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Revised Limited Site Investigation Report for the LRT Station, East Lake Street and Hiawatha Avenue, Minneapolis, Minnesota

Minnesota Department of Transportation
St. Paul, Minnesota

STS Project 99552-XA

THE INFRASTRUCTURE IMPERATIVE

STS CONSULTANTS

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December 13, 2004

Mr. John Driscoll
Minnesota Department of Transportation
Ceresota Building
155 - 5th Avenue South, Suite 300
Minneapolis, MN 55401

Re: Revised Limited Site Investigation Report for the LRT Station, East Lake Street and Hiawatha Avenue, Minneapolis, Minnesota; LEAK00015468; STS Project 99552-XA

Dear Mr. Driscoll:

The attached revised "Investigation Report Form" (MPCA Fact Sheet 4.06) was completed by STS in response to the Minnesota Pollution Control Agency (MPCA) letter dated September 16, 2004. The September 16, 2004 MPCA letter stated that "The full extent of contamination has not been adequately defined" and requested additional information to fully define the contamination extents. On September 21, 2004, Ms. Nancy Radle with MnDOT Environmental Services and Mr. Chris McClain, MPCA Project Manager had a telephone discussion in regards to the required investigation activities at the site. Mr. McClain verbally approved the completion of a single soil boring at the site to define the vertical extent of impacts.

STS Consultants, Ltd. (STS) completed two hollow stem auger borings at the site on October 7, 2004 at the request of MnDOT. One boring was completed to define the vertical extent of impacts and the second boring was completed as a temporary monitoring well. The additional investigation work was completed under the MnDOT Contract # 86562. The original Limited Site Investigation (LSI) report dated May 12, 2004 was revised to include additional information obtained from the October 7, 2004 borings. The revised information is presented in italicized text within the report.

STS recommends no additional action based on the field observations and analytical results.

If you have further questions regarding this report or other property considerations, please contact STS by calling 763/315-6300. We would enjoy hearing from you.

Sincerely,

STS CONSULTANTS, LTD.

Timothy J. Grape
Assistant Project Geologist

Robert L. DeGroot, PG PE
Principal Engineer

TJG/dn
Encs.
cc: Ms. Nancy Radle, MnDOT Environmental Services

C699552XA-4.DOC

Leaking Petroleum Storage Tanks
Minnesota Pollution Control Agency
http://www.pca.state.mn.us/programs/lust_p.html

Investigation Report Form

Guidance Document #4.06 (old Fact Sheet #3.24)

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Complete this form to document remedial investigation (RI) activities, including Limited Site Investigations (LSIs) and full RIs. Do not revise or delete any text or questions from this report form. Include any additional information that is important for making a site cleanup decision. If only a LSI is necessary, you may skip Section 6 and Section 7 of this report form.

Refer to Minnesota Pollution Control Agency (MPCA) fact sheet 3.1 *Leaking Underground Storage Tank Program* for the overall RI objectives, and to other MPCA fact sheets for details on investigation methods. When a tank has been excavated, refer to fact sheets 3.6 *Excavation of Petroleum Contaminated Soil During Tank Removal* and 3.7 *Excavation Report Worksheet for Petroleum Release Sites* for reporting requirements. Document the occurrence of free product using fact sheet 3.3 *Free Product: Evaluation and Recover,* and fact sheet 3.4 *Free Product Recovery Report Worksheet.*

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MPCA Site ID: Leak: **15468**

Date: **May 12, 2004**
Revised: ***November 29, 2004***

Responsible Party:
Minnesota Department of Transportation (MnDOT)

R.P. phone #: **John Driscoll**
(612) 215-8245

Responsible Party Address:
Ceresota Building
155 - 5th Avenue South, Suite 300

City**: Minneapolis**

County: **Hennepin**

Zip Code: **55401**

Alternate Contact (if any) for Responsible Party:
Nancy Radle

Phone #: **(651) 284-3781**

Consultant: **STS Consultants, Ltd.**

Consultant phone #:
(763) 315-6300

Facility Name: **Lake Street LRT Station**

Facility Address: **Northwest quadrant of Hiawatha Avenue and East Lake Street**

City: **Minneapolis**

County: **Hennepin** Zip Code: **55406**

Site location: The required coordinate scheme for reporting site location is Universal Transverse Mercator (UTM), Extended Zone 15, 1983 North American Datum (NAD83). Refer to **http://www.ot.state.mn.us/ot_files/handbook/standard/std17-1.html** for Minnesota spatial data standards, or **http://mac.usgs.gov/mac/isb/pubs/factsheets/fs15799.html** for more information about UTM Coordinates.

