not only from the mixing and stabilization process but also from the initial excavation of the soil to be treated and/or disposed off-Site. The engineering cost estimates in Appendix E of the approved Feasibility Study (FS) shows that about 1,500 cubic yards (cy) of soil are to be consolidated within the WDA for the on-Site containment remedy and about 13,400 cy of soil would be excavated from the WDA for the off-Site alternative, nearly an order-of-magnitude increase in volume. Additionally, the off-Site alternative includes additional materials management for stabilization of the waste material to meet Land Disposal Restrictions (LDRs). This increased quantity of materials management has a direct relation to the short-term risks associated with the implementation of these remedies. Accordingly, characterizing the short-term risk arising from the off-Site alternative as only somewhat greater understates the potential short-term impact to construction workers, ecological receptors, facility personnel, and the surrounding community.*

<u>Ohio EPA Response</u> - Concur. The term "somewhat" will be removed in the description of short-term risk.

c. <u>Clarifications to OEPA's description of 3 WDA/PA in the Preferred Plan:</u> *Gould wishes to clarify the description of Alternative 3 WDA/PA as presented in Section 7.1.3 of OEPA's Preferred Plan. The first bullet in this section includes the statement "... and additional isolated areas of contamination" as a category of material to be removed/excavated. Furthermore, the third bullet states "... consolidate excavated soils with WDA soils in preparation for capping." As a clarification to the first bullet, Gould is unaware of any material other than the Plant Area soils, stained surface soils south of the plant, and wetland sediments that will be placed in the WDA for containment. Furthermore, as a clarification to the third bullet, not only will the excavated soils from other areas of the Site be consolidated into the WDA, but some of the WDA soils themselves may be consolidated to optimize the footprint of the WDA cap. Gould suggests that OEPA make the appropriate modifications in the Decision Document.*

<u>Ohio EPA Response</u> - The text of the first bullet in Section 7.1.3 will be revised to read: "Remove/excavate Plant Area soils which exceed the PRGs for metals and/or VOCs, and stained soils south of plant." The text of the third bullet will be revised to read: "Transport and consolidate excavated soils and WDA soils within the WDA; grade soils to construct an optimized containment cell footprint in preparation for capping."

2 OEPA'S ALTERNATIVE 3 SO/VD - EXCAVATION AND OFF-SITE DISPOSAL

a. *Gould agrees with OEPA that remediation of SO/VD soils is not necessary at this time: The Preferred Plan provides that maintenance of the existing facility and loading dock structures as engineering controls over the SO/VD soils, coupled with deed notices and an operation and maintenance (O&M) plan, are protective of human health and environmental receptors. Gould agrees with this conclusion.*

Ohio EPA Response - No response necessary.

b. *It is premature and, therefore, inappropriate for OEPA to select a contingent future remedy at this time to address hypothetical future conditions: Gould strongly disagrees with OEPA's decision to select excavation and off-Site disposal as a future remedy for the SO/VD soils at a time when all fundamental decision parameters are unknown. It is inappropriate and inconsistent with well-established remedial decision making processes (e.g., the National Contingency Plan or NCP) for OEPA to select a remedy that was not evaluated in the FS to address hypothetical conditions. While it is reasonable to assume that the existing facility will not continue to exist forever, such structures typically remain in place for long periods of time, measured in decades, and there is no reason to assume that the future of this Site will be any different. OEPA has no basis for predicting when/if the existing engineering controls will cease to be effective and, therefore, has no basis for predicting (i) what residual soil impacts, if any, will remain at that unknown time, (ii) what the Site's land use and associated exposure pathways, if any, will be at that unknown time, (iii) what the applicable remedial standards will be for the remaining constituents of interest, if any, at that unknown time, and (iv) what the available remedial technologies will be at that unknown time. All of these fundamental issues must be addressed, and are typically resolved through the RI/FS process, before a defensible remedial decision can be made.[1] OEPA's Alternative 3 SO/VD was not considered or evaluated -- and could not have been reasonably considered or evaluated -- in the approved FS and hence should not be selected as the remedy for the SO/VD soils.*

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1 *Gould disagrees with OEPA's statement on page 25 of the Preferred Plan that Alternative 3 SO/VD was evaluated by the Respondents. No such evaluation occurred in connection with Task 13 of Attachment A (Statement of Work) of the Administrative Order on Consent executed December 11, 1991. In fact, ex-situ treatment and removal technologies were eliminated in the FS (approved by OEPA on August 15, 2001) prior to the Initial Screening of Remedial Technologies stage for the SO/VD soils. In advance of OEPA's issuance of a Preferred Plan, Gould evaluated the potential costs associated with various remedial alternatives that might ultimately necessary for this Site, so that Gould could prepare and file a timely proof of claim in the pending bankruptcies of various entities associated with T&N Industries. However, no evaluation of OEPA's Alternative 3 SO/VD based on the criteria established in Task 13 or the NCP was prepared.*

In prematurely selecting a contingent remedial alternative, OEPA is not allowing the remedy evaluation process to proceed based upon the necessary information. For example, the hypothetical future scenario of the building being removed allows for the consideration of several in-situ technologies which were screened out in the FS process due to the restrictions posed by the operational facility. These in-situ technologies (not to mention other technologies that may be developed in the meantime) may be feasible once the building is removed and may meet the RAOs and satisfy the threshold and balancing criteria in the Task 13 process, while providing less short-term risk and more cost effectiveness.

Ohio EPA Response

General Response

The purpose of a contingent remedy is to provide for hypothetical conditions - e.g. remedy failure, modification of site conditions or controls, alteration or creation of exposure pathways, etc. Ohio EPA agrees that the lifespan of the existing building and loading dock structures cannot be predicted. However, removal of these structures would indeed constitute a removal of engineering controls and creation of a leaching pathway. As discussed more fully in Section 9.1 of the Preferred Plan, the excavation and off-site disposal component of Alternative 3 SO/VD is triggered only when these structures are removed.

Specific Responses

- Ohio EPA agrees that the level of residual soil impact at a future time cannot be accurately predicted. Accordingly, in Preferred Plan Section 9.2, Performance Standards, the final bullet item indicates that excavation and off-site disposal will be implemented for "....all soils where contaminants **exceed the PRGs** for leaching to groundwater" (emphasis added). In the selection of the phased remedy, Ohio EPA is not requiring the removal of a pre-determined area or volume of soil - only those soils which exceed the PRGs for leaching to groundwater. At such future time that the building or dock structures are removed and the phased remedy is triggered, Ohio EPA would anticipate and fully support a pre-excavation sampling program by the Respondents to accurately delineate the soils requiring removal.

- Ohio EPA disagrees that the future land use and associated exposure pathways have a bearing on the selection of the phased remedy. The purpose of both the primary and phased remedy is to prevent exposure of soils and leaching of contaminants to groundwater at levels exceeding the MCL.

- As stated above, the phased remedy for SO/VD soils will apply to "......all soils where contaminants exceed the PRGs for leaching to groundwater". Ohio EPA acknowledges that remedial standards are subject to change -

therefore, the scope of the excavation required by the phased remedy will be based upon the applicable standards at the time of implementation.

- Ohio EPA acknowledges that environmental remediation technologies are subject to evolution, improvement, and innovation over time. It is conceivable that a technology for effective treatment or remediation of the SO/VD soils could be developed prior to the "triggering" of the phased remedy. At such time, Ohio EPA is willing to examine other remedial options that may be evaluated and proposed by the Respondents. If a viable alternative is presented to the Agency, it can be compared with the other alternatives using the appropriate balancing criteria. Ohio EPA has procedures currently in place which govern the modification or amendment of a Decision Document (Statement of Procedure #DERR-00-RR-013).

In developing the remedial options retained in the FS for the SO/VD soils, Ohio EPA agrees that the evaluation of in situ technologies (via pilot testing) could be prohibitively costly or result in disruption of the operating facility. However, we are unaware of any technologies that were screened out solely for this reason. In fact, all three in situ technologies discussed in the FS (Section 4.5.3) were screened out, at least in part, by technical factors (low soil permeability) unrelated to the presence of the facility. Ohio EPA is unaware of any in situ technologies with a high likelihood to effectively remediate SO/VD soils. Therefore, it is entirely appropriate to select the phased remedy (excavation and off-site disposal) based upon a known level of effectiveness in satisfying the balancing criteria. As discussed above, if the Respondents wish to evaluate additional alternatives at a future time, Ohio EPA is committed to a thorough re-evaluation of remedial options. The framework for that process can be negotiated during development of the Remedial Design/Remedial Action Consent Order.

c. *<u>It is unnecessary and, therefore, inappropriate for OEPA to select a contingent future remedy at this time to address hypothetical future conditions:</u> Nothing in Ohio law or the NCP requires or directs OEPA to select contingent remedies to address conditions, such as the SO/VD soils, which only may present a threat to human health or the environment only under hypothetical future conditions.[2] Nothing in the Preferred Plan/Decision Document process limits OEPA's legal authority to require additional actions in the future to address such threats if they occur.*

Gould also disagrees with OEPA's conclusion, expressed in the Preferred Plan (Section 8.2.4.6), that there is no effective mechanism to ensure that the SO/VD soils are not exposed in the future before an appropriate remedy can be selected via an appropriate evaluation of real-world data rather than assumptions and

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2 *The Site data demonstrate that the SO/VD soils, as currently capped, either do not contribute to groundwater contamination at the Site or contribute insignificant concentrations that are contained and captured by the existing groundwater recovery and treatment system.*

hypothetical scenarios. OEPA's concern seems to be that the soils would necessarily be exposed during the time necessary to conduct such an evaluation. The building floor slab and loading dock constitute engineered barriers, just like the RCRA cap proposed for the WDA. Exposure to the SO/VD soils under these engineered barriers can be reliably prevented, just as exposure to soils consolidated under the RCRA cap would be prevented through an enforceable O&M plan and deed restrictions. These legal protections are further reinforced by the five-year reviews of final remedies that are customary under both the NCP and Ohio EPA policy.

