Health Consultation

SOO LINE SHOREHAM YARD
EAST SIDE

MINNEAPOLIS, HENNEPIN COUNTY, MINNESOTA

SEPTEMBER 25, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

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In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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MINNEAPOLIS, HENNEPIN COUNTY, MINNESOTA

Prepared By:

Minnesota Department of Health
Under a Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

FOREWORD

This document summarizes public health concerns related to a hazardous waste site in Minnesota. It is based on a formal site evaluation prepared by the Minnesota Department of Health (MDH). For a formal site evaluation, a number of steps are necessary:

- *Evaluating exposure:* MDH scientists begin by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it is found on the site, and how people might be exposed to it. Usually, MDH does not collect its own environmental sampling data. Rather, MDH relies on information provided by the Minnesota Pollution Control Agency (MPCA), the Minnesota Department of Agriculture (MDA), the US Environmental Protection Agency (EPA), private businesses, and the general public.

- *Evaluating health effects:* If there is evidence that people are being exposed—or could be exposed—to hazardous substances, MDH scientists will take steps to determine whether that exposure could be harmful to human health. MDH's report focuses on public health— that is, the health impact on the community as a whole. The report is based on existing scientific information.

- *Developing recommendations:* In the evaluation report, MDH outlines its conclusions regarding any potential health threat posed by a site and offers recommendations for reducing or eliminating human exposure to pollutants. The role of MDH is primarily advisory. For that reason, the evaluation report will typically recommend actions to be taken by other agencies—including EPA and MPCA. If, however, an immediate health threat exists, MDH will issue a public health advisory to warn people of the danger and will work to resolve the problem.

- *Soliciting community input*: The evaluation process is interactive. MDH starts by soliciting and evaluating information from various government agencies, the individuals or organizations responsible for the site, and community members living near the site. Any conclusions about the site are shared with the individuals, groups, and organizations that provided the information. Once an evaluation report has been prepared, MDH seeks feedback from the public. *If you have questions or comments about this report, we encourage you to contact us.*

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OR call us at:	(651) 201-4897 *or* 1-800-657-3908 (toll free call - press "4" on your touch tone phone)
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Summary

In 2004, staff of Minnesota Pollution Control Agency (MPCA) requested that MDH staff evaluate the potential public health concerns associated with this site. The Soo Line Shoreham Yard-East Side site is contaminated with petroleum-related and non-petroleum volatile organic compounds (VOCs) from over 100 years of railroad maintenance operations and releases from other businesses that handled petroleum and solvents at the site. Contaminated soil remains at the site and contaminants exceed appropriate soil screening values in several areas, primarily at depth. The site is partially fenced and access restricted due to ongoing active railroad operations. Opportunities for frequent direct contact with contaminated soils are minimal, including by railroad employees. Groundwater is contaminated with petroleum products and VOCs on and off the site. Potable water to area residents is provided by the City of Minneapolis, and it is unlikely that any private wells remain in the area. Exposure to contamination from the site appears to be minimal, and active remediation at the site should further reduce the potential for exposure. The site is a "brownfield" site and the majority of the site work is being directed by the Minnesota Pollution Control Agency (MPCA) Voluntary Investigation and Cleanup (VIC) Program. Redevelopment at the site could create possible exposure in the future, although the extent of such exposure is difficult to predict, and could be safely managed during redevelopment. The Soo Line Shoreham Yard-East Side site currently represents no apparent public health hazard.

I. Site Background and History

The historic Shoreham Yard facility consists of a 230-acre parcel of land located west of Central Avenue, east of University Avenue, north of 27th Avenue NE, and south of Columbia Park in Northeast Minneapolis. The location of the Shoreham Yard facility is shown in Figure 1. The facility is currently occupied by active railroad operations, intermodal (i.e. shipping container) facilities, and other commercial operations that use rail service. The focus of this document, to be referred to as the Soo Line Shoreham Yard-East Side (the site), is located in the southeast quadrant of the 230-acre parcel and consists of historic railroad buildings and equipment, active railroad operations, and vacant land along Central Avenue that was once occupied by other businesses. Other known disposal areas on the broader 230-acre parcel Shoreham facility include the Soo Line Dump, the McFarland/Dworsky barrel site, and the Cedar Service site. The Cedar Service site was the subject of a separate Health Consultation in 2006 (MDH 2006). The locations of these disposal sites in relation to the Soo Line Shoreham Yard-East Side site are shown in Figure 2

The Shoreham Yard facility is currently owned and operated by the Soo Line Railroad Company (Soo Line), a business unit of the larger Canadian Pacific Railway (CP Rail). The area around the site is of typical mixed urban use, including commercial/industrial uses, recreation (a golf course and park are located just north of the site), and residential use. The nearest residences are located to the east, just across Central Avenue, and to the south just across 27th Avenue NE.

The Soo Line Railroad began operations at the site in the 1880s with site grading and construction of various industrial buildings for railroad operations including construction, painting, washing, repairing, and fueling of steam locomotives, freight and passenger cars (Golder 2005a; Geomega 2004). Diesel locomotive maintenance, operation and storage also took place at the site, beginning in the mid-1940s. Numerous (as many as 100) above and below ground storage tanks (some in excess of 100,000 gallons) and other miscellaneous maintenance structures were located on the site in support of these operations. Current railroad activities at the site are limited to intermodal operations, track maintenance, and equipment storage. Some incidental light maintenance and repair of railroad equipment (not locomotives) takes place, but many of the remaining historic railroad buildings are no longer in use. The only other business at the site is located in the former Diesel Shop, which is now used by Ambassador Steel to process steel rebar.

Beginning in the early 1900s, small portions of the site along Central Avenue were leased to other companies who operated chemical blending, storage, and transfer operations (initially Rocket Products, subsequently Ashland Chemical) and fuel storage, retail fuel, and vehicle maintenance operations (Murphy Oil). The chemical handling facility operated from 1958 until 1983, while petroleum product operations occurred for a longer period of time, from the 1930s until 1986 (IT 2001; Golder 2005a).

Environmental investigations at the site in the 1980s and early 1990s concentrated on petroleum contamination associated with fuel storage and diesel locomotive fueling and service areas. In 1994, chlorinated solvents were found in groundwater at the site, and subsequent investigations have generally been conducted under the oversight of the Minnesota Pollution Control Agency (MPCA) Voluntary Investigation and Cleanup (VIC) Program under MPCA Project Number VP5080. Many VIC sites are "brownfield" sites that are being investigated and remediated prior to redevelopment. Investigations have identified petroleum contamination (including free product) in soil and groundwater at the site, areas of petroleum mixed with chlorinated solvents, and solvent contaminated soil and groundwater (including some free product) in several areas. Chlorinated solvent contamination in groundwater extends at least ¾ mile off the site to the south.

In April 2004, Minnesota Pollution Control Agency (MPCA) staff in the VIC unit requested that MDH staff assist MPCA staff by evaluating the potential public health concerns associated with the site. In the preparation of this report, MDH consulted with local residents, a community group (the Shoreham Area Advisory Committee, or SAAC), as well as staff from the MPCA, Minnesota Department of Agriculture (MDA), the City of Minneapolis, Soo Line, Ashland, and their respective attorneys and environmental consultants.

Site Description

The Soo Line Shoreham Yard site is a large and complex site, reflecting its long history of railroad operations and other commercial activities. For project management purposes, the site has been divided into separate areas based on historical operations or contamination sources, a common practice on large, complicated sites. The areas are designated A through G (see Figure 3) and have been described as follows (IT 2001; Geomega 2004; Golder 2005a):

- Area A: Former Lease Area. This is the property along Central Avenue formerly occupied by Murphy Oil and Rocket Products / Ashland Chemical.
- Area B: Collector Pan Area. This area was used from 1945 until the early 1990s for refueling locomotives with coal and diesel fuel. Fuel was stored in two 19,000 gallon above ground tanks. Numerous fuel spills occurred in this area.
- Area C: Roundhouse Area. This area contains the roundhouse and associated locomotive service areas. Railroad cars and locomotives were repaired, painted, and cleaned in this area from the 1880s until 1996.
- Area D: Former Ice House Area. This area was used for storage of ice used to cool early refrigerator cars. No environmental concerns have been identified in this area.
- Area E: Waste Reclamation Area. This area was historically used to store railroad supplies such as batteries, journal boxes, oils, solvents, grease, and other materials. Liquid materials and wastes were stored in tanks and drums.
- Area F: Pump House Area. This area was used primarily for fuel storage, including three 110,000-gallon tanks. Some locomotive refueling also occurred in this area.
- Area G: Shops Area. This was the last area defined and added to the site. It contained various buildings used in construction and maintenance of railroad cars and locomotives. Investigations in this area have shown limited contamination from petroleum products and solvents that were used in this area for many years.

A detailed description of all contamination identified on this large and complex site is beyond the scope of this document. Various reports that contain documentation of environmental plans, investigations, and data collected at the site are located in a repository at the Minneapolis public library in Northeast Minneapolis, where they are available to the public. These documents are also available for review at the MPCA St. Paul offices. This report will primarily focus on non-petroleum contamination at the site. Petroleum contamination will be reviewed as well when it co-occurs with non-petroleum contamination, which is the case across much of the site. The majority of site investigation and remedial actions are being conducted under MPCA VIC program oversight.

Geology/Hydrogeology

Surficial soils at the site consist of a mixture of native and imported sand and fill material including construction debris, gravel, cobbles and finer grained material, and other fill including coal and slag from railroad operations (Golder 2005). Fill material ranges from less than one foot to about six in depth at the site. The shallow fill materials are underlain by multiple and complex unconsolidated sediments such as sandy alluvial deposits, glacial tills, localized clay units, and glacial outwash deposits. The deposits consist of primarily fine to coarse-grained sand with variable amounts of silt, clay and gravel (Golder 2005a). These unconsolidated sediments range from less than 50 feet in depth on the west side of the site to over 200 feet in depth on the east. The uppermost bedrock formations beneath the site are the St. Peter Sandstone (consisting of an upper sandstone unit above a lower mudstone unit) and Prairie du Chien Dolomite

(limestone). A bedrock valley trending northeast to southwest exists along the southeast portion of the site. In this valley, the St. Peter Sandstone has locally been eroded away so that the Ordovician-era Prairie du Chien (dolomite) is the uppermost bedrock. This bedrock valley has a strong influence on natural groundwater flow in the vicinity of the site.

The uppermost groundwater at the site is present at depths between 30 and 40 feet (Golder 2005a). Groundwater flow has been characterized by measuring ground water levels in the numerous monitoring wells (over 100) installed at and near the site. Based on measurements collected in 2004 (Golder 2005a), groundwater flow in the unconsolidated sediments beneath the site appears to be generally to the southeast. Groundwater flow in the upper bedrock units at the site (the St. Peter) is generally to the south and southeast. Groundwater flow in the upper Prairie du Chien follows the regional flow pattern, generally to the south.

Groundwater level measurements collected in nested wells (several wells in the same location completed at different depths) also indicate a downward vertical gradient at the site, so that groundwater also flows from the shallow unconsolidated sediments toward the deeper bedrock valley on the east side of the site. Groundwater flow at and near the site can be characterized as complex, in part due to the varied geology and in part due to the presence of the buried bedrock valley. A conceptual model of groundwater flow that illustrates the complex flow at the site was prepared by Golder and is presented in Figure 4.

Soil Investigations at the Site

Investigations at the site began as early as 1977 after reported diesel fuel spills in what is now designated Area B (Geomega 2004). In response to the reported fuel spills the MPCA directed Soo Line to install collector pans to catch fuel spills during locomotive refueling. The first large-scale investigation of soil contamination, conducted in 1987 by Dames and Moore on behalf of Soo Line, identified several additional areas of soil contamination in the roundhouse and waste reclamation areas. Since 1987, at least a dozen separate investigations to document and define soil and groundwater contamination have been conducted at the site. These investigations have included hundreds of soil borings and soil sample analyses. Generally, soil contamination at the site falls into two categories: petroleum-related contaminants and solvent-related volatile organic compounds, or VOCs. The petroleum contamination includes both petroleum hydrocarbons, petroleum-related VOCs, and semi-volatile petroleum contaminants.

Petroleum and petroleum- related VOC contaminated soils are found across much of the site, especially Area A (former Lease Area), Area B (Collector Pan Area), Area C (Roundhouse), Area F (the Pumphouse Area) and Area G (Shops Area). This petroleum related contamination is likely the result of locomotive refueling and fuel spills and leaks, and from storage tank and product handling releases of solvents in the Lease Area.

The extent of the petroleum and petroleum-related VOC contamination are shown in Figures 5 and 6, which were developed by Golder (Golder 2005a). Figure 5 shows the three-dimensional distribution of naphthalene in soil at the site. Naphthalene is a commonly found in petroleum products, and can be an indicator of petroleum contamination, especially heavier fuels such as diesel fuel. Naphthalene is also a solvent, and releases of naphthalene occurred in the Lease

Area. Figure 5 shows the data for naphthalene from soil borings conducted at the site since 1987 in plan view and several isometric views. Highlighted are areas where the concentration of naphthalene exceeds the MPCA tier 1 Soil Leaching Value (SLV) for naphthalene of 7,500 micrograms per kilogram of soil (µg/kg). The SLVs represent the concentration of a contaminant in soil above which leaching could contaminate the groundwater to levels above established standards. Also highlighted are samples that exceed 10,000 µg/kg, which is the MPCA tier 1 (or residential) Soil Reference Value (SRV) for naphthalene. The SRV represents the concentration of a contaminant in soil at or below which normal dermal contact, inhalation, and/or ingestion are unlikely to result in an adverse human health effect (MPCA 2006). The MPCA tier 2 (industrial) SRV for naphthalene is 28,000 µg/kg. Figure 5 clearly shows that naphthalene contamination from petroleum and non-petroleum related sources is present at the site, especially in the former Collector Pan Area, Lease Area, and Roundhouse.

Figure 6 is a similar set of views showing concentrations of toluene in soil at the site. Toluene is found in petroleum products, and is also used alone as an industrial solvent. Figure 6 shows that while toluene is detected across the site, likely as a result of petroleum releases, much higher levels are found in the former Lease Area. This may be the result of petroleum releases, or more likely spills or leaks from tanks that contained toluene used as an industrial solvent. The MPCA SLV for toluene is 6,400 µg/kg, while the SRV for toluene is 107,000 µg/kg based on a residential land use, and 305,000 mg/kg based on an industrial land use. The results of the multiple investigations conducted at the site since 1987 show that a significant area of petroleum and solvent related soil contamination is present at the site, extending in some areas below the water table, and that groundwater at the site had been impacted.

Figure 7 shows the sum of all chlorinated solvents detected in soil at the site (Golder 2005a). Chlorinated solvents, or chlorinated VOCs, are generally used for industrial cleaning purposes, and are not related to petroleum products. Common chlorinated VOCs include tetrachloroethene (or PCE, used in dry cleaning of clothing) and trichloroethene (TCE, used in metal cleaning and degreasing) as well as many related compounds. While low levels of chlorinated VOCs have been detected in many areas of the site (especially the Roundhouse, where they were likely used for cleaning and degreasing), it appears that the majority of the chlorinated solvent releases occurred in the former Lease Area where chlorinated solvents were stored, mixed, and sold commercially. Levels of individual chlorinated VOCs, such as PCE and TCE, exceeded the MPCA SLVs and SRVs at depth in the former Lease Area, and in the southern portion of the Roundhouse.

Groundwater Investigation on and off the Site

Since site investigation activities began, 143 monitoring wells have been installed on and off the site to evaluate groundwater conditions (AMEC 2006). The monitoring wells are designed to monitor groundwater in four different zones: the shallow or surficial zone, intermediate depth, deep zone, and the bedrock aquifer. Additional bedrock monitoring wells were installed in 2006.

The most recent comprehensive groundwater monitoring event for which data have been reported was conducted in October and November 2005. Groundwater samples were collected from each monitoring well and analyzed in a laboratory for VOCs, diesel range organics (DRO),

and gasoline range organics (GRO), as well as miscellaneous other parameters (AMEC 2006). Free product, which usually consisted of a distinct layer of undissolved petroleum (Areas B and F) or solvents (Area A) floating on top of the groundwater, was found in 13 different monitoring wells in 2005. The free product layer ranged from less than an inch to over 17 feet in thickness. This free product is also referred to as light non-aqueous phase liquid, or LNAPL.