X coordinate (Easting) **481152.9**
Y coordinate (Northing) **4977275.7**

What feature does the coordinate represent? (i.e. center of parcel, approximate center of source area, etc. Please describe) **Approximate center of source area**

What method was used to determine the coordinate? (i.e. GPS receiver, map interpolation, address matching, etc. Please describe) **Map interpolation**

If a paper map, digital map, aerial photo or digital orthophotoquad was used to find the site location, please provide the scale of the map or photo (i.e. 1:24,000, etc.) **1:24,000**

Section 1: Emergency and High Priority Sites

1. Is an existing drinking water well impacted or likely to be impacted within a two-year travel time? ☐*Yes* ☒*No*

2. Are there existing vapor impacts? ☐*Yes* ☒*No*

3. Is there an existing surface water impact as indicated by 1) a product sheen on the surface water or 2) a product sheen or volatile organic compounds in the part per million (ppm) range in ground water in a well located close to the surface water. ☐*Yes* ☒*No*

4. Has the release occurred in the last 30 days? ☐*Yes* ☒*No*

5. Has free product been detected at the site? **If *YES***, attach fact sheet 3.4 *Free Product Recovery Report Worksheet.* ☐*Yes* ☒*No*

6. Is sand or gravel aquifer impacted which is tapped by water wells within or potentially within 500 feet from the release source **or** does impacted soil overlie a geologically sensitive area? **If *YES***, explain: ☐*Yes* ☒*No*

If you answered *YES* to any of questions 1 through 6 above describe below the actions taken to date to reduce or eliminate the risk posed by the release.

Section 2: Site and Release Information

2.1 Attach Table 1 - Tank Information. Describe the status of the other components of the tank system(s), (i.e., piping and dispensers).

One 1,000 gallon underground storage tank (UST) was removed from the property on October 3, 2003 including associated piping.

2.2a Describe the land use and pertinent geographic features within 1,000 feet of the site.

Land use on the project site consists of the Lake Street LRT station (building in-progress), a green area and sidewalk area. An LRT flyover bridge is on the east side of the property.

Land use within 1,000 feet of the property consists primarily of commercial tenants with some residential tenants to the southwest of the property. A railroad is located east of the property aligned in a northwest and southeast direction. Hiawatha Avenue and East Lake Street are adjacent to the property to the east and south of the property, respectively.

2.2b List other potential leak sources within 500 feet of the site.

A search of the MPCA website showed two other potential leak sources within 500 feet of the property. The other two potential leak sources are the Hiawatha LRT Corridor VIC site (VP 14020) and the Minnehaha Mall, Target Site #3 VIC site (VP 11331). Figure 3 shows the location of these VIC sites.

2.3 Identify and describe the source or suspected source(s) of the release.

The suspected source of the release was an underground storage tank for the business formerly located on the property. The type of petroleum contents stored in the UST were unknown.

The UST was removed on October 3, 2003. A fax transmittal from Richard Johnson, Braun Intertec, to John Driscoll, MnDOT dated October 17, 2003 indicates that the release was identified by laboratory results. Apparently no field indications of a release were identified. Soil samples obtained below the UST identified the presence of petroleum compounds. A copy of the fax transmittal and laboratory results are attached. ***An Excavation Report Worksheet was not completed for the UST removal.***

2.4 What was the volume of the release? (if known): **Unknown** gallons

2.5 When did the release occur? (if known): **Unknown**

Section 3: Excavated Soil Information

3.1 Include the Fact Sheet 3.7 *Excavation Report Worksheet* in Appendix A

An Excavation Report Worksheet was not completed for this site.

3.2 Was soil excavated for off-site treatment? ☐ *Yes* ☒ *No*

Date excavated: **NA**

Total Volume removed: **NA** cubic yards

How much of the Total Volume removed was petroleum saturated: **NA** cubic yards

3.3 Indicate soil treatment type: **NA**

☐ land treatment
☐ thermal treatment
☐ composting/biopiling
☐ other ( )
Name and location of treatment facility:

Section 4: Extent and Magnitude of Soil Contamination

4.1 Were soil borings conducted in or immediately adjacent to all likely sources including: ☒*YES* ☐*NO*

dispensers,	☐*yes* ☐*no* ☒*not present*
transfer areas,	☐*yes* ☐*no* ☒*not present*
underground storage tank basins,	☒*yes* ☐*no* ☐*not present*
above ground storage tank areas,	☐*yes* ☐*no* ☒*not present*
piping,	☒*yes* ☐*no* ☐*not present*
remote fill pipes,	☐*yes* ☐*no* ☒*not present*
valves	☐*yes* ☐*no* ☒*not present*
known spill areas	☐*yes* ☐*no* ☒*not present*