Ohio EPA Response

Ohio EPA is tasked with the responsibility of protecting the environment and public health, not only under current conditions, but also in the future. The Decision Document for this Site selects a protective remedy for the present and the future.

Furthermore, Ohio EPA does not consider the eventual removal and/or demolition of the facility structure to be merely a hypothetical future condition. We believe that this condition is inevitable - only the timing is unknown. Therefore, the phased remedy has been selected to effectively address the risk at that future time.

d. Even with the limited data available, a proper remedial evaluation would not select Alternative 3 SO/VD:

(1) In-situ remedial technologies are much more feasible and cost-effective once it is assumed that the building will no longer interfere with remediation of the SO/VD soils: It is highly unlikely that a remedial evaluation in accordance with the Task 13 criteria evaluating alternatives for the SO/VD soils after the building is removed would conclude that ex-situ treatment and off-Site disposal best satisfies the balancing criteria. Other alternatives are far more likely to be selected.

Ohio EPA Response

As discussed in a previous response, three in situ technologies were screened out from further evaluation in the FS due to technical and media-specific limitations (i.e. low soil permeability). Based on the information presented to date by the Respondents, there has been no in situ technology identified that has a significant potential for remediating SO/VD soils. In the absence of such an alternative, Ohio EPA believes that excavation and off-site disposal is the only effective alternative identified thus far.

(2) OEPA's Alternative 3 SO/VD has potential unacceptable short-term exposure risks: In the Preferred Plan, OEPA states that "...appropriate controls..." will be able to address short-term pollution issues associated with 3 SO/VD, the excavation and off-Site disposal remedy. Gould disagrees with this

evaluation. OEPA's projected time frame for completion of 3 SO/VD is 2 to 3 months. Removal of this soil would require exposing the footprint of the impacted soil for this time period and creating an excavation nearly 15 feet deep. The likelihood of rainfall over a 2 to 3 month time period, combined with an open, deep excavation, makes this alternative prone to unacceptable short-term risks via leaching to groundwater. Specifically, rainfall occurring within the footprint of the open excavation has the ability to create a hydraulic driving force which may cause downward migration of the VOCs in soil into the groundwater, the very scenario which 2 SO/VD aims to avoid. In addition to the potential leaching to groundwater risks, short-term risk associated with organic vapor emissions require addressing. These short-term risks from leaching to groundwater and vapor emissions need to be balanced against the benefits in a comparative analysis with other remedies (like in-situ remedies), not as a stand-alone evaluation.

Ohio EPA Response

Ohio EPA agrees that the accumulation of water in an open excavation could create an unacceptable leaching risk. However, it is certainly within the capabilities of an experienced remediation contractor with proper engineering oversight, to stage and execute the excavation activities with regard to predicted weather conditions, and such that any open sector is backfilled on a daily basis if necessary.

With regard to vapor emissions during excavation, the FS evaluated the risk to construction workers exposed to SO/VD soils 0-12 feet below ground surface and found that exposure would not exceed acceptable levels. Nonetheless, remediation contractors who deal with such materials would be expected to utilize the appropriate levels of protection and/or engineering controls to ensure worker safety.

e. *Gould cannot agree to providing extensive and burdensome financial assurances for a contingent remedy that is unlikely to be warranted if a hypothetical need arises in the future.*

Ohio EPA Response

As discussed in a previous response, Ohio EPA does not view the eventual removal or demolition of the facility as a hypothetical scenario, but rather as a given with a currently unknown timeframe. Ohio EPA also disagrees that the phased remedy is "unlikely to be warranted". Once the facility structure has been removed, the implementation of a remedy that prevents leaching of contaminants to groundwater will be necessary.

While Gould's corporate identity and financial viability may continue indefinitely, Ohio EPA must plan for a scenario where this is not the case. As such, the Agency believes that it is both necessary and appropriate to establish a phased remedy at this time, along with an appropriate level of financial assurance to ensure its implementation at such time that it becomes necessary.

3. DUCK CREEK SEDIMENTS

a. *Gould agrees with OEPA's selection of long-term monitoring for Duck Creek sediments.*

Ohio EPA Response - No response necessary.

4 GROUNDWATER REMEDIATION

a. *Gould agrees with OEPA that natural attenuation has already reduced the primary contaminants of interest by over 70% in the alluvium since 1994 and that further expansion of the impacts within the alluvium and the bedrock is not expected: These observations are included in Sections 3.2.2.1 and .2 of the Preferred Plan.[3] Accordingly, Gould supports remedial alternatives to maintain the existing groundwater recovery and treatment system, along with monitoring and use restrictions to ensure continued progress and protectiveness.[4]*

Ohio EPA Response

In section 3.2.2.1 of the Preferred Plan, Ohio EPA stated that total VOC concentrations in the alluvium decreased, on average, approximately 89% from 1993/1994 to 2000. In section 3.2.2.2 of the Preferred Plan, Ohio EPA stated that total VOC concentrations in the bedrock decreased, on average, approximately 57% during the same time period. Ohio EPA did NOT specifically attribute these decreases to natural attenuation.

With respect to footnote no. 4, and the issue of RCRA-based attention to groundwater near the former filter beds - the Division of Hazardous Waste Management (DHWM) has reviewed the groundwater component of the Preferred Plan/Decision Document. The DHWM agrees that the remedy substantially addresses the RCRA groundwater monitoring and corrective measures that the DHWM would apply for the contamination which has emanated from the closed RCRA sand filter units. However, any formal waiver of RCRA regulatory

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3 *To the extent that OEPA meant to contradict this conclusion in Section 8.2.5.1 of the Preferred Plan, Gould strongly disagrees. The RI and FS groundwater data show that the shape and extent of the shallow bedrock VOC plume has remained essentially the same, with the exception of a general (and significant) reduction of total VOCs at any given sampling location. Therefore, Site data do not demonstrate any potential for plume migration. Natural attenuation at the Site has been demonstrated in the FS to be present and responsible for significant drops in total VOC concentrations.*

4 *Gould also understands that OEPA has concluded that upon implementation of a Site-wide groundwater remedy pursuant to the Decision Document, there will be no residual potential for separate RCRA-based attention to groundwater in the vicinity of the former sand filter beds. Gould requests that this be explicitly stated in the Decision Document.*

involvement for this aspect of the Site will be more appropriately addressed in the RD/RA Consent Order.

b. *<u>Gould does not agree that in-situ biodegradation enhancements are necessary or appropriate:</u>*

(1) *<u>Enhancements are not necessary to meet the RAOs established in the Preferred Plan:</u> OEPA's RAO for groundwater is to "[p]revent further expansion or off-Site migration of the groundwater contaminant plume and reduce contaminant concentrations in groundwater to achieve established cleanup goals;" As demonstrated in the approved FS, both of these objectives are being met with the current groundwater remedy (natural attenuation and interim treatment system). Expansion or off-Site migration of the VOC plume at the Site is not occurring and natural degradation processes evidenced at the Site are significantly reducing the VOC concentrations. As modeled in the FS, these concentrations are predicted to be below the groundwater preliminary remediation goals (PRGs) in about 30 years. Therefore, OEPA's proposed groundwater remedy in the Preferred Plan goes beyond the RAO and is unnecessary.*

(2) *<u>Moreover, such enhancements as a source-reduction measure are impractical due to physical Site characteristics:</u> In-situ biological enhancements at the Site would clearly be unjustified outside the highest concentration areas, because application of such enhancements outside of the plume center would only reduce the extent of migration of the plume. As recognized by OEPA, the FS demonstrates that the existing recovery and treatment system and natural attenuation currently occurring at the Site already are effectively preventing any such migration to off-Site receptors. Thus, the only area where such enhancements would be considered is below the existing building and its active manufacturing operations. These conditions present real-life physical restrictions, particularly considering the need for close injection spacing based on the characteristics of the underlying soil and bedrock. Given the significant reductions being achieved by the existing system and the limited potential benefits of such enhancements, if any, there is no reason to disrupt current and future operations at the Site to test or implement them.*

<u>Ohio EPA Response to Comments (1) and (2)</u>

Ohio EPA agrees that data presented in the FS provide evidence for a natural attenuation component in the reduction of VOCs in groundwater at the Site. In conjunction with this data, the FS also presented modeling results that predicted a decrease in plume concentrations to PRGs in about 30 years. While VOC concentrations have decreased over time, and may continue to do so, we do not believe that an accurate determination of decay constants (and therefore, prediction of cleanup times) can be made based on limited site data.

Nonetheless, Ohio EPA agrees that the use of in situ biodegradation enhancement may not be fully effective outside the primary zone of impacted soils that remain beneath the facility. In addition, we agree that the physical characteristics of the subsurface materials could prevent effective delivery of the enhancement compounds. Accordingly, we will not specify biodegradation enhancement (and associated pilot testing) as a component of the selected remedy.

Ohio EPA believes that targeted removal of contaminant mass is a necessary element of a natural attenuation strategy, and U.S. EPA guidance supports this concept. Although the primary source area (impacted soils) may lie beneath the facility, we believe that removal of highly impacted groundwater from the groundwater system can constitute an effective measure of source control. The interim recovery system currently removes limited quantities of groundwater, but an expanded system has the potential to significantly increase the rate of groundwater (and consequently, mass) removal. Therefore, FS Alternative 3a - Enhanced Monitoring with Expanded System, has been selected to address groundwater at the Site. To implement this remedy, Ohio EPA will require the Respondents to propose an expanded groundwater recovery and treatment system as part of the Remedial Design. An initial evaluation of site conditions, with respect to this alternative, suggests that 6-8 additional recovery wells could prove effective.

c. <u>*Several statements in the Preferred Plan are potentially misleading and/or require clarification:*</u>

(1) *OEPA states on page 9 that the "...SO Line area...is a significant past and/or current contributor to VOC contamination in groundwater." Data in the RI and the FS provide no evidence to support the current contributor scenario. Comparison of 1994 RI data to the 2000 FS data show a marked decline in total VOC concentrations in shallow bedrock groundwater at a majority of the impacted monitoring wells, including both pumping and non-pumping wells.*

<u>Ohio EPA Response</u>

The text will be revised as follows: "It is likely that this area was a significant past contributor to VOC contamination in groundwater. The area may also act as a current contributor, but at reduced levels."