Groundwater contamination at the site can be divided into two categories: petroleum-related compounds and non-petroleum related solvents, of which chlorinated VOCs are the main concern. To simplify reporting and focus site investigation in necessary areas, typically data are reported only for contaminants that exceed state or federal drinking water criteria. All data are submitted and available for review, however. Generally, these are MDH Health Risk Limits (HRLs) and Health-Based Values (HBVs). The HRLs represent levels of contamination in drinking water that MDH considers acceptable for daily human consumption over a lifetime, and are promulgated rules. An HBV is essentially a site-specific guideline that has not been promulgated as rule. In all, 26 compounds were detected in groundwater in 2005 at concentrations that exceeded a HRL or HBV.

One indicator of petroleum-related contamination frequently detected in monitoring wells at the site is DRO. DRO was detected above the HBV of 200 micrograms per liter of water (µg/L) in 65 primarily shallow monitoring wells in 2005 (AMEC 2006). DRO concentrations ranged from below laboratory detection limits to 44,000 µg/L in monitoring well MW-603, located in the former Pump House Area (Area F). Levels of DRO in excess of the HBV are also found in monitoring wells located to the east and south of the site. Figure 8 shows the concentration of DRO found in monitoring wells at and near the site in October/November of 2005 (AMEC 2006). Concentrations of DRO have generally remained relatively stable, or slightly decreasing in most wells.

The chlorinated VOCs most frequently detected in monitoring wells at the site are PCE, TCE and vinyl chloride. PCE was detected above its HRL of 7 µg/L in 35 monitoring wells in 2005 (AMEC 2006). PCE concentrations ranged from below laboratory detection limits to 5,500 µg/L in monitoring well MW-04-28-I, located in the former Waste Reclamation Area (Area E). Levels of PCE in excess of the HRL are also found in monitoring wells located to the east and south of the site. Figure 9 shows the concentration of PCE found in monitoring wells at and near the site in October/November of 2005, while Figure 10 shows PCE levels in monitoring wells located off-site to the south and east.

TCE was detected above its HBV of 5 µg/L in 34 monitoring wells in 2005 (AMEC 2006). TCE concentrations ranged from below laboratory detection limits to 8,100 µg/L in monitoring well MW-318, located in the former Lease Area (Area A). Levels of TCE in excess of the HBV are found in three monitoring wells located to the east of the site. Figure 11 shows the concentration of TCE found in monitoring wells at and near the site in October/November of 2005.

Vinyl chloride, a common breakdown product of PCE and TCE, was detected above its HRL of 0.2 µg/L in 29 monitoring wells in 2005 (AMEC 2006). Vinyl chloride concentrations ranged from below laboratory detection limits to 2,600 µg/L in monitoring well MW-317. That well is

located off-site to the east of the former Lease Area (Area A). Levels of vinyl chloride in excess of the HBV are also found in monitoring wells located to the east and south of the site. Figure 12 shows the concentration of TCE found in monitoring wells at and near the site in October/November of 2005; Figure 13 shows vinyl chloride levels in monitoring wells located off-site to the south and east.

Soil Vapor Investigations on and off the Site

In 2002, the MPCA directed Soo Line to conduct a vapor risk survey on the east side of the Shoreham Yard – East Side site, along Central Avenue (AMEC 2003). This work was requested to determine if subsurface VOC contamination in soil and groundwater could lead to unsafe or explosive levels of vapors in nearby sewers or utility lines. It was also done to more thoroughly follow-up on a report of workers smelling organic-type vapors when a manhole was opened in the spring of 2000, and on a limited vapor survey conducted in 2000 that did not detect organic vapors in 16 locations on the site.

The 2002 vapor survey was conducted using direct-reading instruments generally used for screening purposes in confined-space entry situations. The instruments are designed to detect explosive gases and organic vapors in enclosed spaces, generally at low part-per-million levels that could be unsafe for humans to enter, and are not designed for low-level vapor assessments where part-per-billion levels may be of long-term health concern. Approximately 80 storm and sanitary sewer manholes, catch basins, and utility access points at the site and along Central Avenue were monitored. None of the 80 sampling points showed detectable levels of explosive gases or organic vapors at the limits of detection of the instruments used.

In late 2003, a large-scale soil gas monitoring program was conducted at the site (AMEC 2004). The program consisted of the temporary installation of 662 passive soil gas monitors in shallow (less than three feet deep) soil at the site, allowing them to sit for a period of two weeks, and then retrieving them for analysis for a wide range of chlorinated and non-chlorinated VOCs. Passive soil gas monitors are designed for screening purposes, to identify potential areas of contamination in soil, and are not considered definitive for the identification of soil vapor impacts. Results are reported as the mass of contaminant absorbed by the detector, and therefore do not equate to a soil, air or soil vapor concentration. The passive soil gas monitoring identified several areas for additional investigation, including the Former Lease Area, the Roundhouse, and the former Waste Reclamation Area. The results of the passive soil gas study (for total chlorinated VOCs) are shown in Figure 14. Several monitoring points on the east side of Central Avenue showed very low levels of chlorinated VOCs.

In 2004, Ashland, a former tenant, collected additional soil gas samples along the west side of Central Avenue (between 29th and 30th Streets NE) adjacent to the former Lease Area (Ashland 2004). This work was facilitated by the reconstruction of Central Avenue, which created an opportunity to conduct soil borings in areas normally inaccessible due to traffic. Soil gas samples were collected from a boring depth of five feet below grade in six locations, using methods designed to identify low levels of VOCs that could be of potential long-term health concern. In two of the locations, the borings were drilled to the water table (approximately 35 feet below grade) and soil gas samples were collected at 10-foot intervals. The samples were

analyzed for VOCs. The data are presented in Table 1; the boring locations are shown in Figure 15. Multiple individual petroleum-related and chlorinated VOCs were detected, some at levels of over 400,000 parts per billion (ppb) at a depth of 25 feet. The findings were generally consistent with the passive gas survey results. However, if VOCs were entering utility lines at these concentrations they should have been detected during the 2002 vapor survey. The lack of detections during the 2002 survey and the much lower concentrations observed in shallow soil gas samples in 2004 indicates that while VOC vapors are present in the deep soil above the water table, they do not appear to be infiltrating nearby utility lines based on these data. The MPCA has requested additional investigation to determine if soil vapor migration could occur, however.

Response Actions to Date

A number of limited response actions were conducted at the site prior to cessation of major railroad maintenance operations in the mid-1990s, generally to respond to spills or leaks of petroleum products. Long-term response actions to address residual contamination from these past operations began in 2005, when major investigation activities were nearing completion and legal liability issues between CP Rail, Ashland, and Murphy Oil that had hindered joint response actions were settled.

The first interim response action at the site designed to address mainly non-petroleum contamination was the installation of a soil-vapor extraction (SVE) system in the Former Lease Area in 2005 (Golder 2005b). The system is designed to remediate soil, LNAPL, and groundwater contamination in that area. SVE systems operate by extracting volatile organic vapors from the pore spaces between soil particles through a system of points or dry wells installed in the soil that are placed under vacuum. The Former Lease Area SVE system consists of six SVE points installed in the shallower, alluvial soils, and nine SVE points installed in the deeper till soils, just above the water table. The predicted radius of the zone of influence of each SVE point ranged from 40 to 60 feet; actual zones of influence as measured during system operation were larger. The layout of the Former Lease Area SVE system is shown in Figure 16. One till SVE point is located in the median of Central Avenue, providing coverage to the east side of the street. The SVE points are connected through above ground piping to a main collection point in a trailer at the site, where the blowers and treatment unit are located.

The SVE system began full operations in April 2006 (URS 2006). Initially, vapors extracted from the SVE points were treated by thermal oxidation (or burning) prior to emission due to the relatively high levels of VOCs present. The thermal oxidizer was used for emission control through July 2006, when it was replaced by two 5,000-pound granular activated carbon (GAC) filter units. While it was in operation, the thermal oxidizer typically achieved 95% or better VOC destruction efficiency. The destruction efficiency declined over the period of operation despite numerous adjustments, in part due to declining concentrations of VOCs in the extracted soil vapors. Emissions form the thermal oxidizer met MPCA thresholds at all times during operation. Through the end of October 2006, the SVE system removed a total of 3,968 pounds of VOCs (URS 2006). Emissions were greatly reduced when the GAC filters were installed, both in the number of compounds and in their concentrations. This was due to both the increased efficiency of the GAC filters, and the much lower mass removal rate of the SVE system over time. Once the remedial goals of the SVE system are achieved (i.e. contaminant mass removal),

confirmation soil and vapor sampling will be conducted. Additional soil excavation or other actions may be needed to achieve the goal of the response action, which is to return the property to (restricted) commercial use (Golder 2005b).

Ambient air monitoring was conducted near the thermal oxidizer/GAC filters and along Central Avenue as a further check on emissions from the SVE system. The monitoring locations, labeled AS-1 through AS-5, are shown in Figure 16. Air samples were collected using a stainless steel canister over a six-hour period and analyzed for VOCs using EPA Method TO-15, which is capable of very low detection limits. Background samples were collected at each of the five locations prior to SVE system operation, in early January 2006. Samples were then collected from each location on three occasions during system testing, in January and February of 2006. Monitoring samples were collected from selected locations in May, July, and August 2006. The data (actual laboratory detections only) are presented in Table 2. Acetone was consistently detected, along with spotty detections of some other VOCs. Two VOCs, benzene and methylene chloride, exceeded MDH chronic Health Risk Values (HRVs) for air on one occasion each. The HRVs represent levels of contaminants in air that MDH considers acceptable for long-term, daily exposure. Benzene, a component of gasoline, is commonly detected in ambient air in urban areas, especially along major roads.

Removal of LNAPL (mainly solvents and petroleum products) from monitoring well MW-402D, located in the Former Lease Area, has been successfully demonstrated using a continuous belt-type skimmer known as a NET^{TM} system (Geomega 2006). The skimmer belt, made of an oleophilic/hydrophobic ("oil loving/water hating") material, wicks up the LNAPL from the water table surface and carries it up the well where it is squeezed out by rollers and collected in a drum. Based on initial operation, it appears that the system is capable of removing up to one or two liters of LNAPL per day. This effort will continue as long as sustainable recovery is possible.

In 2005, Soo Line proposed a site-wide response action plan to address mainly non-petroleum related contamination across the site (Golder 2005c). The plan proposed continuation of the interim response actions (SVE and LNAPL removal) in the Former Lease Area, and proposed similar remedies for other areas of the site. The goals of the site-wide response action plan are:

- Remediate accessible soil to prevent direct contact exposures;
- Remove recoverable LNAPL;
- Remediate deeper soils to mitigate future impacts to groundwater; and
- Remediate or protect potentially potable groundwater by removing contaminants from soils and groundwater.

The overall goal of the response actions is to return the site to productive, restricted commercial or industrial use. The commercial restriction refers to the fact that not all commercial uses are considered equal in terms of the potential for future exposure, or with regards to the population that could be exposed. For instance, a commercial operation such as a day care facility would likely not be allowed under a restricted commercial use scenario, while a small retail business would likely be allowed.

Site-wide response actions proposed for the site (in addition to the SVE and LNAPL removal in the Former Lease Area) include (Golder 2005c):

- Enhanced biodegradation (essentially aiding the natural breakdown) of contaminants in till groundwater in the Former Lease Area;
- Containment pumping of contaminated outwash groundwater in the Former Lease Area;
- Additional SVE systems to remediate soil in the Roundhouse, Waste Reclamation, and Shops areas;
- Limited soil excavation and removal in the Shops Area;
- Pumping of overburden groundwater in the Roundhouse area; and
- Monitored natural attenuation of VOC contamination in the Prairie du Chien bedrock aquifer.

The additional SVE systems will consist of 15 SVE points in the Roundhouse Area, seven SVE points in the Former Waste Reclamation Area, and four SVE points in the Shops Area (Golder 2006). Emission control for each system will be provided by GAC filters, similar to those in use at the Former Lease Area SVE system. They are designed to achieve 98% removal efficiency at standard flow rates. Air emissions from all of the SVE systems to be installed at the site will be minimized by the use of GAC treatment, and should result in emissions well below public health benchmarks.

The MPCA VIC Program staff conditionally approved the site-wide response action plan, with modifications, in January of 2006. The response actions described above are underway, under the oversight of the MPCA. Site safety and contingency plans have been developed to ensure that the response actions are carried out in a way that will protect the health and safety of onsite workers, passers-by, and neighbors. Petroleum contamination is being addressed in a coordinated fashion under similar MPCA reviewed and approved workplans through the MPCA Petroleum Remediation Program. Remediation of strictly petroleum-contaminated soils has also begun.

Site Visit

On Thursday, August 17, 2006 MDH staff conducted a site visit at the Soo Line Shoreham Yard – East Side site located along Central Avenue NE in Minneapolis, Minnesota. Also on the site visit were MPCA staff, representatives of Ashland Inc., and Golder Associates, consultants for CP Rail. The site visit was lead by CP Rail staff. Weather was cool and cloudy.

The site visit began in an office trailer used by Golder, where site safety and the reasons for the site visit were discussed. These included viewing the facility and the historical operating areas, remediation systems in place, and possible exposure areas and air monitoring locations. Safety was an important issue as there are active rail operations at the site.

Most of the historic railroad buildings at the site have been demolished. Remaining are the historic roundhouse, the former diesel shop, and several other small structures. While some

historic railroad equipment remains (such as the sanding towers near the roundhouse), much of the site is vacant land. CP Rail has retained some railroad operations at the site, primarily light maintenance of intermodal cars. Other areas of the Shoreham facility are in active use as an intermodal shipping container transport hub.

First viewed was the soil vapor extraction (SVE) system along Central Avenue, in the Ashland/Murphy Former Lease Area. There are over a dozen SVE wells in place on the Former Lease Area. The SVE wells are connected through large white plastic PVC pipes back through the site fence, and are manifolded prior to entering the treatment shed. The treatment shed is located approximately 200 feet west of Central Avenue. When the system was first installed and operated, pre-emission treatment of VOC vapors consisted of a thermal oxidizer unit. Now that mass recovery of subsurface VOCs has tapered off, two granular activated carbon (GAC) units are being used for treatment and emission control. The GAC units consist of two large cylindrical tanks and associated piping. Noise from the blower was noticeable, but not overwhelming – normal conversation was possible. There was no noticeable odor or other evidence of emissions. Also noted were the locations of ambient air monitoring that have been conducted several times near the SVE system and along Central Avenue. A number of small bushes that were planted this year around the new screening fence along Central Avenue had died during the summer. This is almost certainly from a lack of rain or watering over a dry summer, and is not likely to be related to the SVE system. No obvious signs of stress were observed in the established trees, shrubs, or grass in the area.

Also viewed were the free product recovery well located in the Lease Area, as well as a similar system recently installed in the former locomotive fueling (or Collector Pan) area. These systems consist of a belt that cycles continuously through the water surface in the well, pulling out diesel fuel and solvents that stick to the cloth belt. The belt is then wrung out and the product is deposited in a container for later disposal. The whole system is sealed to prevent odors or loss of the free product through evaporation, and no odors or evidence of a release were noted.

The historic roundhouse was visited next. A separate SVE system is being installed to address solvent and petroleum contamination beneath and around this building. Because of concerns regarding the structural integrity of the older sections of the roundhouse, SVE points were installed outside of the locomotive stall entrance doors in these areas, between the doors and the turntable pit. CP Rail has contracted with a structural engineering firm and a historic renovation firm to try to address concerns regarding the historic roundhouse. In the newer sections of the roundhouse (post-1900), SVE points were installed inside the structure, along with several soil gas monitoring points and groundwater monitoring wells. This SVE system was not yet in operation – lateral piping to connect the SVE points to a blower and emission control system had not been installed (note: the system has now been fully completed and testing is underway). A separate SVE system will be installed in the former Waste Reclamation Area in the SE corner of the site to address solvent and petroleum contamination in that area.

There were only a few small visible areas of clearly contaminated surface soil at the site, and this appeared to be from historic locomotive fueling operations. According to CP, approximately 20-

30 employees currently work out of the facility, mostly on track and freight car maintenance. Exposure to contaminated soils at the site is expected to be minimal, as is exposure to emissions from the SVE system given the stack height of the emission control systems and the lack of a reason for railroad employees to spend much time in close proximity to them. The primary health concern at the site appears to be physical hazards from railroad operations – safety is a major concern for CP Rail as it is for all railroads.