4.2 To adequately define the vertical extent of contamination, soil borings should be completed at least five feet below the water table or ten feet below the deepest measurable (field screening and visual observation) contamination, whichever is deeper. Were all soil borings completed to the required depth? ☐*YES* ☒*NO*

4.3 To adequately evaluate site stratigraphy complete at least one boring to 20 feet below the water table, or to 20 feet below the deepest site contamination, whichever is deeper. If a confining layer is present, drill the boring in an uncontaminated area. Was this done? ☐*YES* ☒*NO*

If you answered *NO* to any of the three previous questions, explain why the borings were not conducted in the required locations or to the required depths (see fact sheet #3.19, *Soil and Ground Water Investigations Performed During Remedial Investigations* regarding exceptions and MPCA approval for depth of drilling):

Refusal was encountered prior to reaching the required depths in all of the Geoprobes advanced at the site on 4/15/04. No field evidence of contamination was observed in the probe borings. Water was identified on top of a clay layer in boring B-5 at 18.9 feet. Groundwater was not encountered in borings B-1, B-2, B-3, B-4 and B-6.

Two hollow stem auger borings (B-1A and B-3A) were conducted on 10/7/04 to define the vertical extent of impacts at the site. Both soil borings encountered refusal at 27 feet below ground surface due to very hard drilling likely at the bedrock interface. Groundwater was encountered at approximately 21 feet below ground surface in boring B-1A and 20.5 feet in boring B-3A.

4.4 Indicate the drilling method:

☒ ***hollow-stem auger (B-1A and B-3A)***
☐ sonic drilling
☒ **push probes (B-1 through B-6)**
☐ other

Note: MPCA staff hydrologist approval is required before use of flight augers

4.5 Discuss soil borings drilled and provide rationale for their locations. Attach boring logs in Appendix D.

Six Geoprobe borings (B-1, B-2, B-3, B-4, B-5 and B-6) were advanced on April 15, 2004 in the immediate vicinity of the former 1,000 gallon UST. Geoprobe borings were advanced to refusal depth which varied from 14' in B-3 to 22' in B-4. Boring B-1 was advanced in the former tank basin area.

Two hollow stem auger borings (B-1A and B-3A) were advanced on October 7, 2004 to define vertical extent of impacts at the site and obtain additional groundwater analytical information. Boring B-1A was advanced in the immediate vicinity of probe B-1. Boring B-3A was advanced in the immediate vicinity of probe B-3. Soil boring locations are illustrated on Figure 2. Boring logs are attached in Appendix D.

4.6 Attach Table 2 - Results of Soil Headspace Screening, In Appendix C, discuss soil headspace screening method and describe any deviation from recommended and/or required methods and procedures.

Soil samples were screened in general accordance with the MPCA polyethylene bag headspace method. Table 2 – Results of Soil Headspace Screening is attached. Headspace screening methodology is described in Appendix C.

No headspace readings above background were identified in the soil samples collected. In addition, headspace readings are provided in the soil boring logs included in Appendix D.

4.7 Attach Table 3 - Analytical Results of Soil Samples. Provide analytical results in Appendix B. In Appendix C, discuss soil sampling and analytical methods used and describe any deviation from recommended and/or required methods and procedures

Table 3 – Analytical Results of Soil Samples is attached. The complete laboratory reports are attached in Appendix A. Sample and analytical methods are described in Appendix C.

4.8 Describe the vertical and horizontal extent and magnitude of soil contamination. Provide a plan-view map and two cross-sections that illustrate both soil head space and laboratory analytical results. See Section 13.

Laboratory analytical services were provided by Pace Analytical Laboratory.

DRO was identified at a concentration of 28 mg/kg in the soil sample B-1 (19') collected from probe boring B-1 conducted within the former UST basin. DRO was not detected in the duplicate sample collected from the same location.

DRO was identified at concentrations of 730 mg/kg and 17 mg/kg in probe borings B-3 (14') and B-4 (22'), respectively. No DRO concentrations above laboratory reporting limits were observed in soil samples collected from 20 feet and 27 feet from hollow stem auger boring B-3A conducted in the immediate vicinity of probe boring B-3. No other petroleum compounds were identified in the soil samples collected.

4.9 Attach Table 4 - Other Contaminants Detected in Soils (Petroleum or Non-petroleum Derived). Discuss the possible sources of these compounds.

Barium, chromium and lead were identified in soil sample collected from B-1 at concentrations of 19.7 mg/kg, 4.73 mg/kg and 3.15 mg/kg, respectively. The concentrations are below MPCA established Tier 1 soil leaching values (SLVs) and soil reference values (SRVs). Other possible sources of these compounds include natural concentrations.