(2) *OEPA states on page 11 that comparison of the 1994 to 2000 data shows "...a slight plume extension down gradient of the former filter beds in the vicinity of well MW-22." Gould does not agree with this analysis. MW-22 was sampled twice in 1993, once in 1994 and once in 2000. Cis-1,2-DCE fluctuated sequentially from 55 ug/L to 6 ug/L to 3.6 ug/L to 97 ug/L during these sampling periods. Although TCE was only detected in the 2000 sampling round, the concentration was relatively low (44 ug/L) and within the range of fluctuation witnessed for cis-1,2-DCE during the RI and FS sampling rounds. Furthermore, the RI sampling was conducted using purge and bailer*

sampling techniques, whereas the FS sampling was performed using low-flow techniques. It is well known that low flow sampling generates less disturbance and aeration of the water column, which can lead to higher detectable concentrations of volatile contaminants. Based on the relatively low concentrations of VOCs in MW-22 and the range of fluctuations of other VOCs at this location, Gould believes that identifying an upward or downward contaminant trend or a plume extension with this limited data is premature.

Additionally, information provided in the RI show that MW-22 is screened in the shallow bedrock, which in this portion of the Site has a top-of-bedrock surface with a depressed zone trending north-northwest from MW-21 towards MW-22. Contouring of the individual or total VOCs may appear to reflect a plume extension in this area attributable to the filter beds; however, it is just as plausible that the depressed characteristics of the shallow bedrock are influencing localized groundwater flow such that the shape of the plume (and migration of fringe VOCs) do not precisely mimic groundwater flow paths. Therefore, the relatively low levels of VOCs detected in MW-22 in 2000 could be the edge of the primary VOC plume at the Site and not an individual contribution from the sand filter beds.

Ohio EPA Response

The reference to plume extension in the area of MW-22 was nearly a direct quotation from Section 2.7.3.2 of the FS (p. 2-30), as prepared by the Site Respondents. Therefore, the text of the Preferred Plan will not be changed.

(3) AGC review of groundwater elevations since submission of the FS determined that Figure 2-2 of the FS does not reflect the groundwater elevations consistently for the RI and FS time periods. There appears to be a datum discrepancy between the 1994 groundwater elevations and the 2000 FS groundwater elevations which incorrectly portrays a dropping groundwater elevation from 1994 to 2000. Further review of the data, including the raw surveying files, and re-plotting of the groundwater surface elevations shows that there was no upward or downward trend in groundwater elevations from 1994 to 2000. As it pertains to evaluations of the SO/VD soils, previous hypotheses that the significant decline in total VOCs in groundwater may have been due to a drop in groundwater elevation do not appear to be supportable theories. Natural attenuation continues to be the principal cause for total VOC declines in groundwater.

Ohio EPA Response

Ohio EPA appreciates this new information as it relates to the understanding of historic groundwater levels at the site. The clarification has been noted in the FS Report currently on file.

COMMENTS FROM DANA/GLACIER VANDERVELL, INC.

As the current owner of the facility and site, Dana is generally supportive of the Preferred Plan for remediation of the site as identifying remediation alternatives that are both protective of human health and the environment and also represent cost-effective alternatives that will achieve the goals stated in the FF&Os. Dana, however, has two comments on the Preferred Plan we would like to have addressed.

(1) First, Dana is concerned about the selection of the remedy involving on-site containment of contaminated soils in the Western Disposal Area ("WDA"). The Preferred Plan provides for the excavation of soils with metals concentrations above PRGs as well as soils with TCE contamination and consolidation of these soils in the WDA. The WDA is in a 100-year flood plain. Dana is concerned about the long-term effectiveness of this proposed remedy given the potential erosion of the cap due to future flooding. It would seem that a more protective and potentially more or equally cost-effective remedy would entail on-site containment of the contaminated soils in an alternate location at the site. Dana, as the current property owner, is prepared to evaluate other potential locations for the consolidation and containment of the waste. In addition, we have performed a feasibility level analysis of the costs associated with such an alternate remedy for on-site containment. Based on this analysis we believe consolidating and containing the soils in an alternate location, outside the floodplain, may be a less expensive and more protective option. We would be happy to share this cost analysis with you.

<u>Ohio EPA Response</u>

Ohio EPA understands Dana/GVI concerns related to containment of soil materials within the current WDA, and the potential for impact due to flooding. However, the decision to consolidate materials ONLY within this area was based on current Ohio EPA rules for allowable hazardous waste management practices. These rules and their applicability are discussed below.

If contaminated soil exhibits a hazardous waste characteristic or the contamination is due to the mismanagement of listed hazardous waste, the soil is said to "contain" a hazardous waste at the point of generation. Such soil is subject to hazardous waste management requirements, including the Land Disposal Restriction (LDR) rules, after it is generated. In this context, the term "generation" applies when the soil is excavated or removed from the disposal location. The exception to this approach is when the hazardous soil is not removed from its area of contamination (i.e. WDA) and it is not managed in a way that triggers substantive hazardous waste requirements. Management that triggers substantive hazardous waste requirements includes placing the soil in a container; ex-situ treatment of soil on-site; and using piles, outside the AOC, to stage soil prior to treatment or transportation off-site. Management that does NOT trigger the requirements includes the use of piles, within the AOC, to stage soil prior to treatment or transportation offsite; the consolidation and/or transportation of hazardous soil within the AOC; and in situ treatment of hazardous soil.

Accordingly, the removal and placement of WDA soils to a separate area of the site would trigger hazardous waste management requirements. In addition to having to meet LDR concentrations for the constituents of concern, the construction requirements for such a containment cell would be far more elaborate. These requirements, as set forth in Chapter 3745-57-03 of the Administrative Code, include (among others) the construction of both upper AND lower low-permeability liners, as well as a leachate collection system. In light of these requirements, Ohio EPA believes that the cost of that alternative would be prohibitively high in comparison with the selected alternative.

Ohio EPA agrees that the issue of potential flooding and damage to the containment cell is a valid concern that must be addressed. In its proposed location, long-term effectiveness and permanence could be ensured through the design and implementation of engineered protective measures (e.g., rock armoring, erosion mats, gabion baskets). These measures would be designed to withstand a flood event typical of that portion of the Site. In addition to the long-term protectiveness afforded by the engineered protective measures, operation and maintenance (O&M) procedures would be established to ensure that the measures are inspected periodically and repaired as necessary. Episodic flooding events which may cause Duck Creek to encroach temporarily onto the WDA cap are not expected to mobilize any contaminants to groundwater or surface water.

It is also possible that consolidation of wastes and optimization of the containment cell footprint could result in a net gain of flood plain area, and a corresponding increase in flood storage capacity. In addition, protection of wetland areas immediately upstream from the site would preserve the existing flood storage capacity. These areas could be protected indefinitely through deed restrictions or conservation easements, the requirements of which could be incorporated into the terms of the RD/RA Consent Order.

(2) Our second issue deals with the remedy selected to address the soluble oil ("SO") line and vapor degreaser soils located underneath the GVI facility building. Under Ohio EPA's Preferred Plan the institutional controls at the site (i.e. the building and loading dock overlying the contaminated soil) will serve as a "cap" to prevent infiltration and leaching of contaminants to groundwater. However, the Agency's selected remedy also calls for an "Operation and Maintenance" ("O&M") plan to be imposed upon the Respondents. The O&M plan will bind the Respondents to a contingent remedy requiring off-site disposal of these soils in the event the building is ever removed and would require the demonstration of financial assurance for that remedy. Such a contingent remedy and requirement for financial assurance is premature and unnecessary. We believe that the need for an alternative remedy to address the soils under the building should be evaluated if and when the building is removed. It is at that time that Ohio EPA should require the Respondents to perform a Focused Feasibility Study to determine the most protective and cost-effective remedy. In the meantime, monitoring will ensure the reliability of the current institutional controls.

<u>Ohio EPA Response</u> - Please refer to all Ohio EPA responses to Gould Comment No. 2.

TABLE 1. Summary of Hazard Indices and Excess Lifetime Cancer Risks

CURRENT RISK ESTIMATES				
Population	Exposure Media	Exposure Pathway	Hazard Index	ELCR[1]
Grounds Workers	Site-Wide 0-2' Soil	Inhalation of Fugitive Dusts	8.3E-03	1.E-08
		Inhalation of VOCs	9.1E-04	1.E-08
		Dermal Contact	5.1E-01	1.E-05
		Soil Ingestion	9.1E-01	9.E-06
		Population Totals:	**1.4E+00**	**2.E-05**
Office Workers	Site-Wide 0-10' Soil	Indoor Inhalation of Volatiles from Soil	6.1E-06	8.E-11
		Population Totals:	**6.1E-06**	**8.E-11**
Construction Workers	Site-Wide 0-5' Soil	Inhalation of Fugitive Dusts	1.6E-04	1.E-11
		Inhalation of VOCs	6.2E-05	3.E-11
		Dermal Contact	6.1E-02	7.E-08
		Soil Ingestion	5.2E-01	2.E-07
		Population Totals:	**5.8E-01**	**3.E-07**
Off-Site Residents	Site-Wide 0-5' Soil	Inhalation of Fugitive Dusts	1.0E-03	7.E-11
		Population Totals:	**1.0E-03**	**7.E-11**
Recreational Users	Soil 0-2'	Inhalation of Fugitive Dusts	2.4E-03	1.E-09
		Inhalation of VOCs	5.1E-04	2.E-09
		Dermal Contact	8.5E-02	8.E-07
		Soil Ingestion	3.8E-01	1.E-06
	Duck Creek Surface Water	Dermal Contact	5.3E-06	NA
		Water Ingestion	1.3E-05	NA
	Duck Creek Sediment	Dermal Contact	2.0E-02	1.E-06
		Sediment Ingestion	3.1E-02	2.E-06
		Population Totals:	**5.1E-01**	**5.E-06**