Land use surrounding the site is a mix of industrial, commercial and residential uses. People may spend time near the site boundary in the following areas:

- Bus stops along Central Avenue, and businesses located across Central Avenue to the east.
- Residences located south of the site, along 27th Street.
- A park and playground located just over the southern property line, at 27th Street and Howard Avenue.
- A community garden located just over the southern property line at 27th Street and 6th Avenue NE.
- A new community center being built at the corner of 27th and Central.
- The city park and golf course located north of the site.

The site itself is fenced, although the fencing is not continuous especially on the northern and western property boundaries. Public access is discouraged to prevent accidents related to active rail operations. Trespassing reportedly occurs, but infrequently according to CP Rail staff. No evidence of frequent trespassing or overnight use were observed on the site. The site is host to at least two public events during a typical year, including the CP Rail "Holiday Train," a fund-raising event featuring music and a fully lighted train.

Public Comment Period

A draft version of this document was released for public review and comment on March 19, 2007. The deadline for public comment was May 21, 2007. Three sets of public comments were received, from the MPCA, Golder Associates on behalf of CP Rail, and from SAAC. The comments, and how they were addressed in the final document, are summarized in Appendix 1.

II. Discussion

Many former railroad maintenance facilities have become contaminated with petroleum and chemical wastes as a result of their use in maintaining, repairing, and even constructing railroad locomotives, freight cars, and other equipment. The Soo Line Shoreham Yard facility, which served as a major maintenance facility for the Soo Line Railroad for over 100 years, is no exception. Soil and groundwater at the site are contaminated, in some areas heavily

contaminated, with residual petroleum and solvents (such as naphthalene, toluene, and chlorinated VOCs). However, the contamination is generally confined to specific former operational areas that are not accessible to the public, and more concentrated at depth in the soil. Other areas where heavily contaminated soils may have once existed at the surface have been remediated, covered, or the contaminants have degraded or volatilized over time. In addition, the SVE systems installed at the site have undoubtedly reduced the concentrations of VOCs in the soil, as over 3,900 pounds of VOCs were removed from the Former Lease Area through October 2006.

The site is partially fenced and access to the public is restricted due to active railroad operations that still take place. Opportunities for frequent direct contact with contaminated soils are minimal. Given the current status of most of the site as vacant land, separated from populated areas by roads and fences, it is unlikely that people, including railroad employees, are being exposed to contaminated soil on a regular basis.

VOC contamination at the site has led to the presence of soil vapors, especially in deeper soils. Based on the results of shallow soil vapor sampling and screening of utility lines, it does not appear that the high concentrations of soil vapors found in deep soil in some areas along Central Avenue have represented a significant risk to the public or surrounding structures. The installation of the SVE systems at the site should effectively interrupt and capture subsurface soil gases and prevent any future migration towards utility lines or buildings along Central Avenue. Data are needed to verify this, however. The MPCA has requested that CP Rail and Ashland, Inc. collect such data after the SVE system has been in operation for one year.

Air emissions from the thermal oxidizer, which treated emissions from the Former Lease Area SVE system from April through July 2006 met MPCA screening thresholds for point sources at all times. Ambient air monitoring done near the thermal oxidizer unit (and later near the GAC filters) showed very low levels of VOCs, indicating the emissions do not pose a health concern to CP Rail employees or others on the site. There were two exceedances of MDH chronic HRVs in air samples collected along Central Avenue, one for benzene and one for methylene chloride. Both are common urban air contaminants, and their detection may or may not have been related to remediation efforts at the site. In a study of VOC levels in the Minneapolis-St. Paul metropolitan area, benzene was detected in 100% of outdoor air samples, at a mean concentration of 1.6 $\mu g/m^3$ (or 0.5 ppb; Sexton et al 2004). Typical indoor air concentrations were two to three times higher. Methylene chloride was detected in 80% of the outdoor air samples, generally at lower concentrations. Concentrations of benzene in ambient air are often elevated near major roadways due to the fact that benzene is a major component of gasoline (ATSDR 2005a). The number of VOCs detected in ambient air samples as well as their concentrations appears to have dropped once the switch from the thermal oxidizer to GAC treatment of SVE air emissions was made in late July.

VOCs have been detected in shallow groundwater and in the underlying Prairie du Chien formation, a regional aquifer, with a maximum level of PCE found in the Prairie du Chien off the site and south of 27th Avenue NE of 69 $\mu g/L$ in MW04-35-OPD (see Figure 10). This concentration exceeds the MDH HRL of 7 $\mu g/L$. TCE and vinyl chloride have also been

detected offsite in the Prairie du Chien aquifer at lower concentrations, but still in excess of their respective interim HBV or HRL in some monitoring wells. Potable water at the site, and in the surrounding community is provided by the City of Minneapolis. Repeated well searches in the area of the Soo Line Shoreham Yard facility have not identified any private wells that are still in use for drinking water purposes (AMEC 2004b; Golder Associates 2006b). While the presence of private wells in the area impacted by the VOC contamination in groundwater cannot be conclusively ruled out, it is unlikely. Remediation efforts underway at the site (such as contaminant source removal and groundwater pumping) should result in future improvements to groundwater quality both on and off the site. The proposed remedy for off-site groundwater contamination in the Prairie du Chien aquifer, monitored natural attenuation, will provide for long-term monitoring of contaminant trends to document plume stability and will provide contingencies in the event that contaminant concentrations do not go down over time. In addition, MDH is planning on extending an existing Special Well Construction Area (SWCA) for the Twin Cities Army Ammunition Plant site in New Brighton, Minnesota westward to the Mississippi River. The expanded SWCA will encompass this site and the surrounding area, and restrict the construction of new wells.

Contaminated soil at depth on the site could be brought to the surface if the site is ever redeveloped for restricted commercial or industrial use, possibly creating new exposure pathways. At least one plan has been proposed for a multi-tenant commercial development that would utilize at least a portion of the Roundhouse and land along Central Avenue. The timing of such a redevelopment is unknown, and the degree to which contaminated soil may remain on the site depends in part on how long the SVE systems are in operation to remove the contamination from the soil, and upon other remedial actions that may be conducted at the site. Redevelopment is certainly possible, assuming that the appropriate precautions are taken to ensure that any remaining contaminated soils are managed appropriately. Institutional controls such as deed restrictions may be needed to restrict disturbance of any residual contaminated soils.

As stated above, exposure to contaminated soil, soil vapors, groundwater, or air emissions does not appear to be occurring, or the concentrations are below public health concern. Because of the potential for future redevelopment, the following brief discussion of the characteristics of the main contaminants of concern at the site is presented for reference purposes only. The main contaminants of concern at the site that could be encountered during redevelopment are petroleum products and solvents (including naphthalene, toluene, DRO, PCE, TCE, and to a lesser extent vinyl chloride).

Naphthalene is a white solid that evaporates easily (ATSDR 2005b). It is also found in and can be referred to as mothballs, moth flakes, white tar, and tar camphor. Fossil fuels, such as petroleum and coal, naturally contain naphthalene. The major commercial use of naphthalene is to make other chemicals such as polyvinyl chloride (PVC) plastics. The major consumer products made from naphthalene are moth repellents, in the form of mothballs or crystals, and toilet deodorant blocks. It is also used for making dyes, resins, leather tanning agents, and the insecticide carbaryl.

Toluene is a clear, colorless liquid with a distinctive smell (ATSDR 2000). It is a major

component of gasoline, along with benzene. Toluene also occurs naturally in crude oil and in the tolu tree. It is usually produced from crude oil, in making coke from coal, and as a by-product in the manufacture of styrene. Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

Diesel Range Organics (DRO) is a term used to describe a broad family of several hundred chemical compounds that are derived from crude oil (ATSDR 1999). DRO is a mixture of chemicals called hydrocarbons because almost all of them are made entirely from hydrogen and carbon. Crude oils can vary in how much of each chemical they contain, and so can the petroleum products that are made from crude oils. Many of these products have characteristic gasoline, kerosene, or oily odors. Because modern society uses so many petroleum-based products (for example, gasoline, kerosene, fuel oil, mineral oil, and asphalt), contamination of the environment by them is widespread. Contamination caused by petroleum products will contain a variety of these hydrocarbons. Because there are so many, it is not usually practical to measure each one individually. However, it is useful to measure the amount of different types hydrocarbons found together in a particular sample of soil, water, or air. DRO represents one such category of petroleum products, usually related to heavier compounds such as fuel oil or diesel fuel, as opposed to lighter compounds such as found in gasoline.

Tetrachloroethylene (PCE) is a synthetic solvent widely used for fabric cleaning and degreasing of metal. It has been the solvent of choice for dry cleaning operators because it is nonflammable and volatilizes quickly. In dry cleaning operations, PCE is used as a scouring solvent to remove oils, greases, waxes, and fats from both natural and man-made fabrics (ATSDR 1997a). PCE is also used in water repellents, silicone lubricants, spot removers, adhesives, and wood cleaners.

Trichloroethylene (TCE) is a nonflammable, colorless liquid with a slightly sweet odor and taste (ATSDR 1997b). TCE is extremely volatile, and most TCE released into the environment will evaporate into the air. It can persist in groundwater, however, due to the limited contact between groundwater and air. TCE was used extensively as a degreasing solvent in a variety of industries. While its use as a solvent has been declining, it is also used in the manufacture of other chemical products (ATSDR 1997b). Due to its extensive use, TCE is one of the most common contaminants found at Superfund sites across the United States, especially in groundwater. TCE can be found throughout the environment, and most people are likely to be exposed to it at low levels through ingestion of drinking water, inhalation of ambient air, and ingestion of food.

Vinyl chloride is known also as chloroethene, chloroethylene, ethylene monochloride, or monochloroethylene (ATSDR 2006). At room temperature, it is a colorless gas. Vinyl chloride exists in liquid form if kept under high pressure or at low temperatures, and has a mild, sweet odor. Vinyl chloride is a manufactured substance that does not occur naturally; however, it can be formed in the environment when other manufactured substances, such as trichloroethylene, trichloroethane, and tetrachloroethylene, are broken down by certain microorganisms in the soil or groundwater. Most of the vinyl chloride produced in the United States is used to make a polymer called polyvinyl chloride (PVC), which consists of long repeating units of vinyl chloride. PVC is used to make a variety of plastic products including pipes, wire and cable

coatings, and packaging materials. Other uses include furniture and automobile upholstery, wall coverings, housewares, and automotive parts.

Once released into the environment, VOCs such as PCE, TCE, and vinyl chloride easily volatilize from soil and water. Factors that can affect the rate of volatilization from soil include soil type, organic matter content of soil, moisture content of soil, and the type of release (e.g. the size of a spill). Volatilization will tend to be higher in sandy soils and lower in denser, more organic soils such as clays where the solvents may be adsorbed onto organic carbon particles. Many VOCs also tend to move rapidly through soil, and can easily contaminate shallow groundwater.

Child Health Considerations

ATSDR and MDH recognize that the unique vulnerabilities of infants and children make them of special concern to communities faced with contamination of their water, soil, air, or food. Children are at greater risk than adults from certain kinds of exposures to hazardous substances. They are more likely to be exposed because they play outdoors and they often bring food into contaminated areas. They are smaller than adults, which means they breathe dust, soil, and heavy vapors close to the ground. Children also weigh less, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most importantly, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

At this time children are unlikely to be exposed to contaminants at the site, except perhaps during public events that are limited to one or two times per year. There is little else to attract children to the site, and children should avoid trespassing on the site due to the frequent truck and rail traffic. There are no known exposures to contaminated groundwater. The potential migration of soil vapors is being interrupted by installation of SVE systems, and emissions from the SVE systems have been below MPCA thresholds. Ambient air monitoring has not shown the consistent presence of site-related contaminants in the air.

III. Conclusions

The Soo Line Shoreham Yard-East Side site is contaminated with petroleum products and VOCs from over 100 years of railroad maintenance operations and releases from other businesses that handled petroleum and chemicals at the site. Contaminated soil remains at the site and site-related contaminants exceed appropriate soil screening values in several areas, primarily at depth. Groundwater is contaminated with petroleum products and VOCs on and off the site. Past exposures are difficult to quantify, and represent an indeterminate public health hazard. Exposure to contamination from the site currently appears to be minimal, and active remediation at the site should further reduce the potential for exposure in the future. Redevelopment at the

site could lead to possible exposure in the future, although the extent of such exposure is difficult to predict. The soil and groundwater contamination at the Soo Line Shoreham Yard-East Side site therefore currently represents no apparent public health hazard.

IV. Recommendations

1. People should follow posted signs and avoid trespassing on the Soo Line Shoreham Yard facility.
2. Site investigation and remediation activities including groundwater monitoring should continue as proposed to ensure that they are effective in monitoring and addressing contamination both on and off the site.
3. Monitoring should continue to ensure emissions from the SVE systems continue to meet MPCA emission thresholds.
4. Additional soil vapor investigations should be conducted to verify that the SVE systems are controlling any potential soil vapor migration off the site.
5. Any resident of the communities near the Soo Line Shoreham Yard facility who has an operating private well should contact MDH, MDA, or MPCA staff so that a water sample from the well can be collected and analyzed for the presence of contaminants from the Soo Line Shoreham facility.
6. MPCA staff should ensure that any identified operating commercial or industrial well located within the identified area of VOC contamination south of the site be sampled for site-related contaminants.

V. Public Health Action Plan

MDH's Public Health Action Plan for the Soo Line Shoreham Yard-East Side site consists of continued consultation with MPCA staff on environmental sampling and analysis, communication of the results to neighborhood residents near the site, and participation in any planned public outreach activities. MDH is also in the process of establishing a Special Well Construction Area to prevent future exposure to contaminants in groundwater from the site.

VI. References

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CERTIFICATION

This Soo Line Shoreham Shops Health Consultation was prepared by the Minnesota Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun. Editorial review was completed by the Cooperative Agreement partner.

Alan Parham
Technical Project Officer, SPS, SSAB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

Alan Yarbrough
Chief, State Program Section, SSAB, DHAC, ATSDR

Appendix 1
Public Comments

Three sets of public comments were received during the public comment period, which ran from March 19, 2007 until May 21, 2007. The comments have been edited for brevity where necessary.

Comments received from Golder Associates on behalf of CP Rail:

1. Page 5 refers to "Investigations in (the Shops) Area have been limited to date". Following completion of the RI report (which was the basis for much of the characterization information presented in the Health Consultation), significant additional investigations of soil and groundwater have been completed in the Shops Area with oversight from both the VIC program and the Petroleum Remediation Program at MPCA. This led to definition of an area of solvent contamination requiring soil cleanup and the affected soil was removed in the fall of 2006. Accordingly the characterization of "limited investigations to date" is no longer accurate.
2. Page 6: 2nd paragraph refers to "Groundwater flow in the upper Prairie du Chein ...to the south and southwest." Subsequent additional investigations and monitoring have clarified that the flow direction is primarily due south in this unit to the south of Shoreham Yard.
3. Page 8: 1st paragraph refers to petroleum free product in Areas C and F (i.e. Roundhouse and Pump House Areas) which is incorrect, the reference should be to Areas B and F (Collector Pan and Pump House Areas).
4. Page 9: First sentence of the section titled "Soil Vapor Investigation" refers to the "Shoreham Shops Site" whereas it would be more consistent (and accurate) to use the term "Shoreham Yard – East Side." Similarly, on page 12: First sentence of the section on "Site Visit" refers to the "Shoreham Shops Facility" whereas it would be more accurate to use the term "Shoreham Yard - East Side."

MDH Response: The Golder/CP Rail comments were relatively minor and changes to the document were made accordingly.

MPCA Comments:

1. Page 5. Investigations of the Shops Area have been limited to date. Phase II Investigations have been conducted at the Shops Area and areas of VOC soil contamination requiring remediation using both soil vapor extraction and soil excavation has been identified. In September 2006, approximately 400 cubic yards of VOC-contaminated soils were excavated and disposed of offsite at an approved landfill. An area of VOC-impacted soils located adjacent to and west of the Roundhouse has been targeted for remediation for the Roundhouse-Shops-Waste Reclamation Area SVE System that was installed and tested in 2006. Full-scale activation of this system is expected to begin in early spring 2007.

2. The MDH Health Consultation does provide information on petroleum contamination where it is associated with non-petroleum contamination. The releases at the Site that are entirely under the direction of the Petroleum Remediation Program, however, are not discussed in the Health Consultation and additionally this information has not been completely reviewed by the MPCA VIC staff. Details regarding the potential to encountered contamination during future redevelopment of the site would need to be made with consultation with staff from the MPCA Petroleum Remediation Program.