4.10 Is contaminated soil in contact with ground water? ☒ *Yes* ☐ *No*

If *YES* or if ground water contamination appears likely, then complete Section 5.

No visual, olfactory or PID headspace evidence of soil contamination was observed during UST removal or during investigation activities. Low level DRO concentrations were observed in soil samples collected at depths ranging from 14 feet to 22 feet. Groundwater was observed at depths ranging from 18.9 feet in B-5 to 21 feet in B-1A. Low level concentrations of DRO (0.13 mg/L) were identified in the groundwater sample collected at boring B-1A.

If *NO* (contaminated soil is not in contact with ground water), what is the distance separating the deepest contamination from the surface of the water table? Was this distance measured during site activities, referenced from geologic information, or estimated based on professional opinion during a site visit? feet

4.11 Describe observations of any evidence of a fluctuating water table and a seasonal high water table (e.g., mottling). Also, from other sources of information describe the range of natural water table fluctuations in the area.

No evidence of a seasonal high/fluctuating water table was observed during site investigation activities.

4.12 In your judgment, is there a sufficient distance separating the petroleum contaminated soil (or an impacted non- aquifer) from the underlying aquifer to prevent petroleum contamination of the aquifer? Please explain in detail. In your explanation, consider the data and information of this section as well as the nature of the petroleum release (i.e., volume, when it occurred, petroleum product). ☒ *Yes* ☐ *No*

If *YES,* a ground water contamination assessment is not necessary as part of the LSI.

If *NO*, a ground water contamination assessment is necessary. Complete Section 5.

The date and volume of the petroleum release associated with the former UST is unknown.

No visual, olfactory or PID headspace evidence of contamination was observed in or around the "source area" during UST removal or during investigation activities. There does not appear to be a threat of continued contamination migration to the groundwater table at this site. The UST was removed and extensive impacts were not observed beneath the UST.

The groundwater sample collected from boring B-1A had a low level DRO concentration (0.13 mg/L). The Health Based Value (HBV) established by the Minnesota Department of Health (MDH) for total petroleum hydrocarbons (TPH) is 0.2 mg/l (200 µg/l). The shallow groundwater encountered at the site at depths ranging from 18.9 feet to 21 feet is not considered a sustainable yield aquifer due to the estimated thickness of the aquifer based on hollow stem auger boring refusal depths of 27 feet. Depth to bedrock in the area is estimated at less than 50 feet based on published geologic data referenced from Depth to Bedrock, County Atlas Series Atlas C-4, Plate 4 of 9, by Bloomgren, Cleland and Olsen 1989. Bedrock beneath the site area consists of Decorah Shale and Platteville Formations overlying the St. Peter Sandstone. The Decorah Shale is up to 25 feet thick. The Platteville Formation is approximately 30 feet thick. The Decorah Shale and Platteville Formation form a confining layer between the shallow upper aquifer and the St. Peter Aquifer.

Section 5: Aquifer Characteristics/Ground Water Contamination Assessment

Complete Section 5 if groundwater has been contaminated or may become contaminated. Aquifer determination is made during the LSI. It is based upon the stratigraphy and a hydraulic conductivity measurement calculated from grain size distribution analysis. The site stratigraphy gives the context within which the hydraulic conductivity measurement can be interpreted. Please refer to Fact Sheet 3.19, *Soil and Ground Water Investigations Performed During Remedial Investigations* for methods and requirements.

5.1 Provide an average hydraulic conductivity value (K) measured:

K = 10^{-5} cm/sec. = 0.3 ft/day - Referenced from C.W. Fetter, Applied Hydrogeology 3rd Edition, based on a soil type of clayey sands.

Indicate the method of measurement (i.e., Hazen, Masch and Denny, Kozeny-Carmen, etc.): Grain-size distribution approximations by method(s).

Indicate the locations and depths of soil samples submitted for grain size analyses. Provide the results of grain size analyses and other information used for the determination of K-values in Appendix F.

K values were referenced from C.W. Fetter, Applied Hydrogeology 3rd Edition, based on a soil type of clayey sands.

5.2 Calculate a range for aquifer transmissivity (T) using the equation T = Kb, where b is the thickness of the aquifer:

Refusal due to bedrock was encountered at a depth of approximately 26 feet below ground surface in the hollow stem auger borings (B-1A and B-3A). The shallowest groundwater encountered was approximately 18.9 feet in B-5.