(light shading)	Cancer risk exceeds point of departure but within risk range
(dark shading)	Hazard index or cancer risk exceeds risk range
NA	Carcinogenic risk data Not Available

[1] Note the following relationships:

1.E-5 = 1 in 100,000
1.E-6 = 1 in 1,000,000
1.E-7 = 1 in 10,000,000
1.E-8 = 1 in 100,000,000
1.E-9 = 1 in 1,000,000,000
1.E-10 = 1 in 10,000,000,000
1.E-11 = 1 in 100,000,000,000
Example, 3.2E-5 = 3.2 in 100,000

TABLE 1. Summary of Hazard Indices and Excess Lifetime Cancer Risks (cont)

FUTURE RISK ESTIMATES				
Population	Exposure Media	Exposure Pathway	Hazard Index	ELCR[1]
Construction Workers	Site-Wide 0-10' Soil	Inhalation of Fugitive Dusts	1.1E-03	6.E-11
		Inhalation of VOCs	1.1E-03	6.E-10
		Dermal Contact	2.2E-01	4.E-07
		Soil Ingestion	1.8E+00	1.E-06
		Population Totals:	**2.1E+00**	**1.E-06**
On-Site Adult Residents	Site-Wide 0-10' Soil	Inhalation of Fugitive Dusts	9.3E-03	1.E-08
		Inhalation of VOCs	9.5E-03	1.E-07
		Dermal Contact	6.3E-02	2.E-06
		Soil Ingestion	5.3E-01	7.E-06
		Groundwater Ingestion	1.9E+01	6.E-04
		Population Totals:	**1.9E+01**	**7.E-04**
On-Site Child Residents	Site-Wide 0-10' Soil	Inhalation of Fugitive Dusts	2.6E-02	9.E-09
		Inhalation of VOCs	2.6E-02	9.E-08
		Dermal Contact	1.2E-01	1.E-06
		Soil Ingestion	5.0E+00	2.E-05
		Groundwater Ingestion	4.4E+01	4.E-04
	Wetlands Sediment	Dermal Contact	3.3E-03	0.E+00
		Sediment Ingestion	1.6E-02	0.E+00
	Duck Creek Surface Water	Dermal Contact	5.3E-06	NA
		Water Ingestion	1.3E-05	NA
	Duck Creek Sediment	Dermal Contact	2.0E-02	1.E-06
		Sediment Ingestion	3.1E-02	2.E-06
		Population Totals:	**4.9E+01**	**4.E-04**

(light shading) Cancer risk exceeds point of departure but within risk range
(dark shading) Hazard index or cancer risk exceeds risk range
NA Carcinogenic risk data Not Available

[1] Note the following relationships:

1.E-5 = 1 in 100,000
1.E-6 = 1 in 1,000,000
1.E-7 = 1 in 10,000,000
1.E-8 = 1 in 100,000,000
1.E-9 = 1 in 1,000,000,000
1.E-10 = 1 in 10,000,000,000
1.E-11 = 1 in 100,000,000,000
Example, 3.2E-5 = 3.2 in 100,000

TABLE 2. PRGs for Media of Concern

Constituent	Group	WDA/Plant Area Soils (mg/kg)	Duck Creek Sediment (mg/kg)	Cattail Wetland Sediment (mg/kg)	Non-Cattail Wetland Sediment (mg/kg)	Groundwater (ug/l)
Antimony	Metal	30	---	---	---	---
Arsenic	Metal	18	11	---	---	50
Cadmium	Metal	---	1.2	---	---	---
Copper	Metal	3,036	---	358	3036	1300
Lead	Metal	1,600	---	189	1600	15
Nickel	Metal	---	33	---	---	100
Tin	Metal	---	---	299	2536	---
Benzo(a)pyrene	SVOC	0.05	---	---	---	---
Benzo(b)fluoranthene	SVOC	0.52	---	---	---	---
Benzo(ghi)perylene	SVOC	96	---	---	---	---
Benzo(k)fluoranthene	SVOC	5	---	---	---	---
Bis(2-ethylhexyl)phthalate	SVOC	34	---	---	---	---
Di-n-butyl phthalate	SVOC	17,033	---	---	---	---
Di-n-octyl phthalate	SVOC	3,407	---	---	---	---
Fluoranthene	SVOC	5,451	---	---	---	---
Naphthalene	SVOC	3	---	---	---	---
Pentachlorophenol	SVOC	---	---	---	---	1
Phenanthrene	SVOC	954	---	---	---	---
Pyrene	SVOC	3,885	---	---	---	---
1,1,1-trichloroethane	VOC	1.3	---	---	---	---
1,3-dichlorobenzene	VOC	133	---	---	---	---
1,4-dichlorobenzene	VOC	---	---	---	---	75
Benzene	VOC	0.015	---	---	---	5
Bromodichloromethane	VOC	---	---	---	---	100
Chloroform	VOC	---	---	---	---	100
Chloromethane	VOC	2.49	---	---	---	---
cis-1,2-dichloroethene	VOC	0.12	---	---	---	70
Dichlorodifluoromethane	VOC	100	---	---	---	---
Dichloromethane	VOC	0.5	---	---	---	---
Ethylbenzene	VOC	16	---	---	---	700
Methylene Chloride	VOC	---	---	---	---	5
Tetrachloroethene	VOC	0.27	---	---	---	5
Toluene	VOC	7.7	---	---	---	1000
Trans-1,2-dichloroethene	VOC	---	---	---	---	100
Trichloroethene	VOC	0.048	---	---	---	5
Vinyl chloride	VOC	---	---	---	---	2
Xylenes, total	VOC	190	---	---	---	10000
1,1-dichloroethene	VOC	---	---	---	---	7
1,2-dichloroethane	VOC	---	---	---	---	5

Notes:
--- Not Applicable, PRG Not Established
SVOC - Semivolatile Organic Compound
VOC - Volatile Organic Compound
mg/kg - milligrams per kilogram
ug/l - micrograms per liter

TABLE 3. Cost Evaluation - WDA and Plant Area Soils Remedial Alternatives

Alternative	Capital Cost	O&M Cost per Year	Total Present Worth Cost
No Action	$0	$0	$0
Institutional Controls	$72,600	$18,500	$372,100
On-Site Containment	$973,300	$25,100	$1,316,900
Removal, On-Site Treatment, Off-Site Disposal	$2,863,139	$0	$2,657,851

TABLE 4. Cost Evaluation - Duck Creek Sediment Remedial Alternatives

Alternative	Capital Cost	O&M Cost per Year	Total Present Worth Cost
No Action	$0	$0	$0
Long-Term Monitoring	$0	$7,000-$13,000	$39,600

TABLE 5. Cost Evaluation - Wetland Sediment Remedial Alternatives

Alternative	Capital Cost	O&M Cost per Year	Total Present Worth Cost
No Action	$0	$0	$0
Removal and On-Site Disposal within the WDA	$561,700	$10,000	$539,000
Removal and Off-Site Disposal	$686,200	$10,000	$654,500

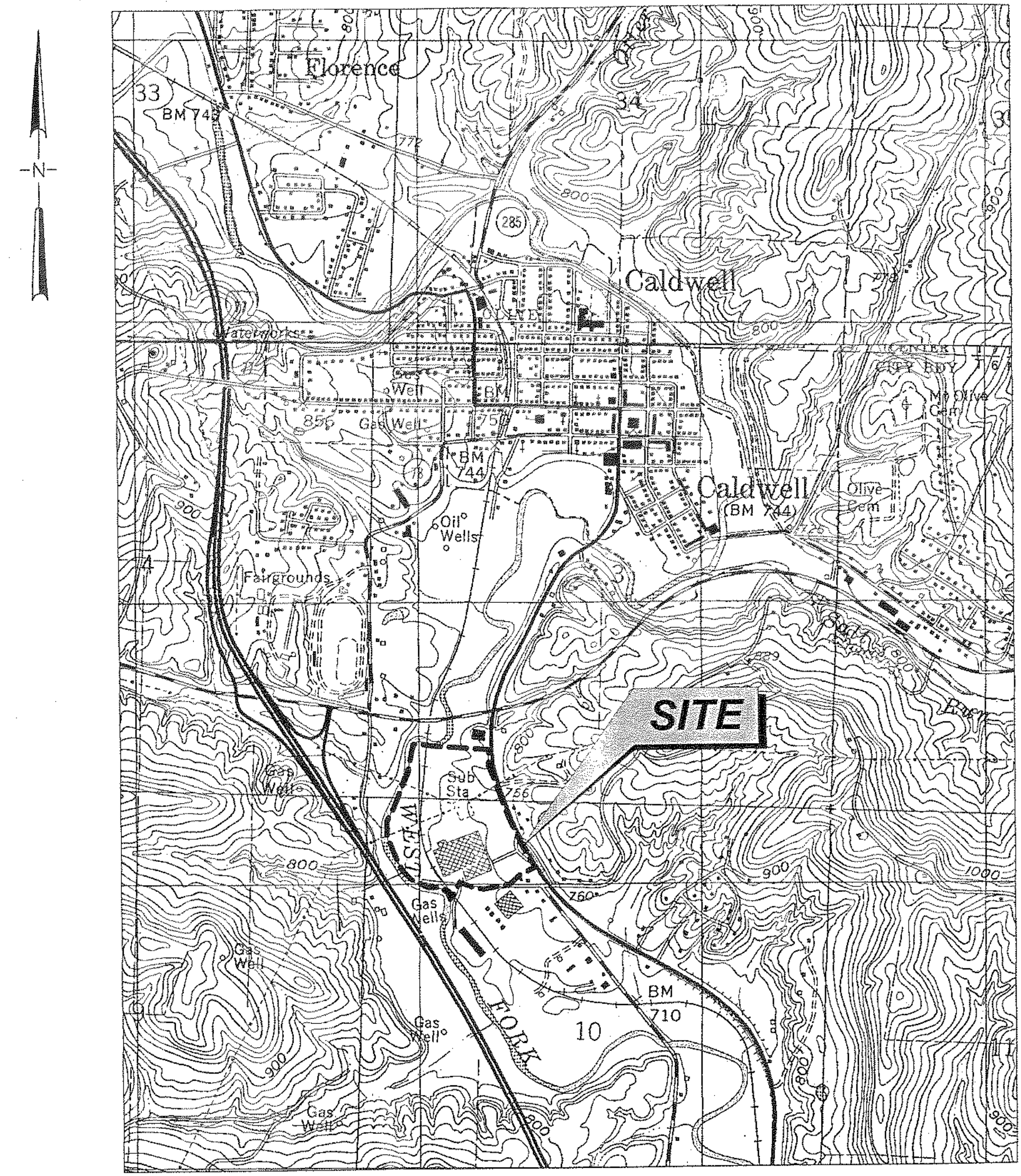
TABLE 6. Cost Evaluation - SO Line and Vapor Degreaser Soils Remedial Alternatives