3. Soil Investigations at the Site, page 6. The MDH Health Consultation states that the extent of the petroleum and petroleum-related VOC contamination is shown on Figure 5 and Figure 6, developed by Golder, which are provided in the Report. Figures 5 and 6 illustrate the distribution of naphthalene and toluene, respectively. The MPCA VIC staff consider that although petroleum releases have contributed to the distribution of naphthalene and toluene contamination, some of these compounds likely originated from releases from the former bulk chemical facility that was operated on the Former Lease Area. Toluene is known to have been stored at the Former Lease Area and likely resulted in releases to soil and ground water at the historic bulk chemical facility. Naptha, was also stored at the facility, and, while different in composition than naphthalene, may have contained naphthalene in sufficient amounts to have contributed to the naphthalene releases described in Figure 5 of the Report.

4. Soil Vapor Investigations on and off the Site, page 9. The MPCA generally concurs with the description of the soil vapor investigations conducted at the site. The MPCA staff, did consider the subsurface concentrations detected at shallow depths of five feet below ground surface in 2004 during the Ashland Geomega investigation indicative of vapor concentrations of potential concern via the vapor intrusion pathway to both future redevelopment as well as to nearby building occupants. The MPCA staff, however, recognized that the soil vapor extraction system proposed and eventually constructed at the Former Lease Area had the capability to both capture vapors potentially leaving the site and to remediate the source for the vapors through the SVE operation. Subsequent to the Ashland subsurface soil gas investigation, Ashland installed the FLA SVE system in late 2005, conducted a start-up test in January 2006, and began operating the system full-time in April 2006. Monitoring of vacuum in the SVE system vents and wells have supported that the radial and vertical influence of the negative pressure capture zone for the subsurface vapors is greater than predicted prior to installation and the effective subsurface vapor capture extends to the eastern perimeter of Central Avenue N.E. Since the SVE system has been operating over 4,000 pounds of VOCs have been removed from the subsurface. The MPCA has requested follow-up vapor investigations to verify potential risks posed by the vapor intrusion pathway now that a majority of the extractable VOCs in the vadose zone have been remediation by the SVE system. An initial proposed from Ashland for this investigation was reviewed in March 2007 and currently a revised vapor investigation work plan is being developed by Ashland for MPCA review.

5. Description of SVE Interim Response Action at Former Lease Area, top page The Health Consultation states that “Once the remedial goals of the SVE system are achieved (i.e. contaminant mass removal and LNAPL removal), confirmation soil and vapor sampling will be conducted.” The MPCA concurs that contaminant mass removal is the remedial goal of the SVE system at the Former Lease Area, however, LNAPL removal is not explicitly a component of this remedy, but is considered a separate remedy. The LNAPL recovery is proposed to continue recovery of LNAPL as long as sustainable recovery is possible. Currently active recovery of LNAPL is occurring only at MW-402D using an automated belt-skimmer pump system. Upon reaching the practical limit of this technology monitoring will continue and sorbent socks will be used to recover subsequent LNAPL accumulation in this and other wells where LNAPL is present. Monitoring will be continued after recovery has been stopped until at least four consecutive quarters of observations without the presence of a sheen.

6. The Health Consultation states that the Site is fenced and secured. Largely this is true, although the front entrance to the Site is open to traffic and potential walk-throughs and the northern part of the Site facility, south of Columbia Golf Course is not fenced and has few cautionary signs. The MPCA staff would recommend that CP consider additional security measures in the northern part of the facility and perhaps additional signage between the Roundhouse and the front gate to caution potential trespassers.

MDH Response: Changes have been made to reflect the MPCA comments where possible; some of the comments are explanatory in nature and required no changes.

Shoreham Area Advisory Committee (SAAC) comments:

1. The Eastside document, like the Cedar Services Health Consultation document from 2006, downplays or misconstrues public accessibility – and thus the opportunity for public exposure -- to Shoreham Yards. The document states that access is "carefully controlled." However, the main gate along Central Avenue has routinely been observed as open. The site is readily accessible from the north, and the frontage road on the west side leads directly into Shoreham with neither a fence nor a gate at this access point. While the site is open to trespass, the site is also open legitimately to the public for at least two well-publicized and well-attended community events each year in June and December. At both of these events, hundreds of people (including a large percentage of children) mill about outside for several hours directly on the VIC site, and their vehicles drive in and out of the site.
   MDH Response: Modifications to the document have been made to reflect the current state of accessibility of the site as noted in the comment.
2. Although the Health Consultation concludes that "no apparent public health hazard" exists for the Eastside site, the report goes on to make six recommendations for continued investigations, continued monitoring, continued sampling of wells, and public avoidance of the site. Additionally, the document calls for establishment of an expanded Special Well Construction Area. While we applaud this continued attention to the site, we

suggest that at the very least this document, like the Cedar Services Health Consultation, note that the public health hazard at the Eastside site is indeterminate at this time. The conclusion in the Eastside Health Consultation seems premature and misleading.
MDH Response: MDH staff feel that while it is somewhat of a gray area, the site currently fits best into the "no apparent public health hazard" classification as defined by ATSDR. The Cedar Service site was categorized as an “indeterminate” health hazard because of the potentially completed exposure pathways through the use of contaminated wells.

3. Page 3 of the document (and other sections pertain to this as well) neglects to point out that the area adjacent to the site contains numerous residences not only across the street on the east and south sides but in the surrounding nearby neighborhood. A daycare center has been opened at the new Salvation Army Community Center across the street. It should also be pointed out that the nearby dog park and Golf Learning Center appear to be growing in popularity, and that the popular bikeway/pedestrian path areas are slated for enhancements this year that will no doubt increase public access to this area. Rather than a merely "commercial/industrial" area, this is a busy urban neighborhood with plans to grow even more so.
   MDH Response: Changes have been made to reflect the current nature and trends in uses of the community where the site is located.
4. The document reveals that MDH continues to look at the five polluted sections within Shoreham Yards in isolation from one another. Rather, the community is exposed to the cumulative effect of Shoreham, as well as the many other industrial uses past and present around us, plus the giant Riverside power plant nearby. To use an analogy, if one room of a home was filthy, a resident might be OK. If several rooms of that house are filthy, the house itself might be in jeopardy of deterioration or condemnation. Or: If a person takes an appropriate dose of one prescribed drug, they should be fine. Appropriate doses of five different drugs prescribed legitimately but independently without looking at the whole picture can be lethal. We ask that the big picture be addressed and assessed. A public meeting dedicated solely to discussion of public health and Shoreham should be conducted by the state. A response to the comment of the University of Minnesota professor who advised community members to get blood tests should be prepared for SAAC.
   MDH Response: MDH has evaluated two of the sites found at Shoreham Yards given the scope of its ATSDR funding, which is to examine public health concerns associated with hazardous waste sites. While it recognizes that exposure to other sources of environmental contaminants occurs in the area, tools currently available for evaluating such cumulative exposure are of limited use and are beyond the scope of site-related health assessments. With regards to testing of blood, such testing does not identify the source of exposure to a given contaminant and is rarely of use in determining appropriate site related response efforts. In evaluating hazardous waste sites, MDH recommends actions that will prevent or reduce exposure to site contaminants.
5. Assuming the health risk to current residents is nonexistent or low, as the report states, what is the health impact on those who lived and worked at or near the site before remediation was underway and/or who drank out of the wells? What has been done to

assess their health status? Further investigation is warranted, since remediation began only relatively recently.
MDH Response: There are no data available to evaluate past exposures at or from the site.

6. Page 4 states that groundwater contamination extends 3/4 of a mile off the site to the south. This is incorrect or, at best, misleading. The extent of the contamination plume has not yet been fully defined and testing wells are still being put into place.
   MDH Response: A minor change in the description of the plume was made.
7. Page 9 refers to Soil Vapor Investigations using instruments NOT designed for assessment of long-term health concerns. Can MDH clarify whether long-term health risk has been evaluated and how?
   MDH Response: A change was made to reflect that later investigations did use methods capable of detection limits low enough to detect contaminants at levels of potential long-term health concern.
8. Air emissions at or near the site for some contaminants (and if I recall correctly from past meetings, noise levels) exceed allowable levels (page 11). Whether directly related to Shoreham activities or not, can MDH explain what is being done about this situation and how public health will be protected?
   MDH Response: MDH has evaluated emissions of site-related contaminants from site activities. It is outside the scope of this document to either evaluate or make recommendations regarding ambient air pollution in urban areas. In addition, noise issues are solely under the purview of local officials and the MPCA.
9. As noted in past comments to the state regarding remediation plans for this site, the state has designated a lower level of clean-up at the site than is preferred by SAAC. Progress at the site has been substantial in the last year and a most welcome development, but, as noted on Page 12 of the document, the remediation level may need to be strengthened in the eyes of the community for the sake of public health as well as economic redevelopment health.
   MDH Response: Comment noted.
10. We appreciate the state's continued efforts to find and test private and commercial wells. At least three businesses in the community continue to use private wells reportedly contaminated by Shoreham. This exposes humans to contaminated water. These wells should be shut down and the obvious alternative water source (city water) used instead.
    MDH Response: The wells in question are impacted by contamination from the Cedar Service site, not from the Shoreham Yard – East Side site, and are discussed in the Health Consultation for that site.

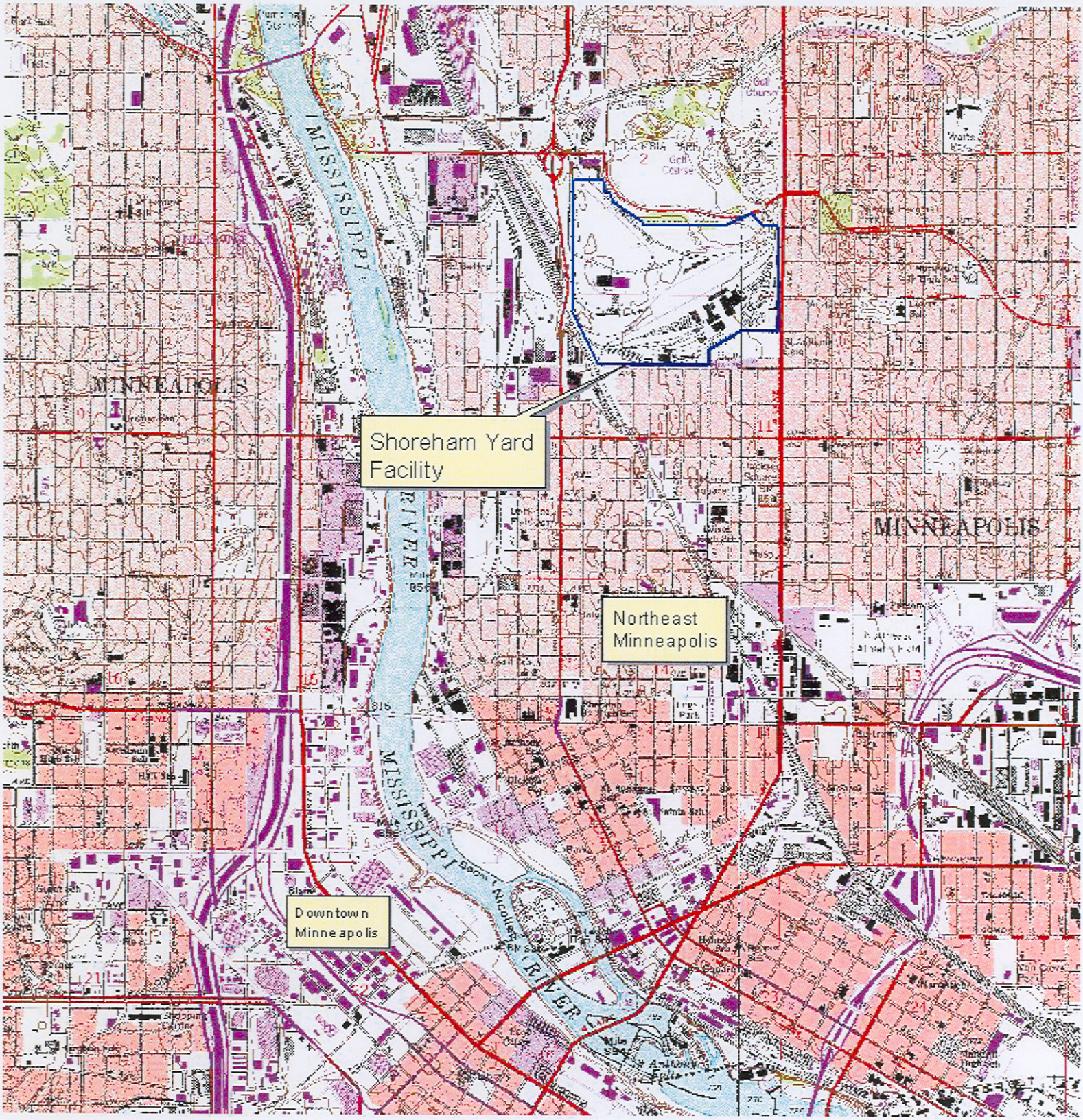
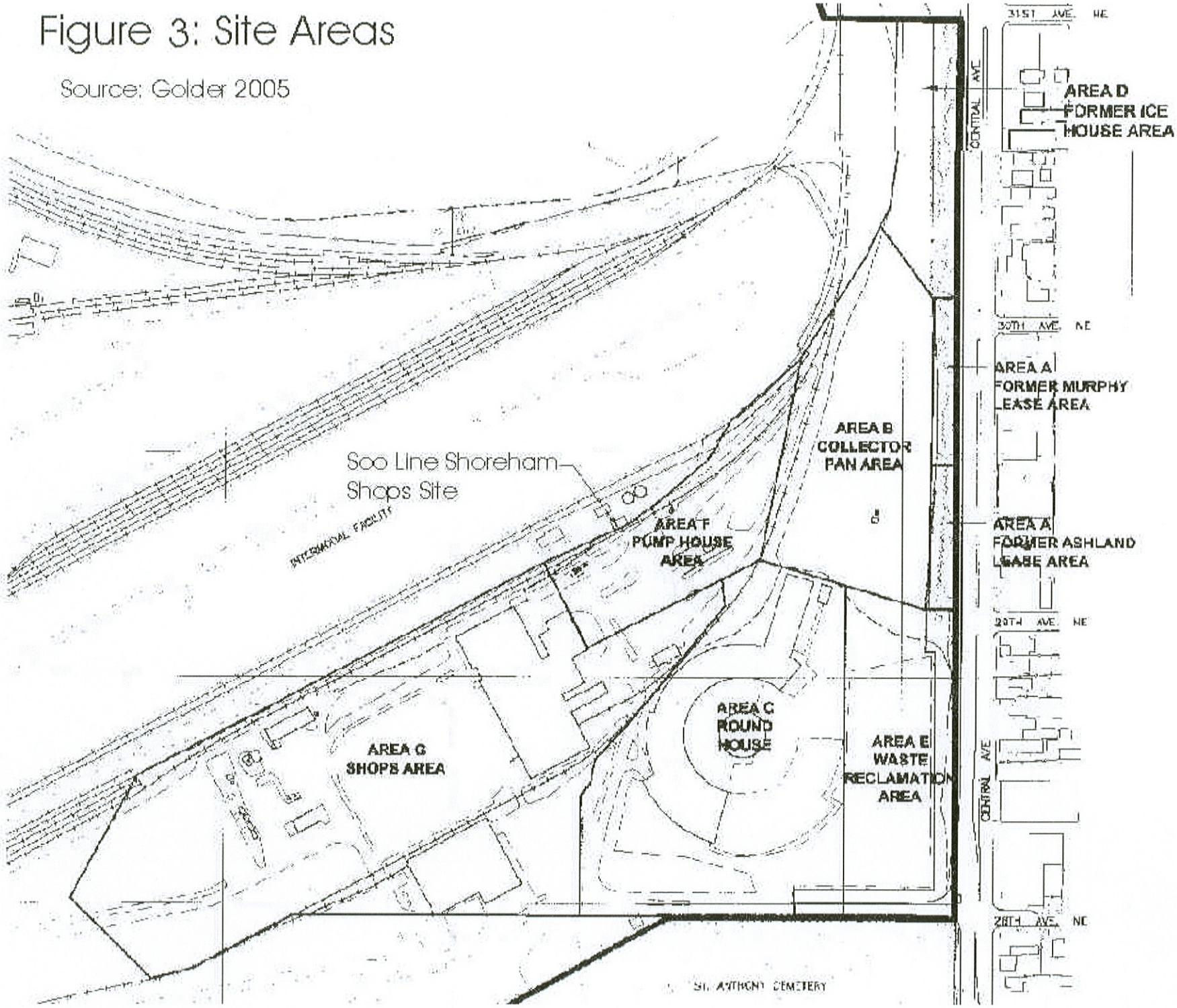