T_{High} = ***2.4 ft^2/day b = 8 ft.***
T_{Low} = ***1.8 ft^2/day b = 6 ft.***

Determine the aquifer thickness (b) from geologic logs of soil borings, water well logs, and available published information. Attach water well logs in Appendix D. If the transmissivity of a contaminated hydrogeologic unit is greater than 50 ft^2/day, it is considered an aquifer (for the purpose of the LUST program), and monitoring wells will be necessary.

5.3 Discuss in detail the site geology and stratigraphy, including a discussion of local and regional hydrogeology, using soil boring data and cross sections, geologic logs of near-by water wells, and available published information.

Soil type encountered in the borings consisted of fine to coarse sand in the upper 15 feet, on top of alternating layers of sand, silty sand and sandy, silty clay to approximately 27 feet. Auger refusal was encountered at a depth of 27 feet in borings B-1A and B-3A.

Available published information indicates that bedrock present in the area consists of the Decorah Shale and Platteville Formations overlying the St. Peter Sandstone. The Decorah Shale is comprised of green calcareous shale with thin interbeds of limestone and has an approximate thickness of up to 25 feet. The Platteville Formation is comprised of fine-grained limestone containing thin shale partings near the top and base, underlain by green sandy shale of the Glenwood Formation. The Platteville Formation is approximately 30 feet thick and the Glenwood Formation is approximately 5 feet thick. The St. Peter Sandstone consists of fine to medium-grained friable quartz sandstone in the upper half to two-thirds. The lower part of the St. Peter Sandstone consists of beds of mudstone, siltstone, and shale with interbedded very coarse sandstone. Depth to bedrock in the area is estimated at less than 50 feet based on published geologic data referenced from Depth to Bedrock, County Atlas Series Atlas C-4, Plate 4 of 9, by Bloomgren, Cleland and Olsen 1989.

Groundwater flow direction in the area is estimated to be generally east to southeast towards the Mississippi River. Depth to groundwater in the soil borings ranged from 18.9 feet to 21 feet below ground surface.

5.4 Attach Table 5- Water Level Measurements and Depths of Water Samples Collected from Borings. Indicate the method used to measure the water levels in borings, and the depth water samples were collected from borings. Allow water levels in borings to equilibrate to static conditions, and the adjust the effective screened intervals in borings to intercept the static water table prior to water sample collection. Discuss groundwater flow direction.

Groundwater flow direction in the area is estimated generally east to southeast towards the Mississippi River.

5.5 Attach Table 6 - Analytical Results of Water Samples Collected from Borings. Summarize the analytical results of groundwater samples collected as part of an LSI. Discuss the extent and magnitude of groundwater contamination. Also provide a discussion on QA/QC, including information on the samples collected and laboratory analyses performed.

Two groundwater samples (B-5 and B-1A) were collected and analyzed for VOC and DRO. No VOC or DRO concentrations above laboratory reporting limits were observed for sample B-5. No VOC compounds were identified above laboratory reporting limits in sample B-1A. A DRO concentration of 0.13 mg/L was identified in sample B-1A. The HBV established by the MDH for TPH is 0.2 mg/L.

5.6 Attach Table 7 - Other Contaminants Detected in Water Samples Collected from Borings (Petroleum or Non-petroleum Derived). Discuss the possible sources of these contaminants and provide a discussion of QA/QC information.

No other contaminants were detected in the water samples collected from borings.

5.7 Laboratory certification number: ***Pace Analytical Certification # = 027-053-137***

Additional Ground Water Investigation

Additional Ground Water Investigation Was Not Completed

Complete **Section 6** only if: 1*) an aquifer has been impacted at or above Minnesota Department of Health HRLs, 2) an aquifer has been impacted below the HRLs, but the levels are likely to reach the HRLs, or 3) there is an insufficient distance separating the petroleum contaminated soil (or an impacted non- aquifer) from the underlying aquifer.* Complete **Section 7** only if remediation is anticipated. Regardless of whether you are submitting a *LSI* or a *full RI*, all sections following Section 7 must be completed.

Section 6. Extent and Magnitude of Ground Water Contamination

6.1 Discuss drilling and installation of wells, including the rationale for their locations. Attach boring logs in Appendix D.

6.2 Attach Table 8 - Monitoring Well Completion Information.

6.3 Attach Table 9 - Summary of Water Levels Measured in Wells.

6.4 Attach Table 10 - Analytical Results of Water Samples Collected from Wells. Indicate here whether samples were purged or unpurged (see fact sheet 3.23). If purged, indicate purging method.

6.5 Attach Table 11 - Other Contaminants Detected in Water Samples Collected from Wells (Petroleum or Non-Petroleum Derived). Indicate here whether samples were purged or unpurged (see fact sheet 3.23). If purged, indicate purging method.