Alternative	Capital Cost	O&M Cost per Year	Total Present Worth Cost
No Action	$0	$0	$0
Institutional Controls	$10,000	$0	$9,300
Excavation and Off-Site Disposal	$6,500,000	$0	$5,914,000[1]

[1] Assumes minimum 10-yr time frame prior to implementation

TABLE 7. Cost Evaluation - Groundwater Remedial Alternatives

Alternative	Capital Cost	O&M Cost per Year	Total Present Worth Cost
No Action	$0	$0	$0
Continued Operation of Interim System	$0	$62,500-$77,500	$1,091,500
MNA with Interim System	$0	$67,500-$127,500	$1,264,800
MNA with Expanded System	$70,400	$67,500-$127,500	$1,330,200
MNA with Phytoremediation and Interim System	$62,300	$69,500-$129,500	$1,355,600
MNA with In-Situ Enhancements and Interim System	$214,000	$67,500-$177,800	$1,525,400



Note:
Basemap Source from U.S.G.S. 7.5 minute quadrangles of Caldwell North and South Ohio, dated 1994.

APPROXIMATE LIMIT OF INVESTIGATION

GLACIER VANDERVELL, INC.
CALDWELL, OHIO

Scale: N.T.S.	SITE TOPOGRAPHIC MAP
Originated By: A.P.C.	
Drawn By: V.E.N.	
Checked By:	Figure 1. Site Location Map
Project Mgr: P.A.H.	
Dwg No. 95177-01	
Issued: JUN 2 9 2001	