Figure 1: Shoreham Yard Facility Location
Minneapolis, MN

Figure 2: Shoreham Yard Facility Sites

Figure 3: Site Areas

Source: Golder 2005



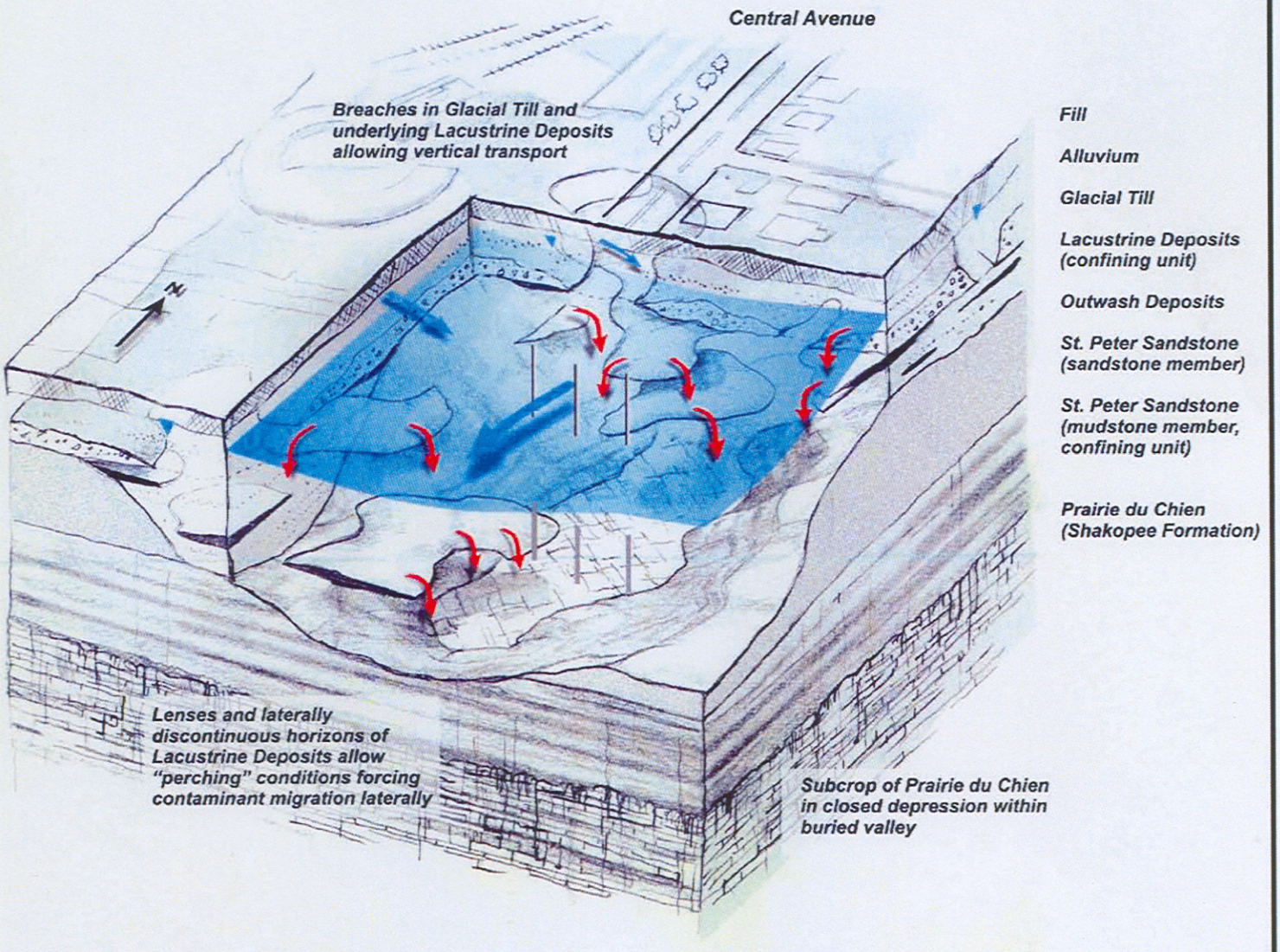
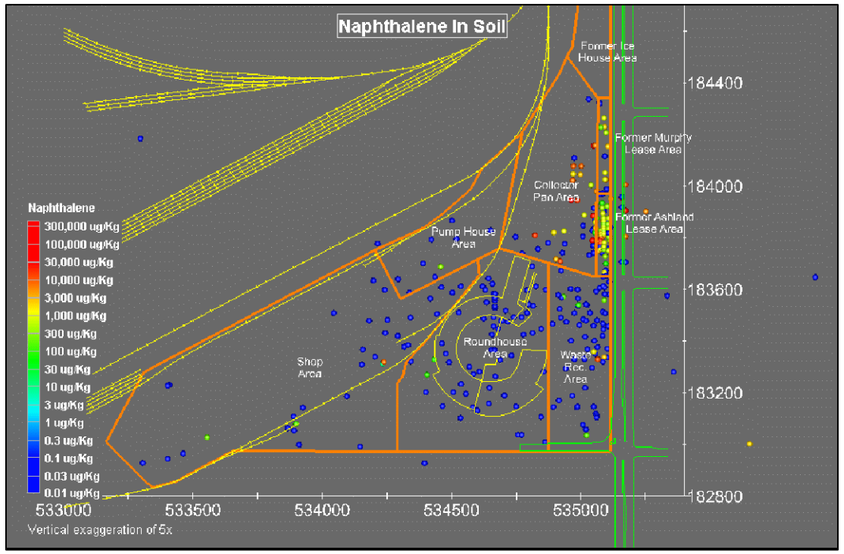


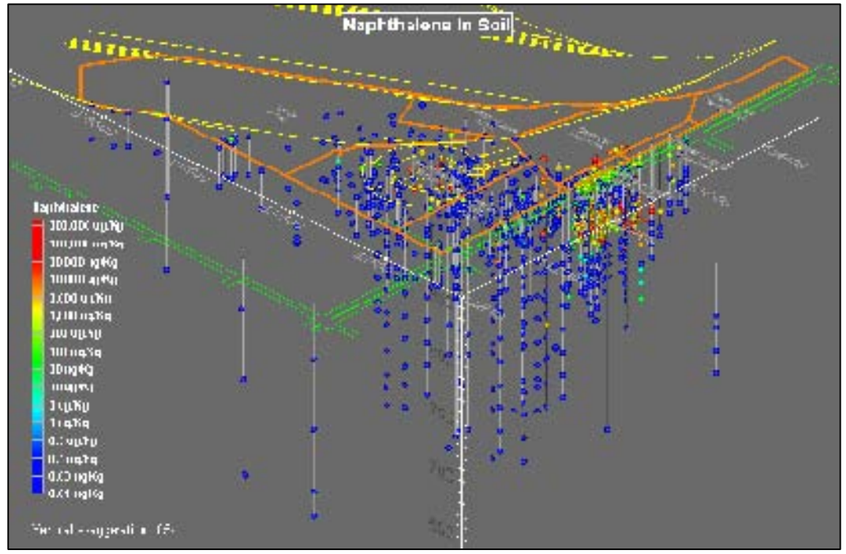
Figure 4: Groundwater Flow

Source: Golder 2005

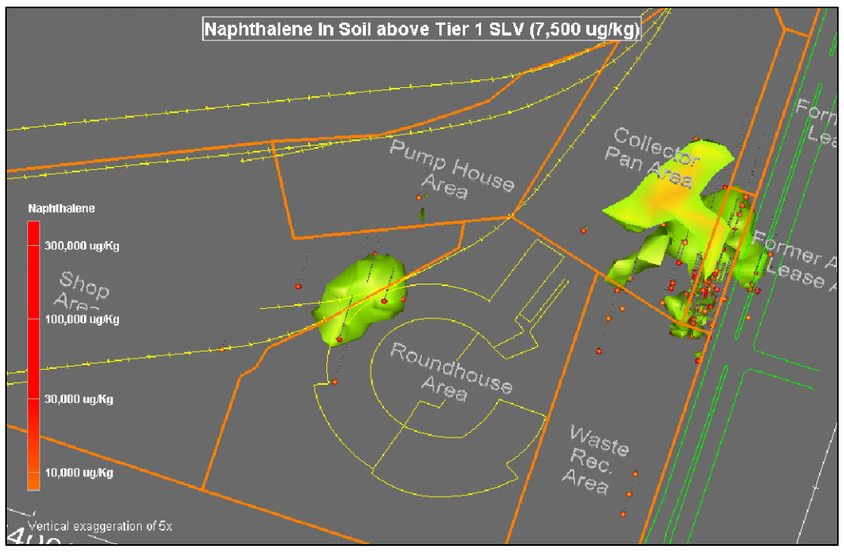
Golder Associates Philadelphia USA	SCALE AS SHOWN	TITLE	FLOW PATHS IN THE AREA OF THE BEDROCK VALLEY
	DATE 02/16/05		
	DESIGN		
	CADD		
FILE No.	CHECK		
PROJECT No. REV.	REVIEW	SOO LINE SHOREHAM FACILITY	



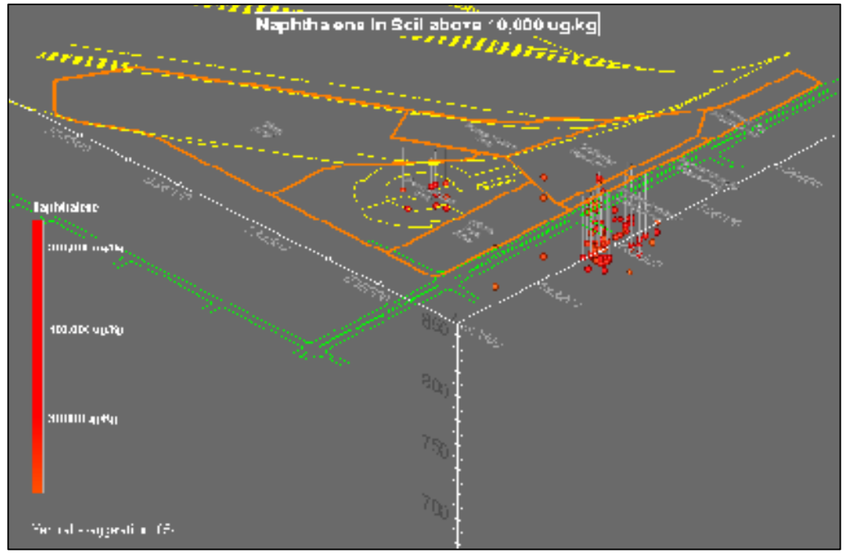
A. NAPHTHALENE - ALL DATA



B. NAPHTHALENE - ALL DATA



C. NAPHTHALENE ABOVE TIER 1 SLV (7,500 ug/kg)



D. NAPHTHALENE ABOVE 10,000 ug/kg

REFERENCES

1.) BASE MAP FROM DIGITAL CAD FILE NEW_BASE_2_2001.DWG, TITLED "PORTIONS OF SECTIONS 2 & 11 T29N, R24W HENNEPIN CO., MN", PROVIDED BY AMEC EARTH AND ENVIRONMENTAL, INC.

2.) ANALYTICAL DATA, BORING LOCATIONS AND WELL CONSTRUCTION INFORMATION FROM AMEC GIS LAYERS AND 12th EDITION DATATBASE.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

SOO LINE SHOREHAM FACILITY
INTERIM RESPONSE ACTION PLAN
MINNEAPOLIS, MINNESOTA

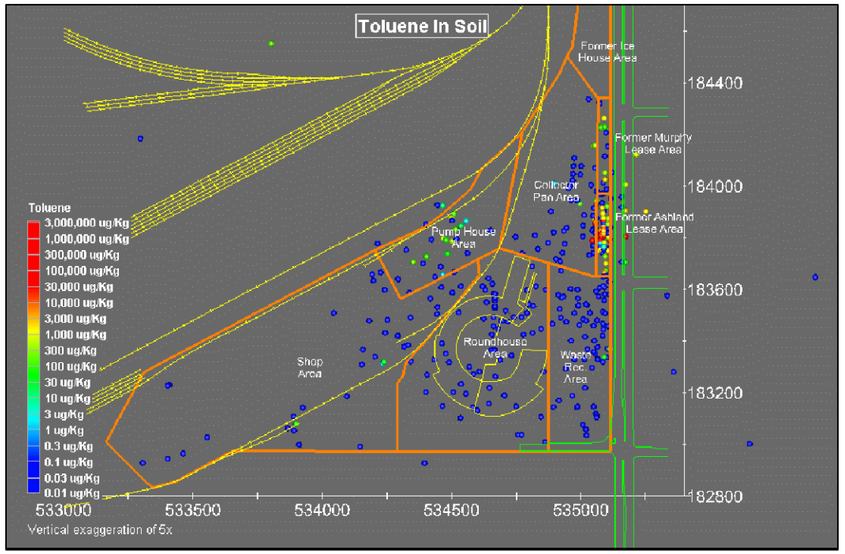
TITLE

DISTRIBUTION OF NAPHTHALENE IN SOIL

Golder Associates
Philadelphia USA

PROJECT No.		023-6105	FILE No.		02361050007
DESIGN	AJ	05/17/05	SCALE	N.T.S.	REV. 0
CADD	AM	05/19/05	Figure 5		
CHECK					
REVIEW					

Drawing file: 02361050007.dwg May 19, 2005 - 2:00pm



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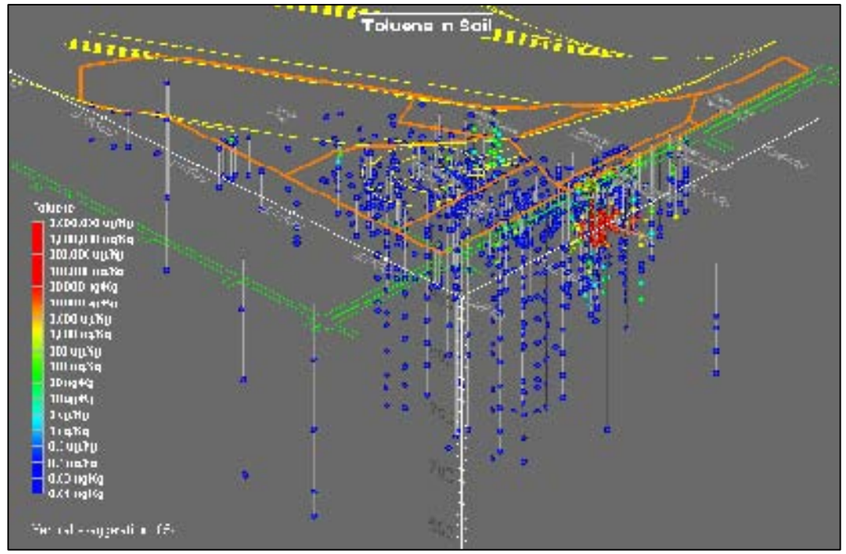