6.6 Describe the extent and magnitude of the ground water contamination. Discuss the presence of non-petroleum compounds, if detected, and identify possible sources of these compounds. Also provide a discussion on QA/QC, including information on the samples collected and laboratory analyses performed.

6.7 Is there a clean or nearly clean (below HRLs) down-gradient monitoring well located along the longitudinal axis of the contaminant plume? (approximately 20 degrees plus or minus the axis) ☐*Yes* ☐*No*

6.8 Is there a worst case well completed through the source area(s) of the release? ☐*Yes* ☐*No*

If you have answered *NO* to any of the above two questions, please explain why a well was not completed in the required location.

6.9 Provide an estimate of the longitudinal length of the dissolved contaminant plume: feet

6.10 Calculate groundwater flow velocity (based on Darcy's Law) using the average K-value, average horizontal hydraulic gradient, and effective porosity. Provide documentation in Appendix F.

Hydraulic Conductivity (K) = Method
Porosity (n) = method/reference
Average horizontal gradient (dh/dl) =
Calculated GW velocity (v) = cm/s ft/day

6.11 Using the calculated groundwater flow velocity (above), is there a receptor within a five-year travel time? ☐*Yes* ☐*No*

If *YES*, provide the unique well number and identify the location of the receptor(s).

6.12 Were any deep monitoring wells completed at the site? ☐*Yes* ☐*No*

If *YES*, list them and indicate their depths:

Contact the MPCA project hydrologist before installing a deep monitoring well. A deep monitoring well may be necessary if: 1) Contamination exists more than 10 feet below the water table or 2) the impacted aquifer is a drinking water aquifer or is hydraulically connected to the aquifer(s) presently utilized by a water supply well located within 500 feet of the release source.

If contamination is present at depth in the aquifer or in deeper aquifers, additional deep wells may be required. Provide the following information if deep wells are installed:

Vertical Gradient (dv/dl)
Inferred GW Flow Direction

Provide the following information for the deep aquifer unit if it appears to be hydrogeologically distinct from the upper unit.

Porosity (n):
Hydraulic Conductivity (K)

Submit this RI report after completing a minimum of *two quarterly sampling events.* Groundwater monitoring should continue until MPCA response is received.

Section 7: Evaluation of Natural Attenuation

Evaluation of Natural Attenuation Was Not Conducted

Refer to the fact sheet #3.21 *Assessment of Natural Attenuation at Petroleum Release Sites.* **Note**: Evaluation of natural attenuation is not required unless requested by MPCA staff.

7.1 Attach Table 12 - Natural Attenuation Parameters. Discuss the results. Specifically, compare the concentrations of the inorganic parameters inside and outside the plume.

7.2 In your judgment, is natural biodegradation occurring at this site? Please Explain. ☐ *Yes* ☐ *No*

If active remediation is anticipated, discuss reasons why natural attenuation (including biodegradation) can not adequately remediate the contaminants to acceptable risk levels.

Section 8: Well Receptor Information/Assessment

Include in Appendix E, copies of the water supply well logs obtained from MGS, MDH, drillers, and where applicable, from County well management authorities.

8.1 Attach Table 13 - Properties Located Within 500 Feet of the Release Source. Provide a map identifying the features listed in Table 13.

See Table 13 and Figure 2.

8.2 Were all property owners within 500 feet of the release source successfully contacted to determine if water wells are present? ☐*Yes* ☒*No* **If *NO***, please explain.

A walking well survey was conducted within 500 feet of the release area. In addition, the County Well Index (CWI) was searched and the Minneapolis Park and Recreation Board and Metropolitan Council were contacted. No water wells were identified during the water well survey or CWI search. The properties within a 500 foot radius of the release source obtain water from a municipal supply.

8.3 Attach Table 14 - Water Supply Wells Located within 500 Feet of the Release Source and Municipal or Industrial Wells Within ½ Mile.

See Table 14.

8.4 Discuss the results of the ground water receptor survey and any analytical results from sampling conducted at nearby water wells. Comment on the risks to water supply wells identified within 500 feet from the release source as well as the risk posed by or to any municipal or industrial wells found within ½ mile. Specifically indicate whether water supply wells identified utilize the impacted aquifer. (Note: an impacted aquifer separated from another aquifer by a clay lens may not be considered a separate aquifer).