J:\CALDWELL\DRAWINGS\9517700\95177-01

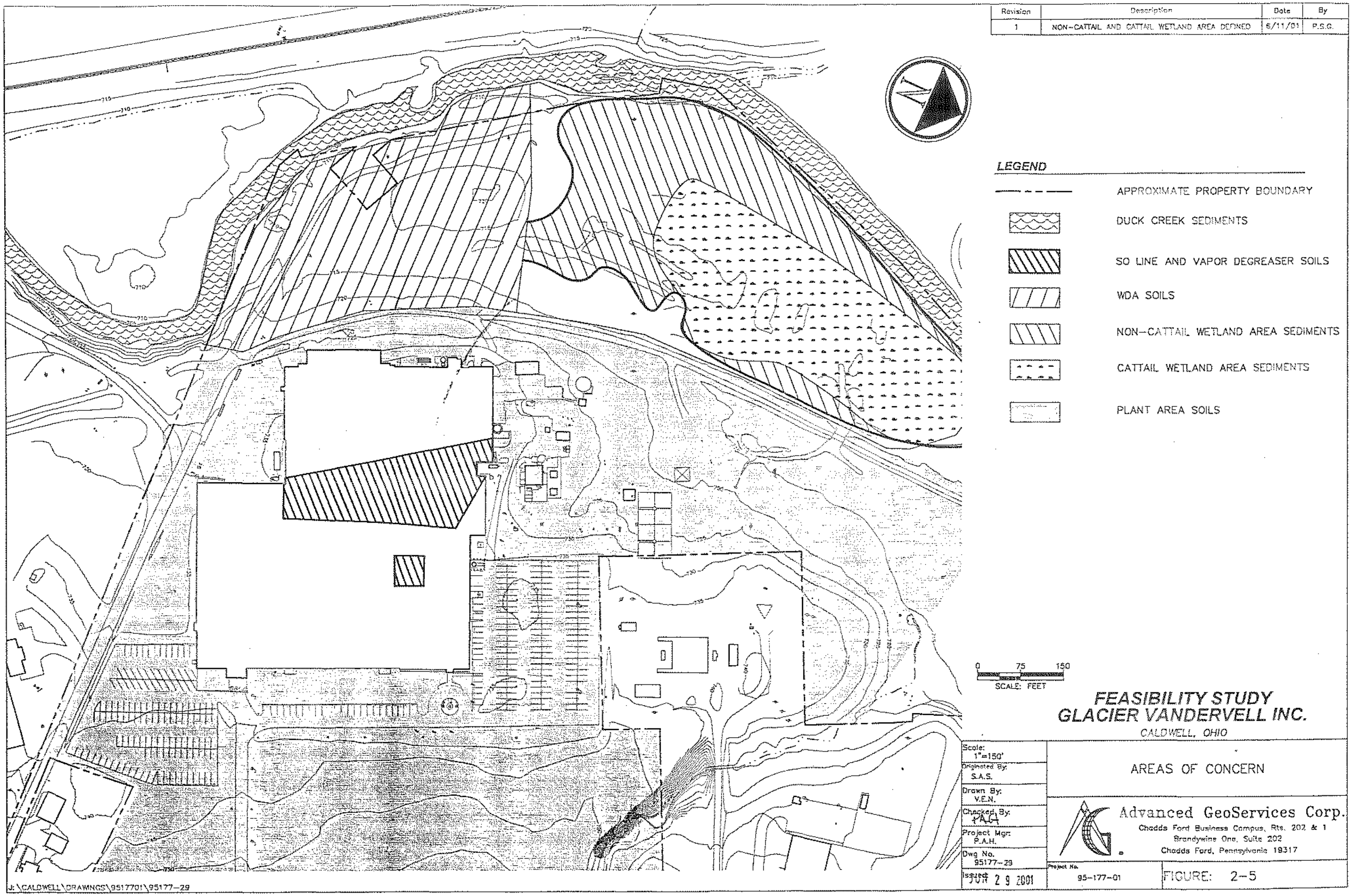


Figure 2. Site Features Map

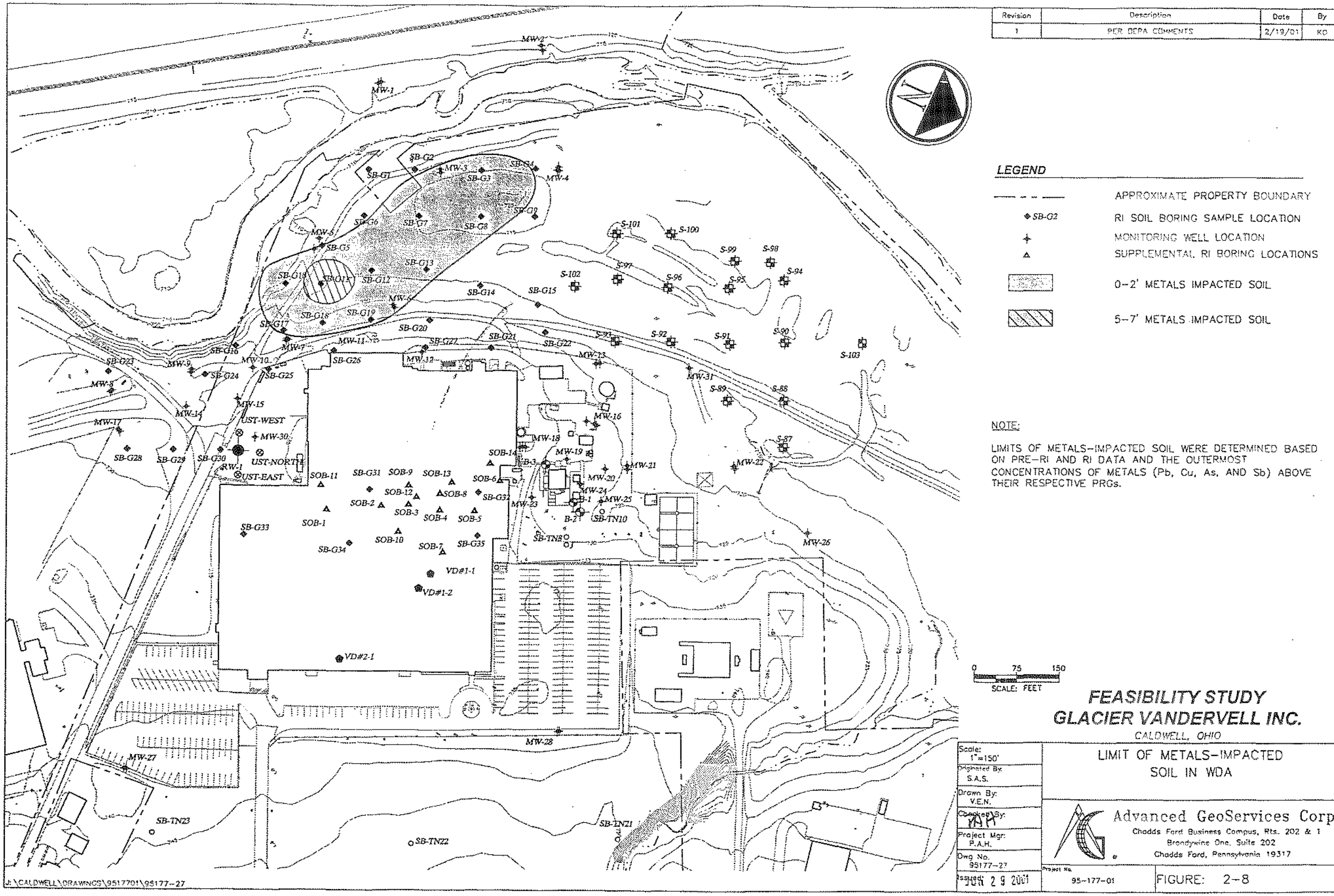


Figure 3. Metals in Soil - WDA

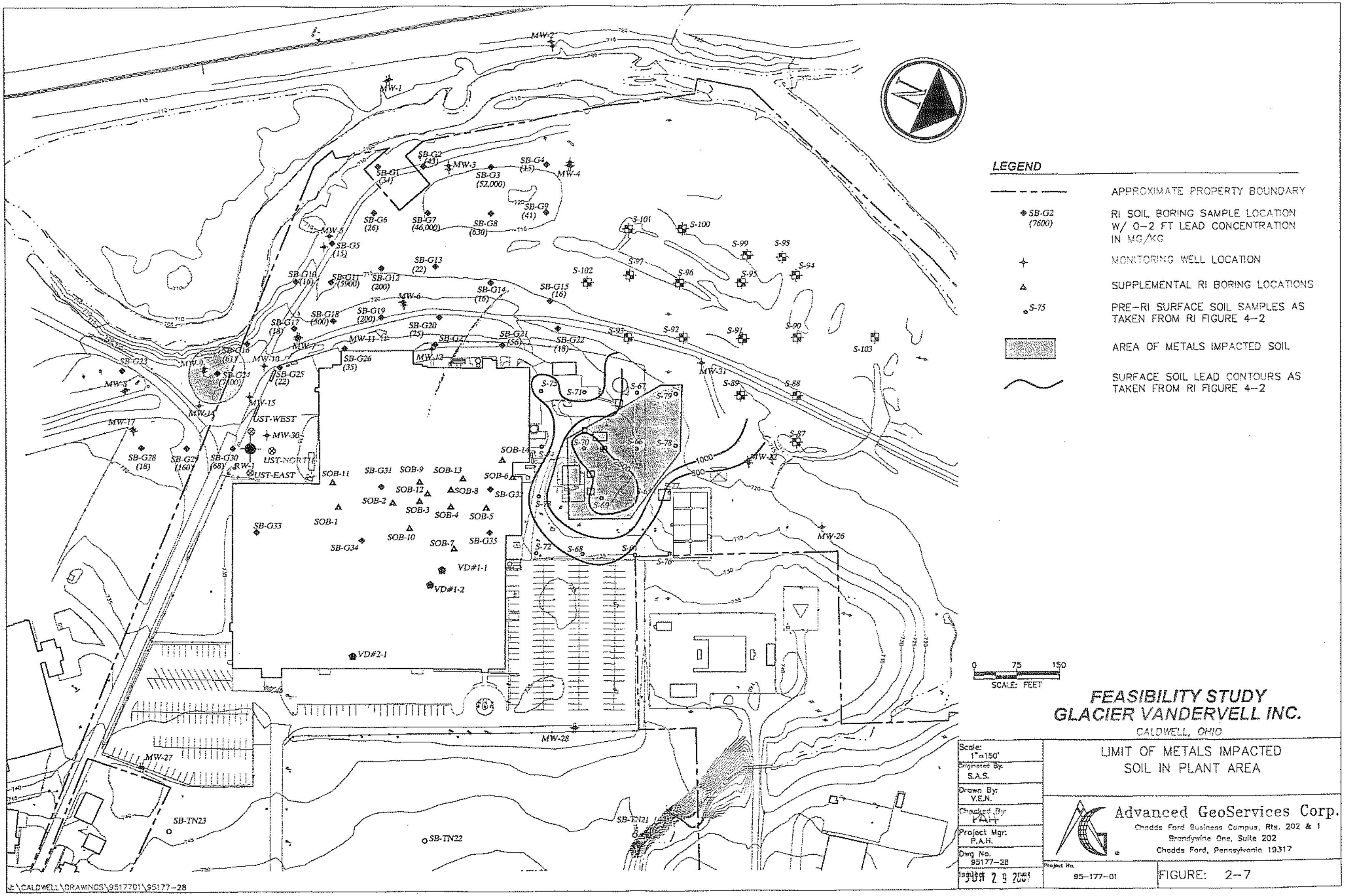
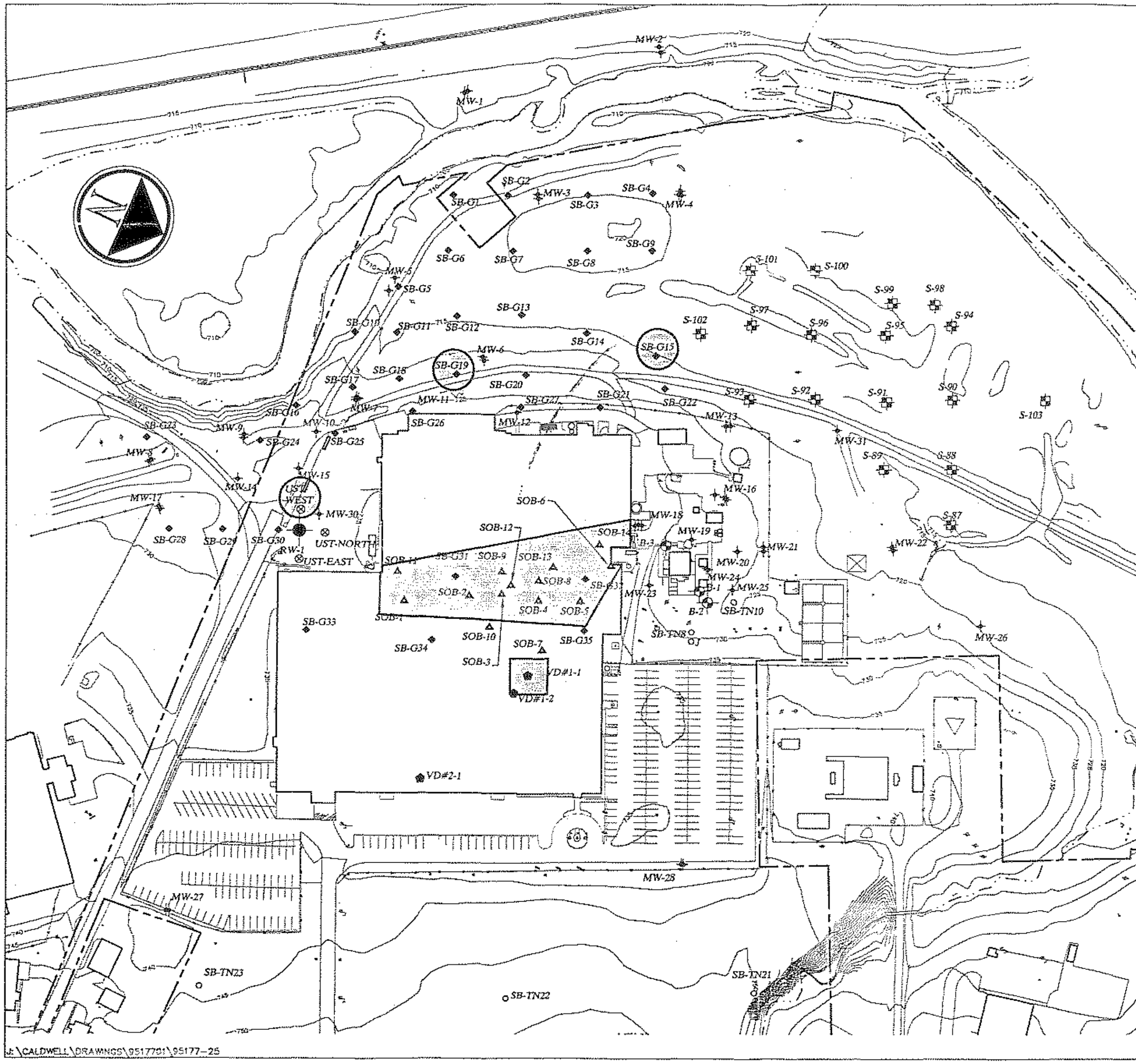


Figure 4. Metals in Soil - Plant Area



LEGEND

- – – APPROXIMATE PROPERTY BOUNDARY
- ◆ SB-G2 SOIL BORING SAMPLE LOCATION
- ✦ MONITORING WELL LOCATION
- △ SUPPLEMENTAL RI BORING LOCATIONS
- ▒ AREA OF VOC-IMPACTED SOIL

NOTE:

LIMITS OF VOC-IMPACTED SOIL WERE DETERMINED BASED ON THE RI DATA AND THE OUTERMOST CONCENTRATIONS OF VOCs ABOVE THEIR RESPECTIVE PRGs.

RI Soil Borings with VOC Contaminant Concentrations Above PRGs

BORING #	VOC Contaminant	Concentration Above PRG (mg/kg)	Depth (ft. bgs)
SB-G15	TCE	2.90	5-7
SB-G19	TCE	0.140	0-2
	TCE	0.096	5-7
	TCE	0.360	10-12
UST West	TCE	0.360	5-7
	Ethylbenzene	48.0	5-7
	Toluene	61.0	8-10
SOB-1	TCE	1.30	11
SOB-2	PCE	36.0	6
	PCE	11.0	11
	TCE	13.0	6
	TCE	27.0	11
SOB-3	PCE	92.0	11
	TCE	210.0	11
SOB-4	TCE	1.0	5
	TCE	.092	11
SOB-5	TCE	0.190	6
	TCE	0.310	11
SOB-12	PCE	18.0	10-12
	TCE	0.410	0-2
	TCE	13.0	10-12
SOB-13	PCE	0.320	10-12
	TCE	0.430	10-12

FEASIBILITY STUDY

GLACIER VANDERVELL INC.