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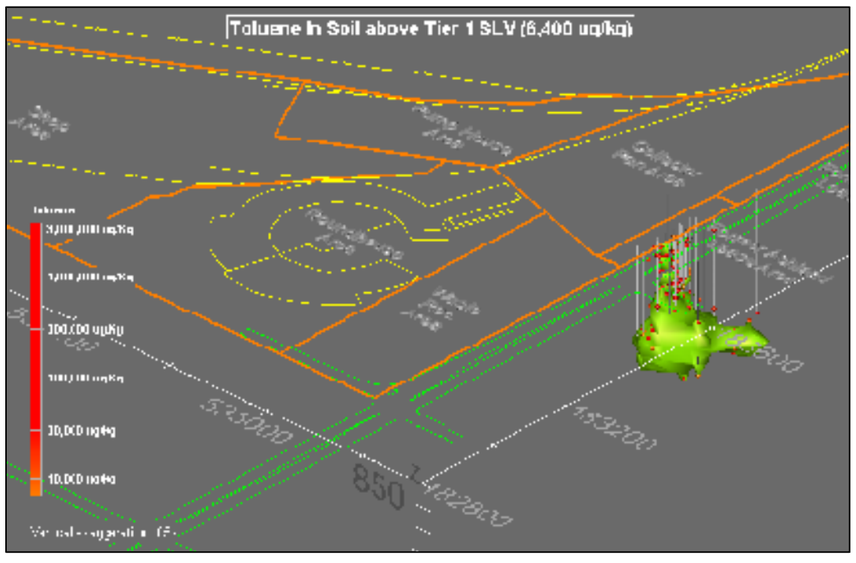
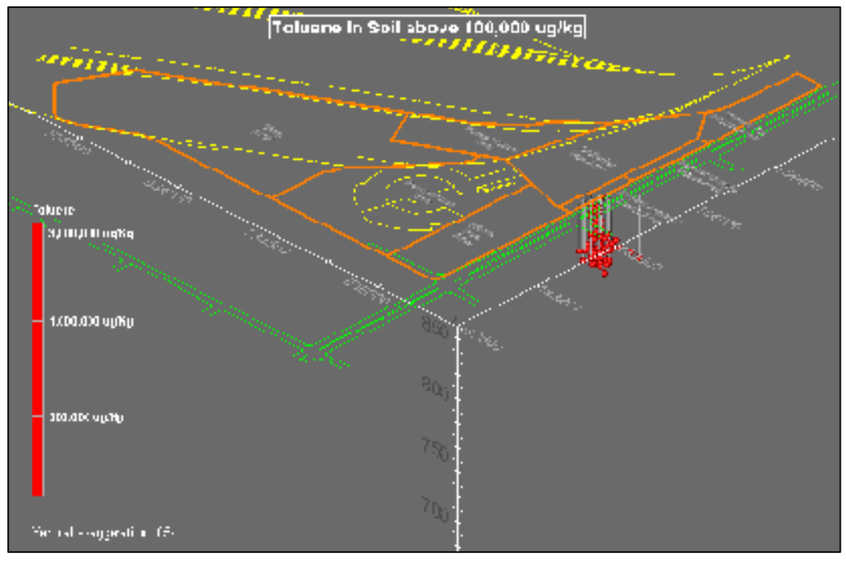


C. TOLUENE ABOVE TIER 1 SLV (6,400 ug/kg)



D. TOLUENE ABOVE 100,000 ug/kg

REFERENCES

1.) BASE MAP FROM DIGITAL CAD FILE NEW_BASE_2_2001.DWG, TITLED "PORTIONS OF SECTIONS 2 & 11 T29N, R24W HENNEPIN CO., MN", PROVIDED BY AMEC EARTH AND ENVIRONMENTAL, INC.

2.) ANALYTICAL DATA, BORING LOCATIONS AND WELL CONSTRUCTION INFORMATION FROM AMEC GIS LAYERS AND 12th EDITION DATATBASE.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

SOO LINE SHOREHAM FACILITY
INTERIM RESPONSE ACTION PLAN
MINNEAPOLIS, MINNESOTA

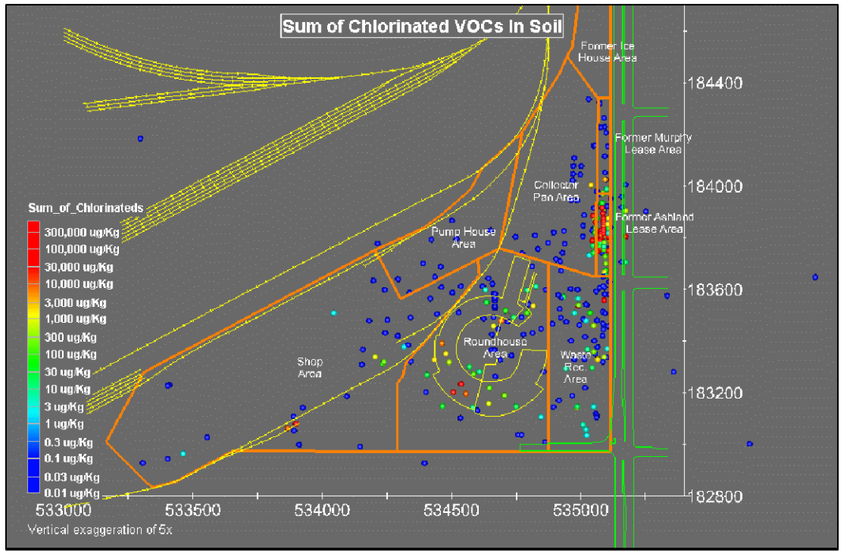
TITLE

DISTRIBUTION OF TOLUENE IN SOIL

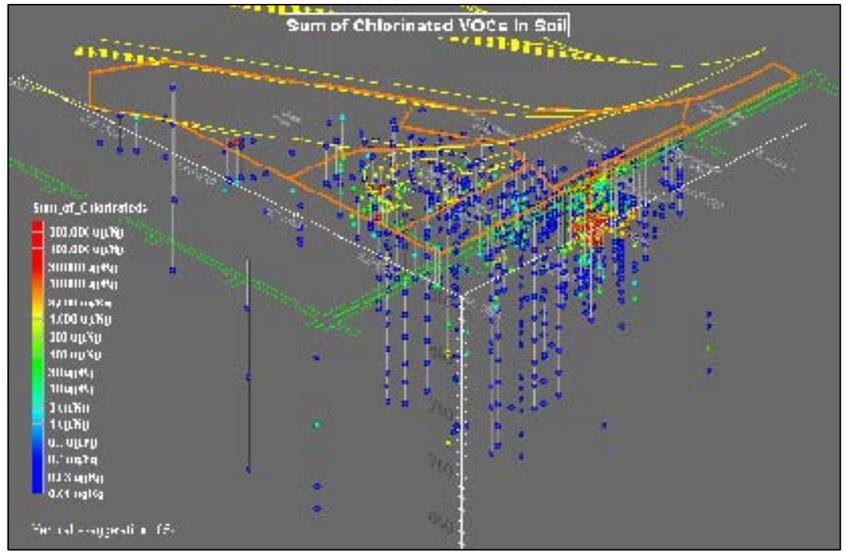
Golder Associates
Philadelphia USA

PROJECT No.		023-6105	FILE No.		02361050005
DESIGN	AJ	05/17/05	SCALE	N.T.S.	REV. 0
CADD	AM	05/19/05			
CHECK			Figure 6		
REVIEW					

Drawing file: 02361050005.dwg May 19, 2005 - 1:56pm



A. SUM OF CHLORINATED VOCS - ALL DATA



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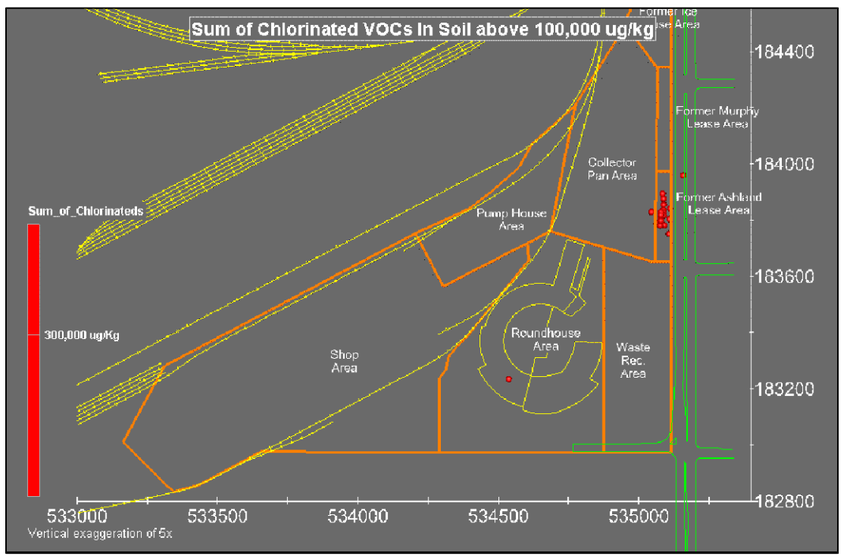
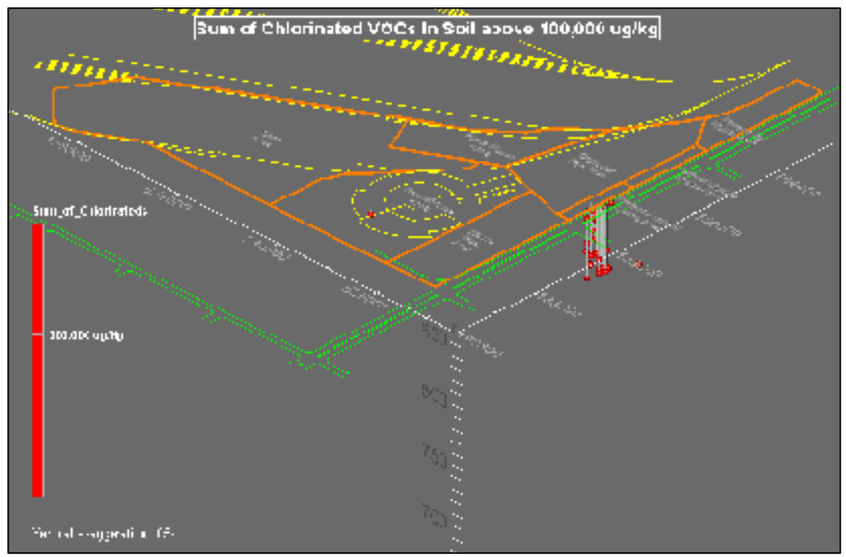


C. SUM OF CHLORINATED VOCS ABOVE 100,000 ug/kg



D. SUM OF CHLORINATED VOCS ABOVE 100,000 ug/kg

NOTES

1.) SUM OF CHLORINATED VOCS INCLUDES: PCE, TCE, cis−1,2−DCE, Vinyl Chloride, 1,1,1−TCA, 1,1−DCA, AND 1,1−DCE.

REFERENCES

1.) BASE MAP FROM DIGITAL CAD FILE NEW_BASE_2_2001.DWG, TITLED "PORTIONS OF SECTIONS 2 & 11 T29N, R24W HENNEPIN CO., MN", PROVIDED BY AMEC EARTH AND ENVIRONMENTAL, INC.

2.) ANALYTICAL DATA, BORING LOCATIONS AND WELL CONSTRUCTION INFORMATION FROM AMEC GIS LAYERS AND 12th EDITION DATATBASE.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

SOO LINE SHOREHAM FACILITY
INTERIM RESPONSE ACTION PLAN
MINNEAPOLIS, MINNESOTA

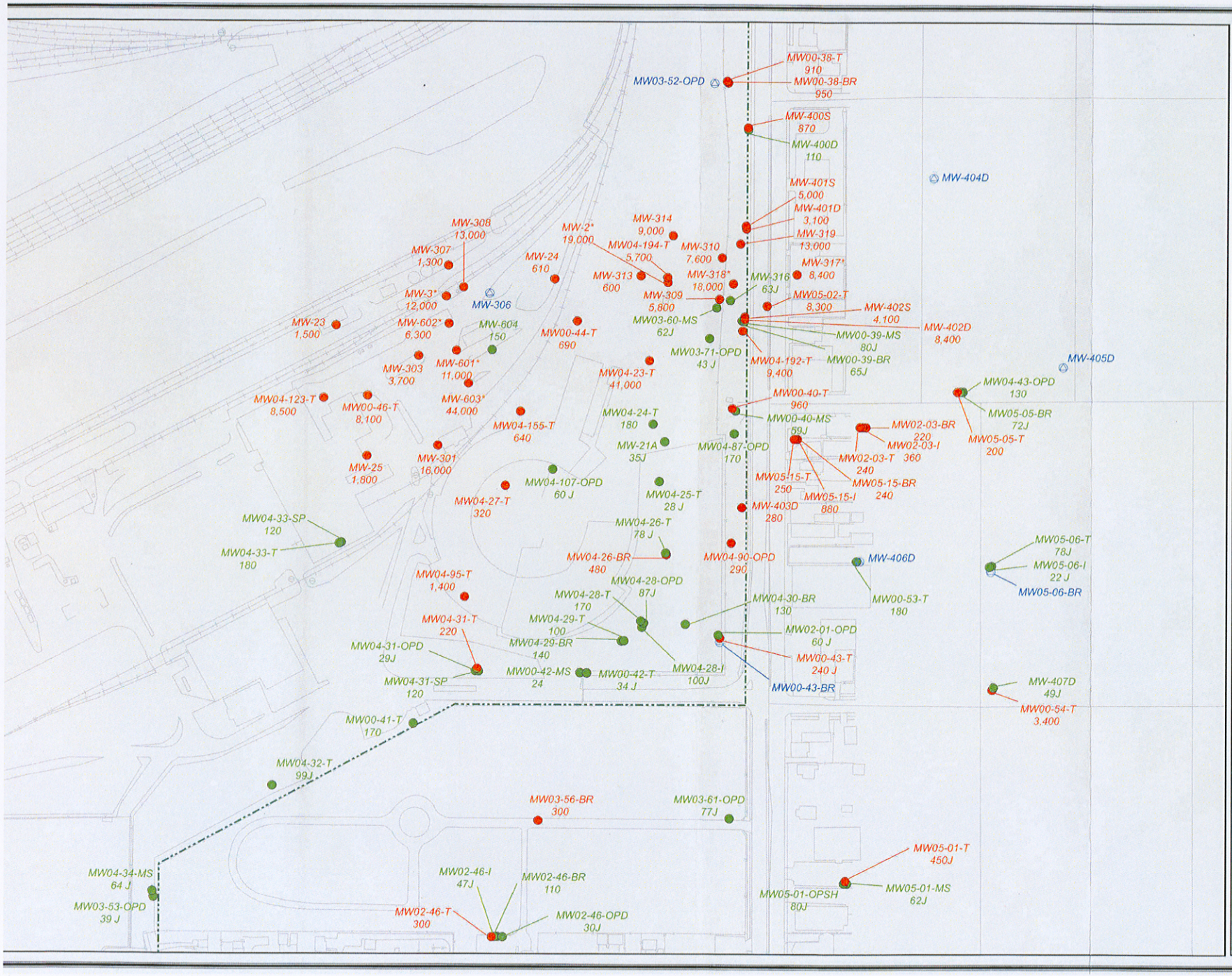
TITLE

DISTRIBUTION OF SUM OF CHLORINATED VOCS IN SOIL

Golder Associates
Philadelphia USA

PROJECT No.		023−6105	FILE No.		02361050008
DESIGN	AJ	05/17/05	SCALE	N.T.S.	REV. 0
CADD	AM	05/19/05	Figure 7		
CHECK					
REVIEW					

Drawing file: 02361050008.dwg May 19, 2005 − 2:00pm



N
W E
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100 0 100 200
Feet

LEGEND

MW-301 Monitoring Well Location
* Denotes Product Well; Water sample collected from beneath product
Blue = Parameter not detected above Method Detection Limit
Green = Parameter detected at a concentration less than groundwater criteria
Red = Parameter detected at a concentration that exceeds groundwater criteria

33 Analytical Result (µg/L)

J Estimated Value

Facility Boundary

NOTE: Screening criteria equals 200 µg/L (HBV)