The following sources were contacted/databases searched for potential groundwater receptors within a 500 ft. and 1/2 mile radius:

- **Minneapolis Park Board (personal contact)**
- **Metropolitan Council (personal contact)**
- **County Well Index**

One industrial well was identified within 1/2 mile of the project site (Unique Well Number 00201088). The well is located near the intersection of East Lake Street and Hiawatha Avenue approximately 500 feet east of the project site. The well utilizes the Prairie du Chien and Jordan Aquifers and has a depth of 427 feet. The well is cased to a depth of 256

feet. According to the Minnesota Department of Health, the well has not been abandoned. A copy of the well log is included in Appendix E.

Based on analytical data, field observations, well construction and well depth, this well does not appear to have potential to be impacted by the project site at this time.

8.5 Is municipal water available in the area? ☒*Yes* ☐*No*

8.6 Are there any plans for ground water development in the impacted aquifer within 1/2 mile of the site, or one mile down-gradient of the site if the aquifer is fractured? Please give the name, title and telephone number of the person that was contacted for this information (below). ☐*Yes* ☒*No*

Mr. Chris Elvrum
MCES Environmental Planner
Telephone (651) 602-1000

Mr. Mike Perniel
Minneapolis Park Board Environmental Specialist
Telephone (612) 313-7762

Section 9: Surface Water Risk Assessment

NOT APPLICABLE

9.1 Are there any surface waters or wetlands located within ¼ mile of the site? ☐*Yes* ☒*No*

If *YES*, list them:_____

Also list any potential pathway such as ditches, drain tiles, storm sewers, etc., that may lead to the identified surface water features.

9.2 If surface water is present down-gradient of the site, is there a clean down-gradient monitoring well (temporary or permanent) located between the site and the surface water? ☐*YES* ☐*NO* ☒*N/A*

9.3 If you answered *NO* to question 9.2, we assume that contamination discharges to surface water. Therefore, complete the following information:

Name of receiving water:	
Receiving water classification	
ORVW?	☐*Yes* ☐*No*
Plume width, (W):	feet
Plume thickness, (H):	feet
Hydraulic conductivity, (K):	gal/day/ft^2
Horizontal gradient, (dh/dl):	(unitless)
Discharge, (Q) = H*W*K*(dh/dl)/1440	gal/min
Applicable chronic standard (7050 or 7052)	
Applicable max. standard (7050 or 7052)	
Applicable FAV (7050 or 7052)	
Contaminant concentration in ground water	

9.4 If you answered *YES* to question 9.2, identify the clean down-gradient boring or monitoring well, the distance to the surface water feature, and discuss the contamination risk potential.

Section 10: Vapor Risk Assessment/Survey

10.1 Is there a history of vapor impacts in the vicinity of the site ? ☐*Yes* ☒*No*

If *YES*, describe:

10.2 Is there any indication that free product or contaminated ground water may be traveling off-site within the utility corridors? ☐*Yes* ☒*No*

If *YES*, utility backfill investigation is required (refer to Fact Sheet 3.19). Discuss the investigation rationale and results.

10.3 Discuss the potential for vapor migration/accumulation near the site. Your discussion should consider: Soil types, product type, presence and distribution of free product or high concentrations of dissolved product. Also, using cross-sections to illustrate the relationship, compare the depth of contamination with the location of underground utility lines, location and depth of storm and sanitary sewers, and location of nearby basements and sumps.

The potential for vapor migration/accumulation near the project site is low. The extent and magnitude of the release is limited. No elevated PID headspace readings were observed in the soil borings. No visual/olfactory evidence of contamination was observed in the tank basin area. Laboratory analysis identified limited concentrations of DRO in the soil and groundwater. See 10.4 below for further information.

10.4 Conduct a vapor survey if the vapor risk assessment indicated a risk of vapor impacts to buildings or utilities. Ask occupants of nearby buildings if they have smelled petroleum odors. See fact sheet 3.20 *Potential Receptor Surveys and Risk Evaluation Procedures at Petroleum Release Sites*. Identify all vapor monitoring locations on an attached site map by labeling each monitoring location with a number. Tabulate the list of vapor monitoring locations in Table 15. Vapor monitoring methods, including instruments used, must be discussed in Appendix C. Provide a detailed description of each vapor monitoring location and an interpretation of the vapor monitoring results below.

STS conducted a limited vapor survey to the storm sewer manways and grates adjacent to the project site on 4/15/2004. No PID or Lower Explosive Limit (LEL) gas readings above background levels were observed at the aforementioned locations. Vapor Point monitoring locations are illustrated on Figure 2.

10.5 Attach Table 15 - Results of Vapor Monitoring.

Results of vapor monitoring are summarized on Table 15.