CALDWELL, OHIO

Scale: 1"=150'	LIMIT OF VOC-IMPACTED SOIL
Originated By: S.A.S.	
Drawn By: V.E.N.	
Checked By: PAH	Advanced GeoServices Corp. Chadds Ford Business Campus, Rts. 202 & 1 Brandywine One, Suite 202 Chadds Ford, Pennsylvania 19317
Project Mgr: P.A.H.	
Dwg No. 95177-25	
Issued: JUN 2 9 2001	Project No. 95-177-01 FIGURE: 2-10

Figure 5. VOCs in Site Soil

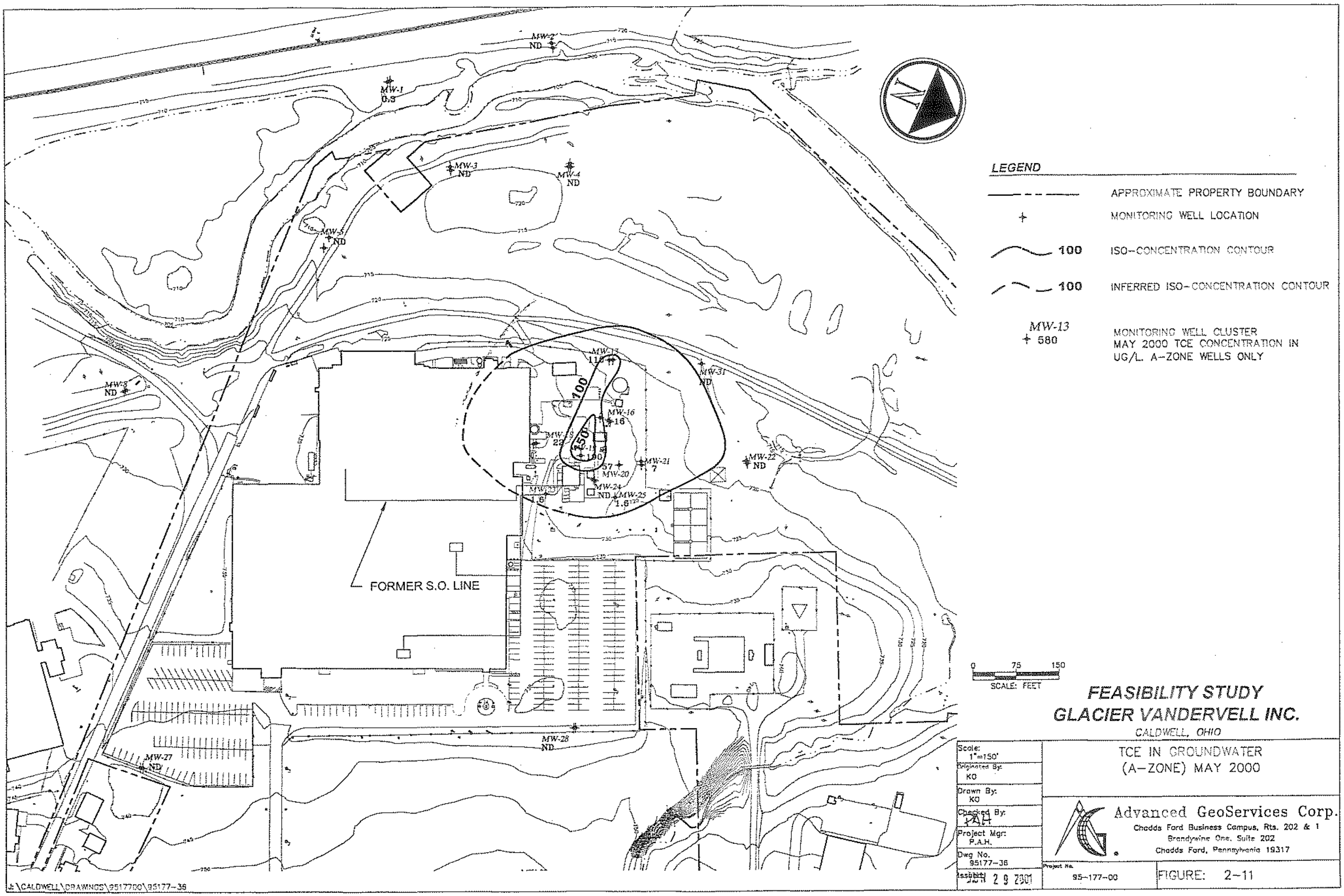