Where duplicate samples (-300) were taken, the highest result is shown on figure

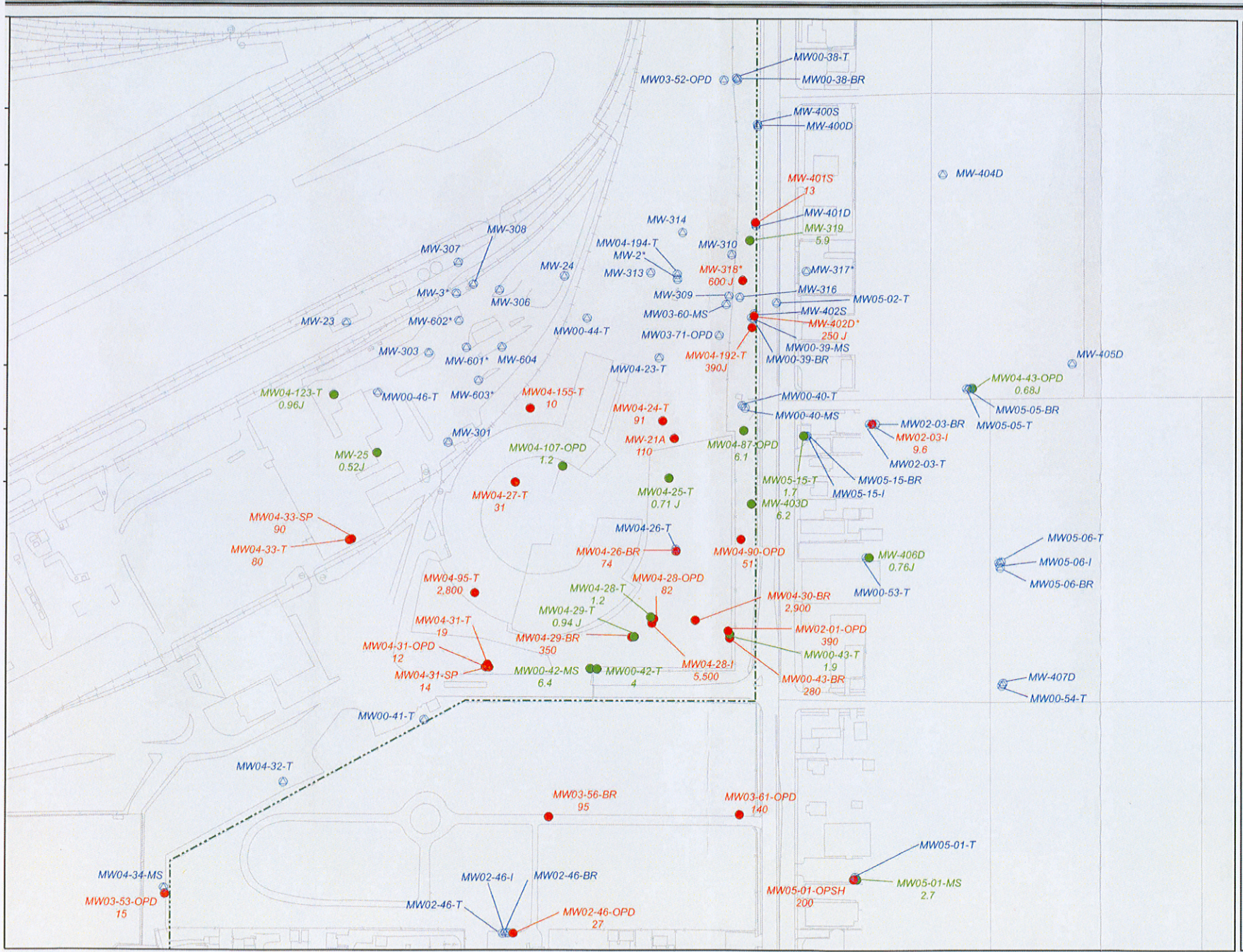
Figure 8

October/November 2005 Groundwater Analytical Summary Map
Eastside Detail
Diesel Range Organics (DRO)

Prepared for

Canadian Pacific Railway
Shoreham Facility
Minneapolis, Minnesota

amec



N
W E
S

100 0 100 200
Feet

LEGEND

MW-301 Monitoring Well Location
* Denotes Product Well; Water sample collected from beneath product
Blue = Parameter not detected above Method Detection Limit
Green = Parameter detected at a concentration less than groundwater criteria
Red = Parameter detected at a concentration that exceeds groundwater criteria

33 Analytical Result (µg/L)

J Estimated Value

Facility Boundary

NOTE: Screening criteria equals 7 µg/L (HRL)

Where duplicate samples (-300) were taken, the highest result is shown on figure

Figure 9

October/November 2005 Groundwater Analytical Summary Map
Eastside Detail
PCE

Prepared for

Canadian Pacific Railway
Shoreham Facility
Minneapolis, Minnesota

amec

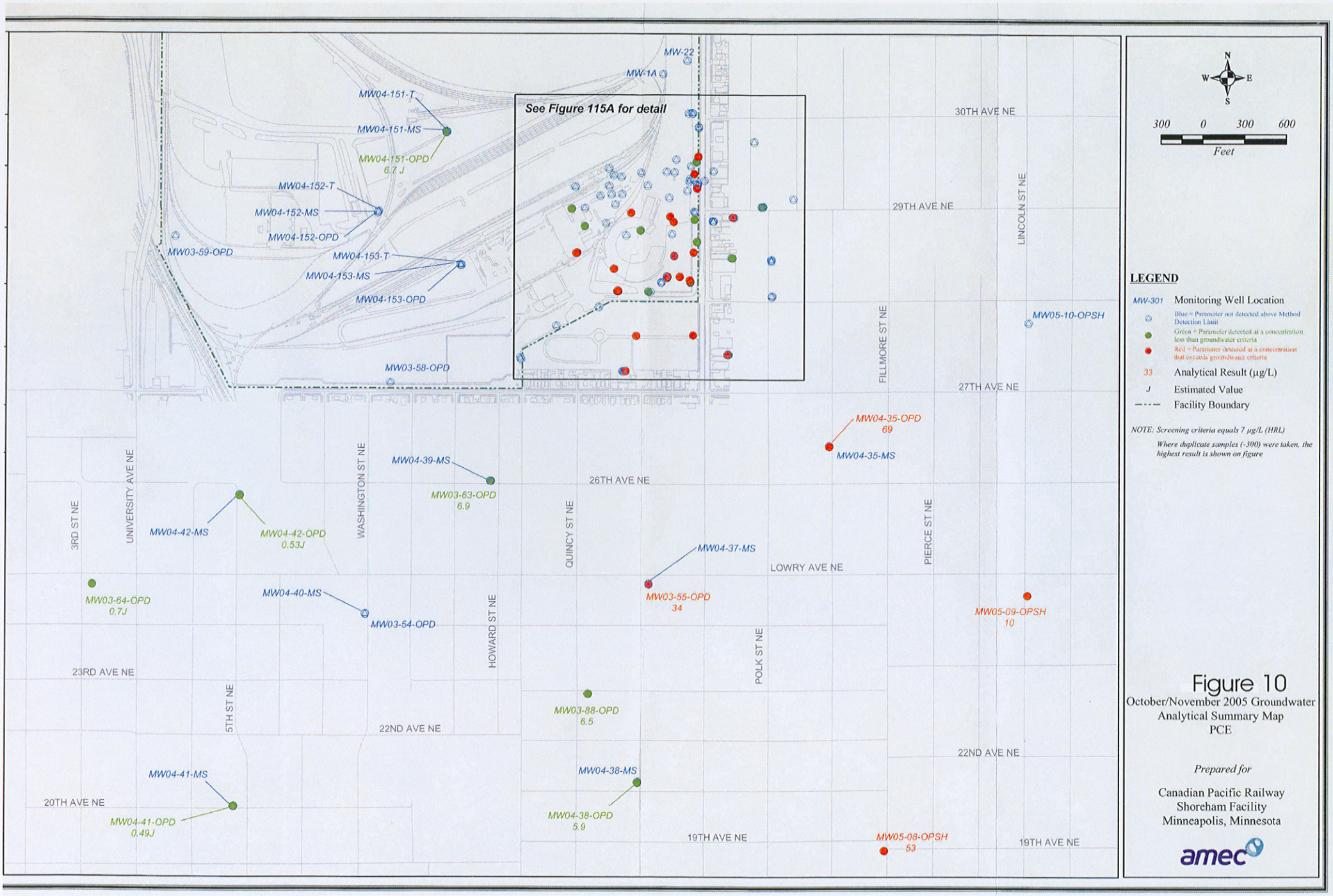


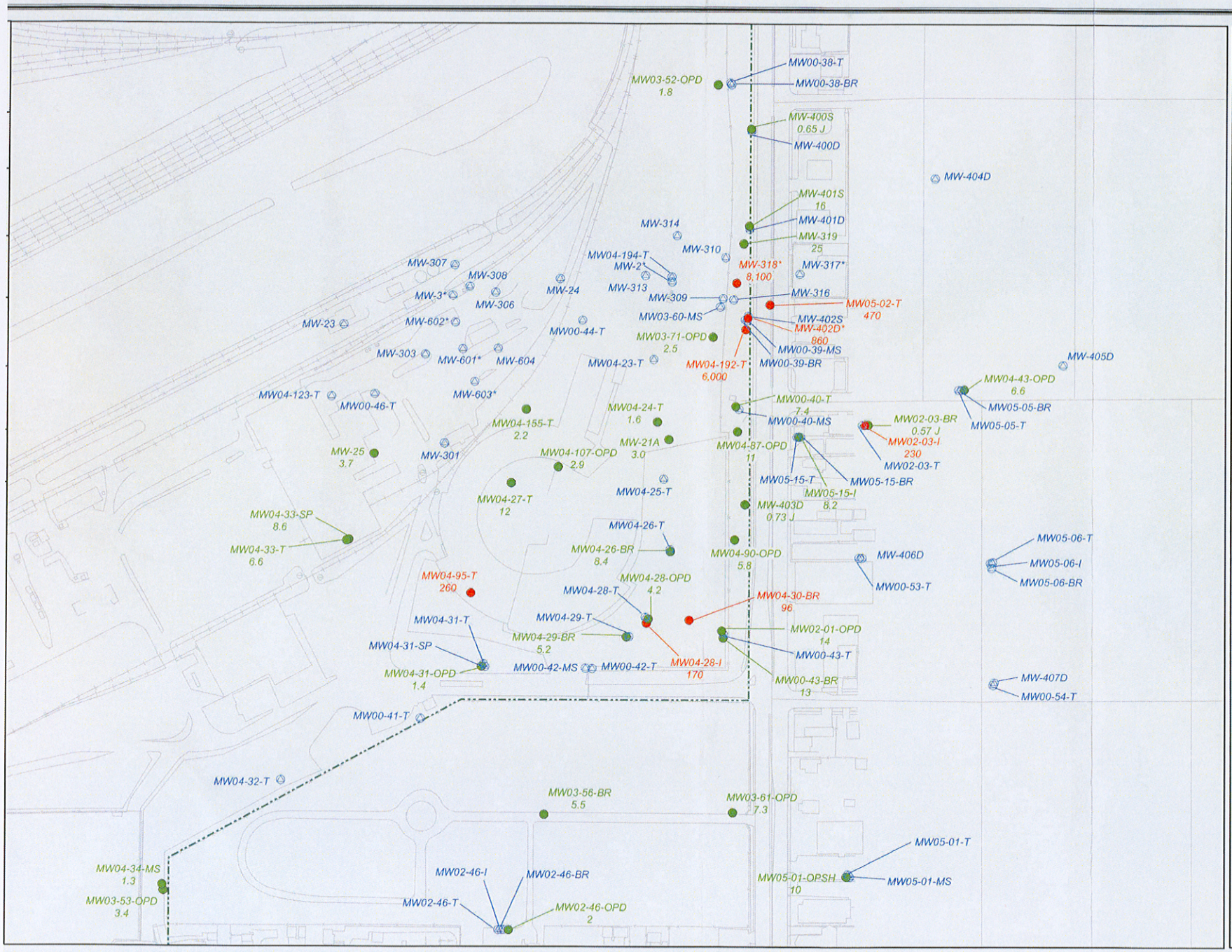
Figure 10

October/November 2005 Groundwater Analytical Summary Map
PCE

Prepared for

Canadian Pacific Railway
Shoreham Facility
Minneapolis, Minnesota

amec



LEGEND

MW-301	Monitoring Well Location
	* Denotes Product Well; Water sample collected from beneath product
	Blue = Parameter not detected above Method Detection Limit
	Green = Parameter detected at a concentration less than groundwater criteria
	Red = Parameter detected at a concentration that exceeds groundwater criteria
33	Analytical Result (µg/L)
J	Estimated Value
	Facility Boundary

NOTE: Screening criteria equals 30 µg/L (HRL)
MDH recommends EPA MCL of 5 µg/L
Where duplicate samples (-300) were taken, the highest result is shown on figure

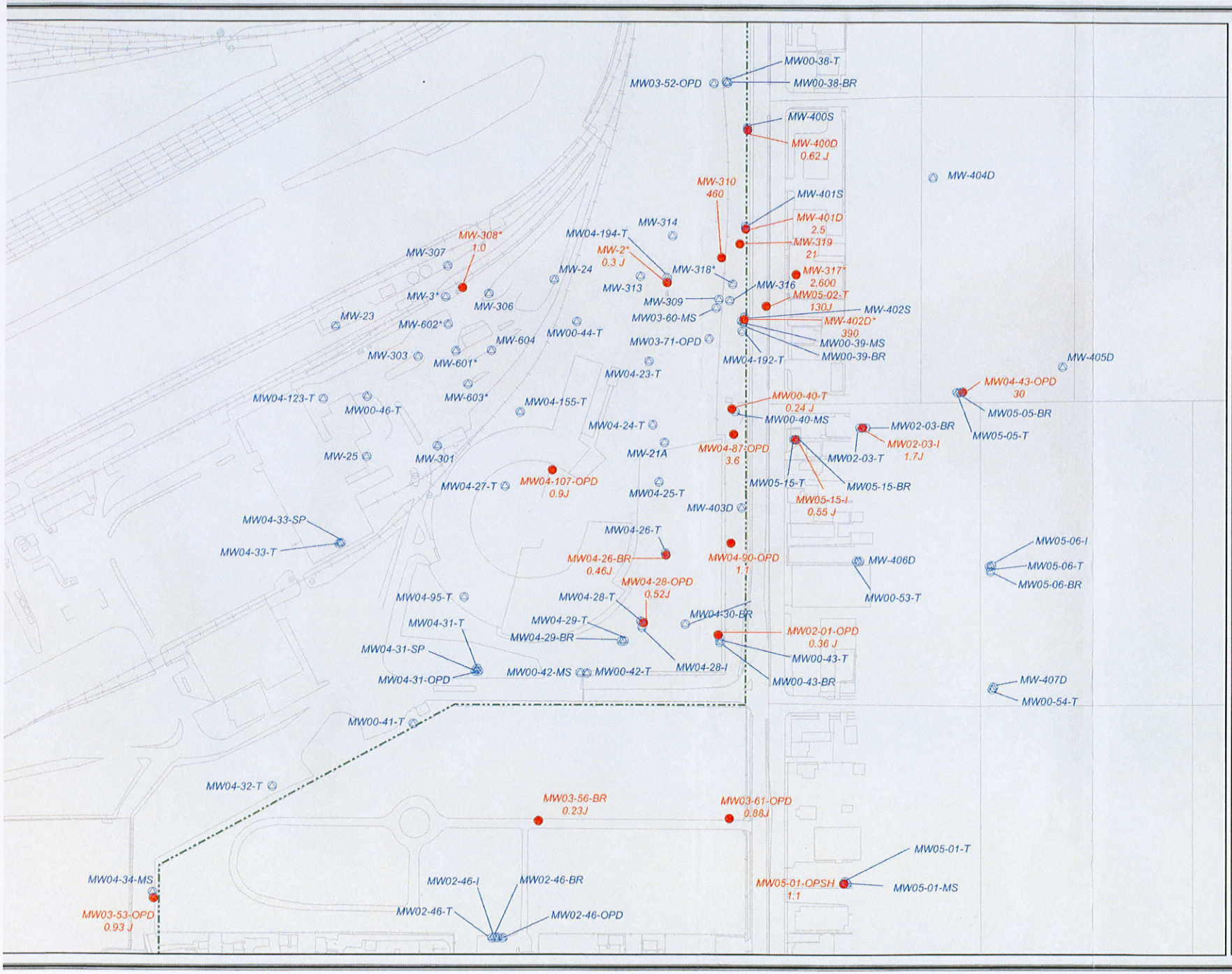
Figure 11

October/November 2005 Groundwater
Analytical Summary Map
Eastside Detail
TCE

Prepared for

Canadian Pacific Railway
Shoreham Facility
Minneapolis, Minnesota

amec



N
W E
S

100 0 100 200
Feet

LEGEND

MW-301 Monitoring Well Location
* Denotes Product Well; Water sample collected from beneath product
Blue = Parameter not detected above Method Detection Limit
Green = Parameter detected at a concentration less than groundwater criteria
Red = Paramater detected at a concentration that exceeds groundwater criteria

33 Analytical Result (µg/L)

J Estimated Value

Facility Boundary

NOTE: Screening criteria equals 0.2 µg/L (HRL)

Where duplicate samples (-300) were taken, the highest result is shown on figure

Figure 12

October/November 2005 Groundwater
Analytical Summary Map
Eastside Detail
Vinyl Chloride