Figure 6. TCE in Groundwater - Alluvium

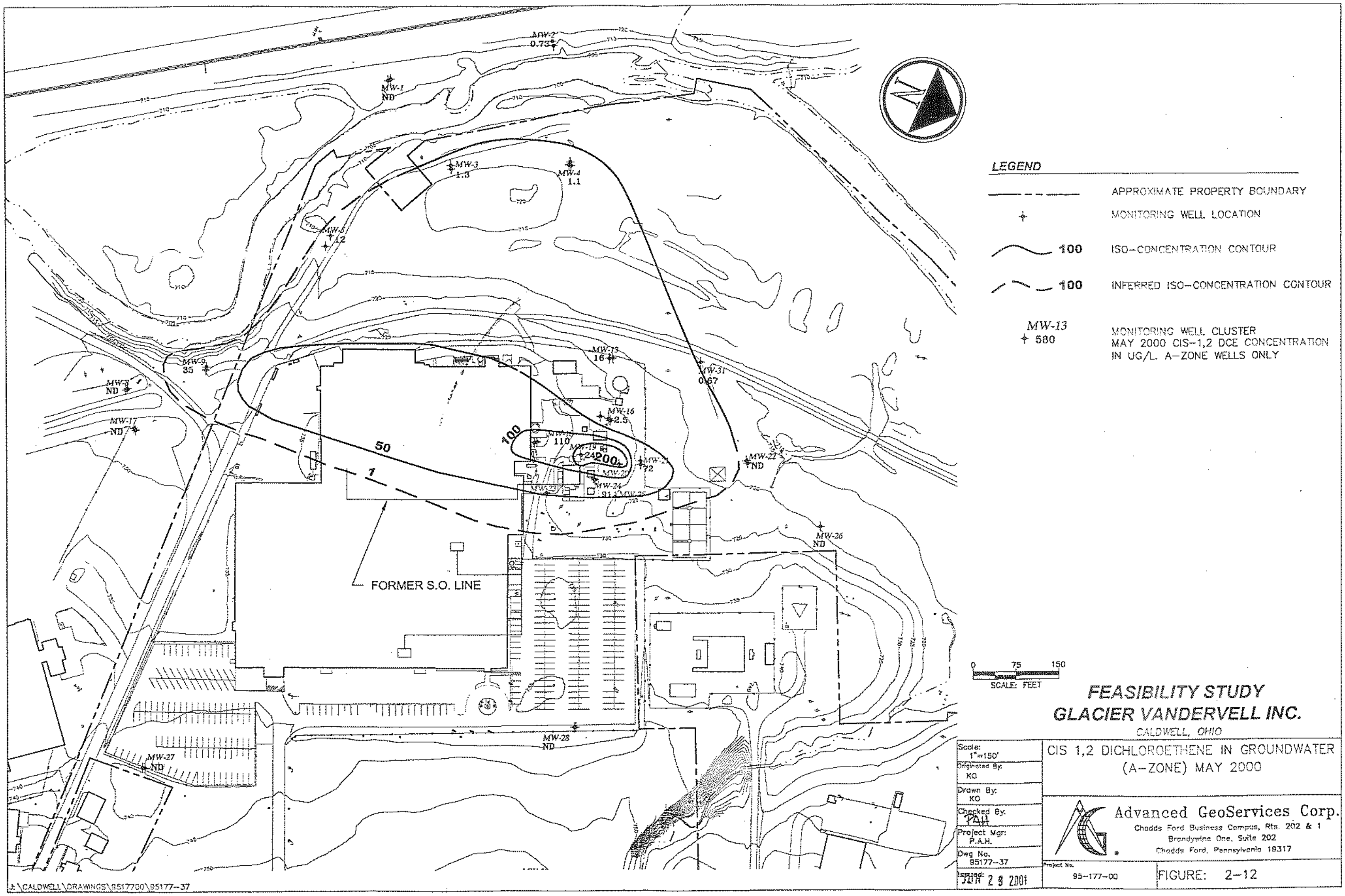


Figure 7. Cis 1,2-DCE in Groundwater - Alluvium

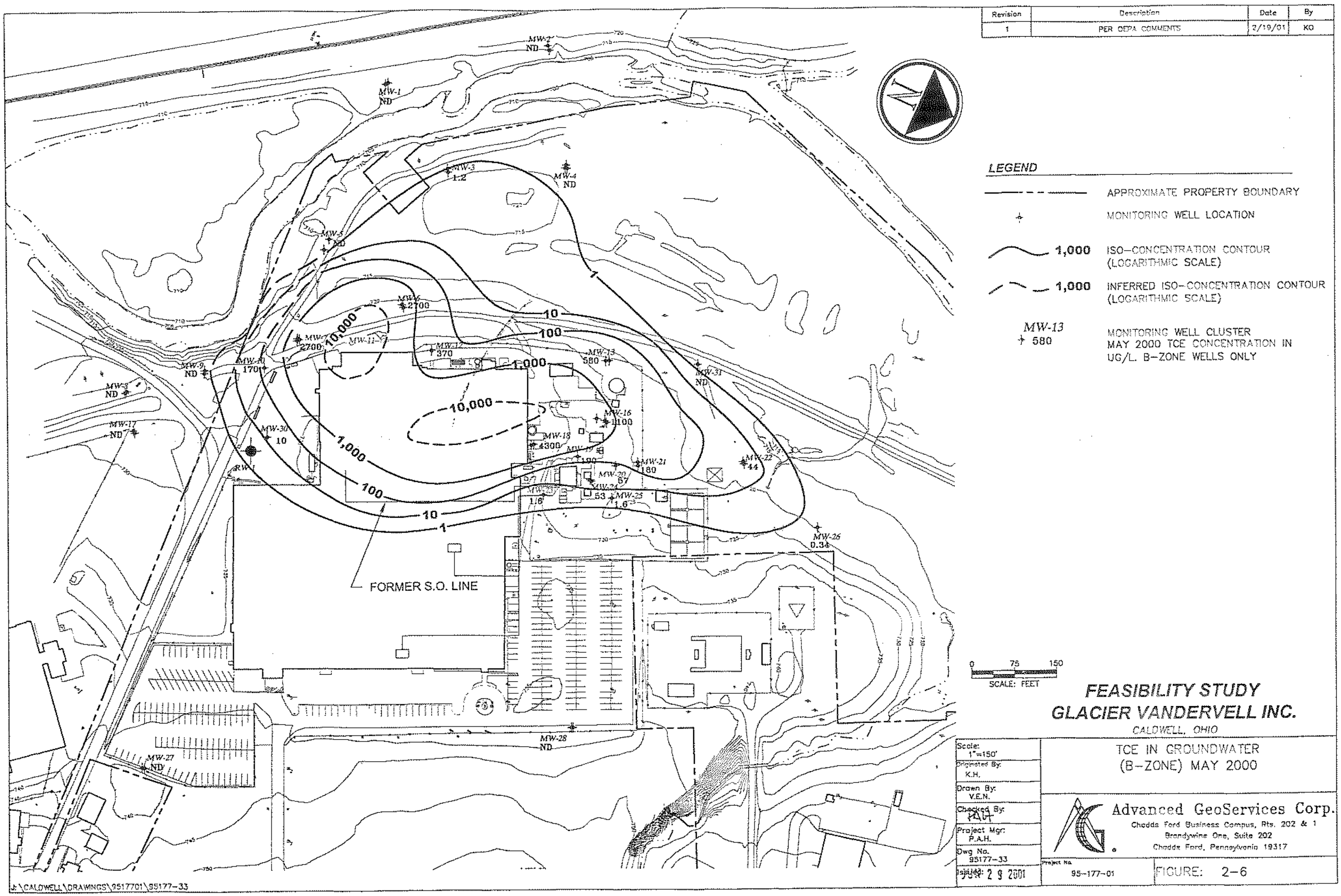


Figure 8. TCE in Groundwater - Bedrock

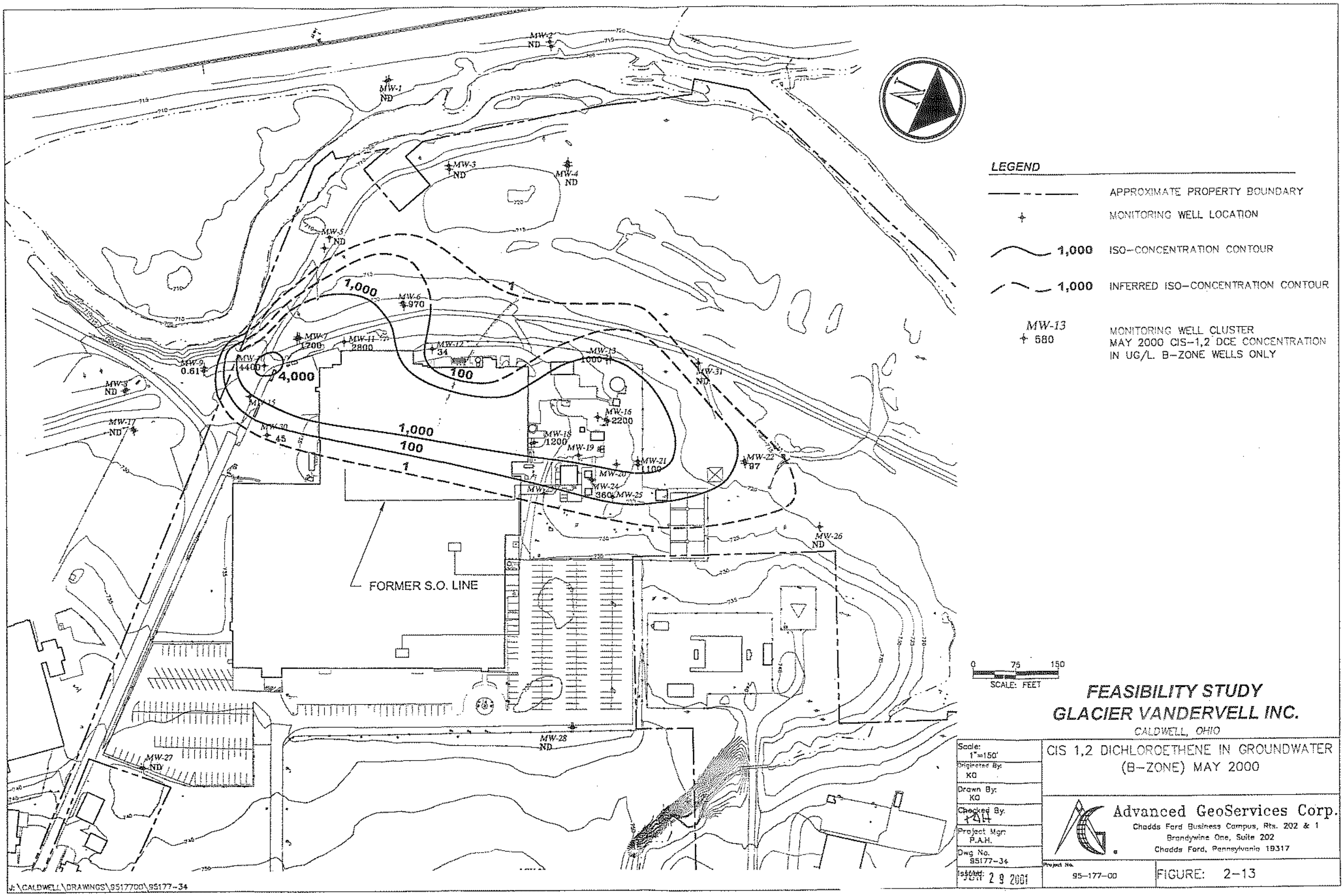


Figure 9. Cis 1,2-DCE in Groundwater - Bedrock

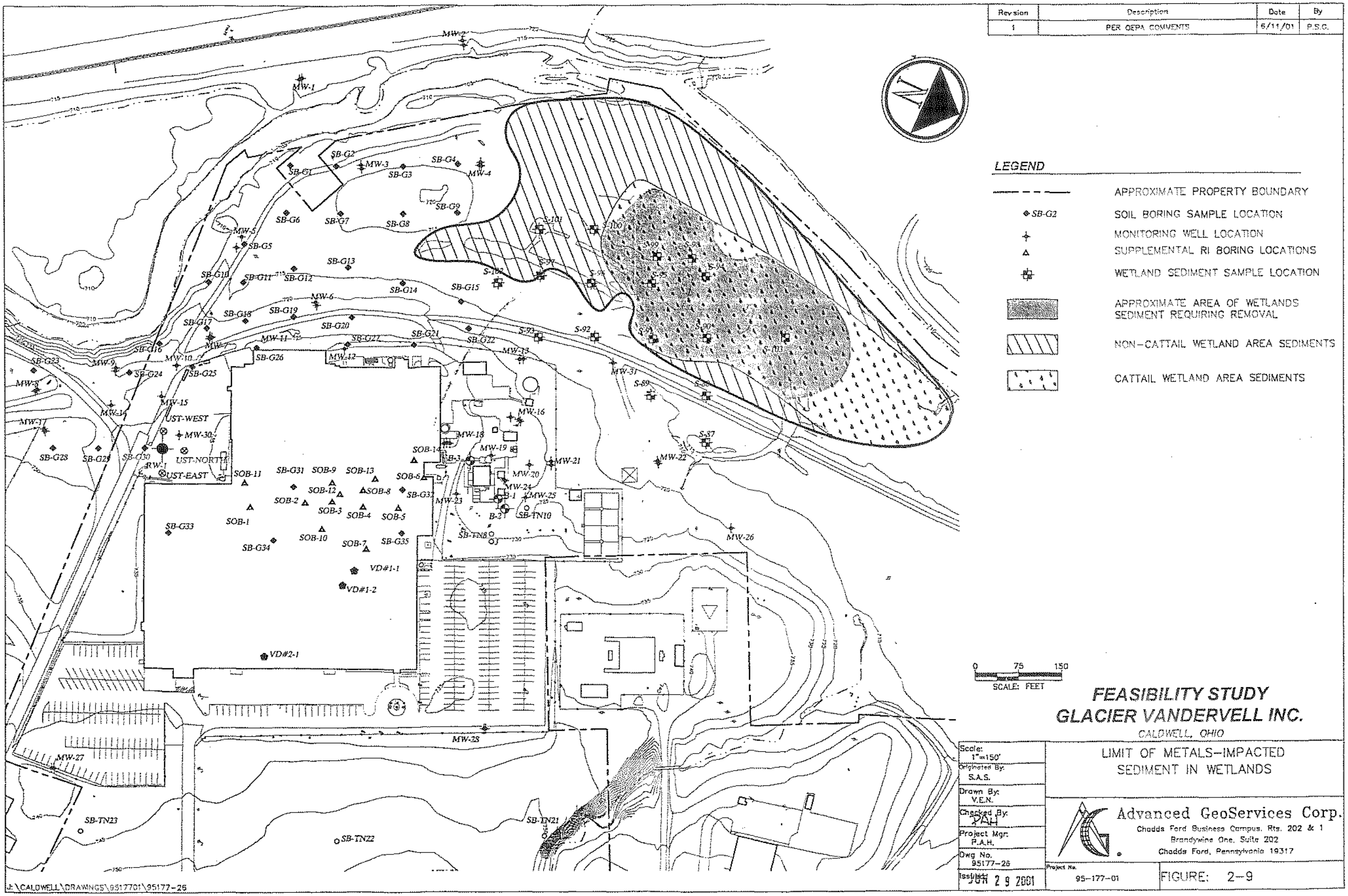


Figure 10. Metals in Wetland Sediment