Prepared for

Canadian Pacific Railway
Shoreham Facility
Minneapolis, Minnesota

amec

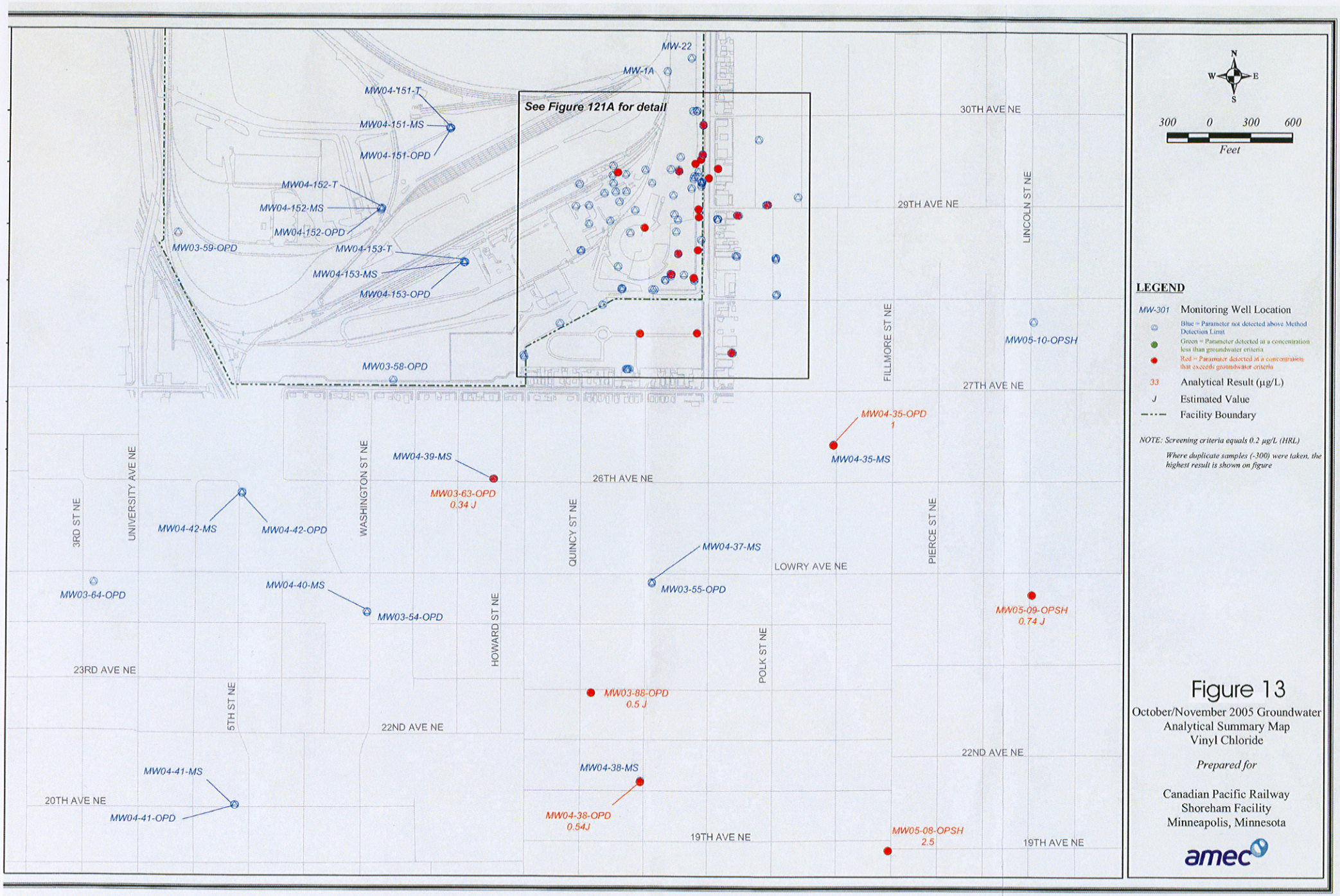


Figure 13

October/November 2005 Groundwater Analytical Summary Map
Vinyl Chloride

Prepared for

Canadian Pacific Railway
Shoreham Facility
Minneapolis, Minnesota

amec

N
W E
S

75 0 75 150
Feet

LEGEND

- PSG SAMPLING LOCATION
- TOTAL CHLORINATED'S CONCENTRATION CONTOUR (µg)
- FACILITY LOCATION

Figure 14

TOTAL CHLORINATED
CONCENTRATION MAP
PSG SURVEY

PREPARED FOR

CANADIAN PACIFIC RAILWAY
SHOREHAM FACILITY
MINNEAPOLIS, MINNESOTA

amec
EARTH AND ENVIRONMENTAL, INC.

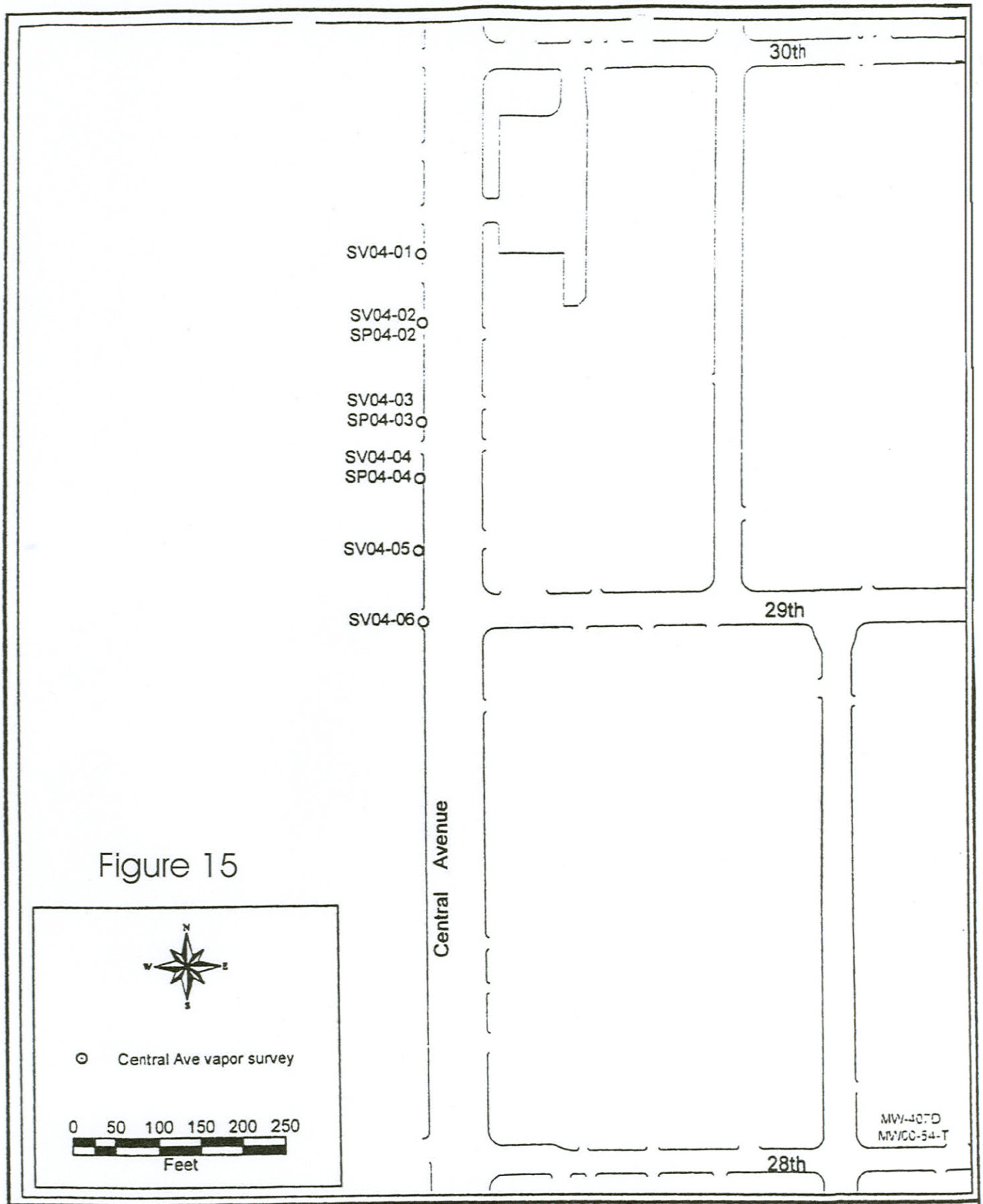
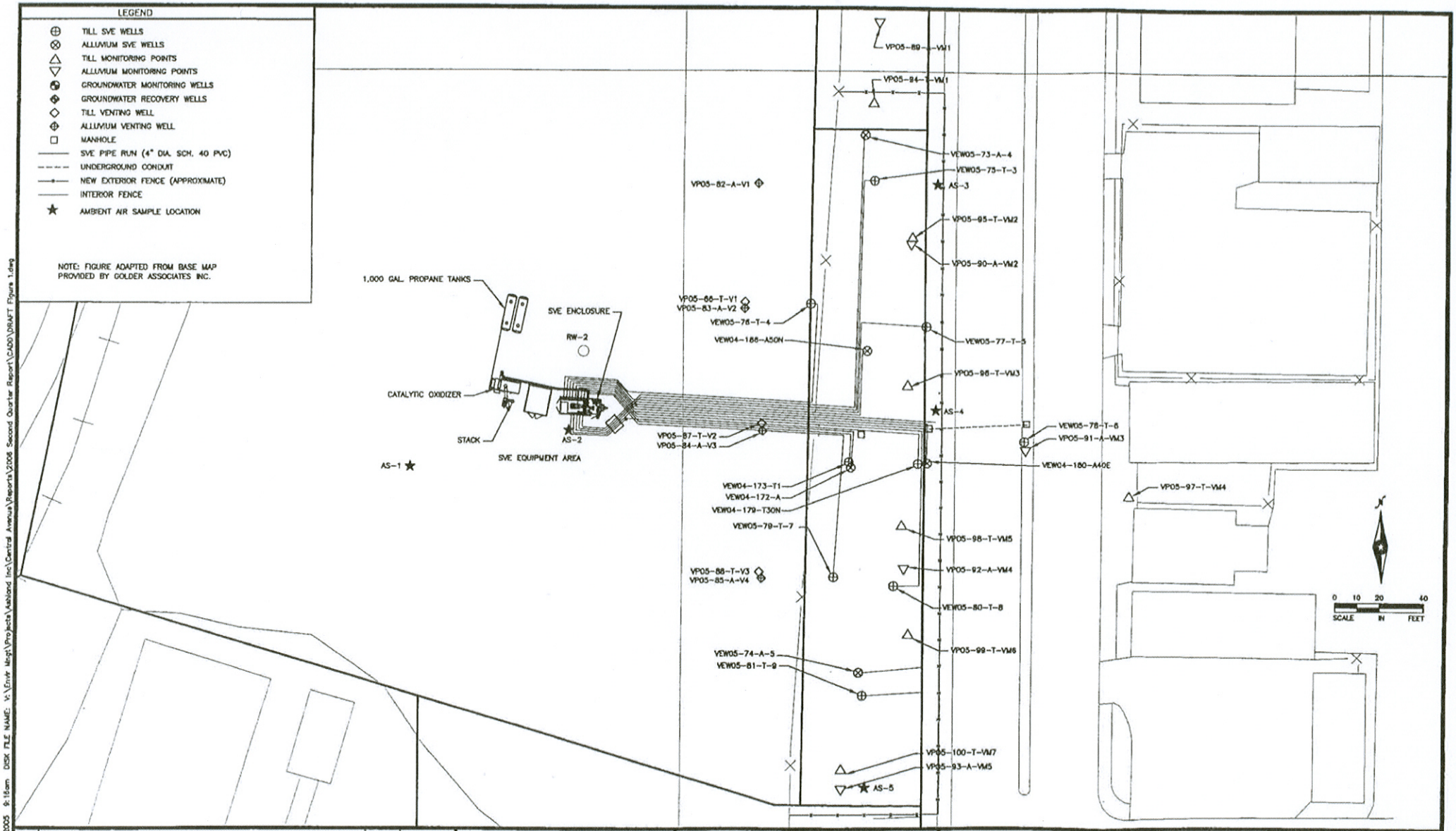


Figure 15

Generation Date: 8/17/04	Ashland Central Avenue soil gas sample locations.	Geomega



PLOT DATE: Aug 31, 2005 9:16am DISK FILE NAME: Y:\Envir Mngt\Projects\Ashland Inc\Central Avenue\Reports\2006 Second Quarter Report\CADD\DRAFT Figure 1.dwg

REV	DESCRIPTION OF REVISION	BY	DATE

FORMER LEASE AREA
SHOREHAM FACILITY
CENTRAL AVENUE
MINNEAPOLIS, MINNESOTA

URS
MINNEAPOLIS, MINNESOTA

SCALE: 1"=40' | DRAWN BY: AGL | CHECKED BY: DJL | DATE: 08/22/2006

DWGNAME

SVE SYSTEM LAYOUT

Figure 16

PROJECT NUMBER
37679621

Table 1
2004 Soil Vapor Sample Analytical Results
Soo Line Shoreham Yard Site
Results in parts per billion (detections only)

Compound	SV04-01 (5')	SV04-02 (5')	SV04-02 (15')	SV04-02 (25')	SV04-03 (5')	SV04-03 (15')	SV04-03 (25')	SV04-04 (5')	SV04-05 (5')	SV04-06 (5')
Acetone	54	160		86	34	66		30		
Cyclohexane	100						8700			
1,1,1-Trichloroethane	280	4200	4900	5200	9500	4800	56000	30000	1600	210
1,1-Dichloroethane	38	120	57	150	160	280	1100	200		
1,1-Dichloroethene	33	36		62	29	30	2800			
cis-1,2-Dichloroethene		39		34	36	55	850	59		
Benzene							900			
Trichloroethene (TCE)	260	23000	4200	17000	3200	1800	170000	410	400	68
4-ethyltoluene	36						2700			
Toluene	370			97			400000	300	64	270
Tetrachloroethene (PCE)	300	3100	950	2100	4900	2200	12000	300	380	280
Ethylbenzene							69000	31		
m&p Xylenes							200000	140		83
o-Xylene							70000	46		25
n-Heptane						520	91000	23		
n-Hexane			55						26	
Propylene	25	41			39	260		47	87	23
Styrene				37			130000	99		80
1,3,5-Trimethylbenzene	42						3300			
1,2,4-Trimethylbenzene	100						7600	23		
THC as Gas	31000	19000	8500	16000	19000	23000	2200000	10000	4700	2300

Source: Ashland 2004

Table 2
2006 Ambient Air Sample Analytical Results
Soo Line Shoreham Yard Site
Results in ug/m^3 (detections only)

	AS-1					AS-2					Chronic Screening	
Compound	(Background) 1/4/2006	2/3/2006	7/11/2006	7/27/2006	8/16/2006	(Background) 1/4/2006	5/30/2006	7/11/2006	7/27/2006	8/16/2006	Criteria	Source
Acetone	12.0		24.0	16.0	11.0	9.4	13.0	26.0	25.0	13.0	350	RfC
Tetrahydrofuran	4.1									25.0	NA	
Methyl ethyl ketone			2.6			2.7		3.0		4.7	1000	RfC
Ethanol		7.1	6.7					10.0			NA	
Carbon disulfide								19.0			700	HRV
Methylene chloride											20	HRV
Hexane											2000	HRV
2-propanol											NA	
Benzene											1.3-4.5	HRV
Toluene			4.3				4.1	4.8			400	HRV
m&p Xylenes								4.1			700	RfC

	AS-3	AS-4		AS-5						Chronic Screening	
Compound	2/3/2006	(Background) 1/4/2006	2/3/2006	(Background) 1/4/2006	1/25/2006	5/30/2006	7/11/2006	7/27/2006	8/16/2006	Criteria	Source
Acetone	12.0	10.0	7.8			7.6	42.0	23.0	10.0	350	RfC
Tetrahydrofuran				3.8						NA	
Methyl ethyl ketone							4.0	3.2		1000	RfC
Ethanol							16.0		9.4	NA	
Carbon disulfide						2.5	2.6			700	HRV
Methylene chloride						**63.0**			7.2	20	HRV
Hexane						4.9				2000	HRV
2-propanol							8.2				
Benzene					**5.4**					1.3-4.5	HRV
Toluene					4.0		8.4		3.8	400	HRV
m&p Xylenes										700	RfC

Bold indicates exceedence of chronic screening criteria
NA = None established
RfC = EPA Reference Concentration, IRIS Database
HRV = Minnesota Dept. of Health Chronic Health Risk Value for Air