Section 11: Discussion

11.1 Discuss the risks associated with the remaining soil contamination:

The risks associated with the remaining soil contamination appear to be limited. The extent and magnitude of soil contamination appears limited based on the field observations and laboratory analysis. No elevated PID headspace readings were observed in the soil samples collected. A low level DRO concentration of 28 mg/kg was identified in the former UST basin (B-1) at 19 feet but not in the duplicate sample collected from the same location. The lack of highly impacted soils in the source area indicated a limited source of contaminant migration to the groundwater table.

DRO was identified at concentrations of 730 mg/kg and 17 mg/kg in Geoprobes B-3 (14') and B-4 (22'), respectively. No DRO concentrations above laboratory reporting limits were observed in soil samples collected at depth (20 feet and 27 feet) from boring B-3A. Concentrations of DRO in B-4 (22') are consistent with concentrations in B-1 (19').

11.2 Discuss the risks associated with the impacted ground water:

No significant risks associated with impacted groundwater were identified. DRO was detected in sample B-1A at a concentration of 0.13 mg/kg. The HBV established by the MDH for TPH is 0.2 mg/L. No DRO impacts were identified in the groundwater sample obtained from B-5. No VOC compounds were detected above laboratory reporting limits in the groundwater samples collected from temporary wells at the site.

The shallow groundwater at the site is separated from the St. Peter aquifer by the Decorah Shale and Platteville Formation confining units with a combined thickness of up to 55 feet.

Acetone was detected at 5.9 µg/L in the field blank. Acetone is a common laboratory glassware cleaning compound and may have been present due to cross-contamination at analysis. Acetone was not identified in the groundwater samples collected at the site.

A well receptor survey conducted within a 1/2 mile radius of the project site identified one potential well receptor located approximately 500 feet east of the project site (unique #00201088). The well record for the potential well receptor is attached. The well is an industrial well cased to a depth of 256 feet. According to the Minnesota Department of Health, the well has not been abandoned. This well does not appear to have potential to be impacted by the project site at this time, based on analytical data, field observations, well construction and well depth.

11.3 Discuss other concerns not mentioned above:

Concerns are discussed above.

Section 12: Conclusions and Recommendations

12.1 Recommendation for site:

- ☒ site closure
- ☐ additional vapor monitoring
- ☐ additional ground water monitoring
- ☐ active remediation

12.2 Base the recommendation above on fact sheet #3.1 *Leaking Underground Storage Tank Program*. Describe below how you applied the policy to support your recommendation. If closure is recommended, please summarize significant site investigative events and describe how site specific risk issues have been adequately addressed or minimized to acceptable low risk levels.

Summary of Site Investigation Activities:

- ***October 3, 2003 - Removal of 1,000 gallon underground storage tank (UST)***
- ***April 15, 2004 – Limited Site Investigation - six push probe borings***
- ***October 7, 2004 – Additional Site Investigation – two hollow stem auger borings***

The removal of the UST has significantly reduced the potential for an ongoing release of petroleum at the site. No visual, olfactory or PID headspace evidence of soil impacts was identified during site investigation activities. Impacts at the site consist of low level DRO concentrations in the soil and one groundwater sample (B-1A). The DRO concentration (0.13 mg/L) observed in groundwater sample B-1A is below the MDH established Health Based Value (HBV) of 0.2 mg/L for total petroleum hydrocarbons (TPH). No VOC compounds were detected above laboratory reporting limits in the soil or groundwater samples collected from the borings.

The vertical extent of contamination was defined with additional soil borings B-1A and B-3A. No VOC or DRO compounds were detected above laboratory reporting limits in the soil sample collected from 27 feet in B-3A.

No existing receptors were identified based on the site investigation activities and reviews of area well log records.

No vapor migration associated with a release from the former UST appears likely based on the lack of elevated PID headspace readings, site observations and a limited vapor survey conducted by STS.

12.3 If additional monitoring is recommended, indicate the proposed monitoring schedule and frequency. Conduct quarterly monitoring until the MPCA responds to this report.

Additional monitoring is not recommended at this time.

12.4 If active remediation is proposed, then recommend a conceptual approach by listing the remedial technologies or combination of technologies that are likely feasible. MPCA staff will review this RI report at a higher than normal priority to determine if active remediation is required. We will respond with either a request for proposal for additional monitoring or a Corrective Action Design report.

Active remediation is not recommended at this time.

Section 13: Figures

Attach the following figures in order of discussion in the text:

☒ Site location map using a U.S. Geological Survey 7.5 minute quadrangle map.

☒ One or more site map showing:

- Structures
- Locations and depths of on-site buried utilities
- All past and present petroleum storage tanks, piping, dispensers, and transfer areas.
- Extent of soil excavation
- Boring and well locations (including any drinking water wells on site)
- Horizontal extent of soil contamination
- Horizontal extent of ground water contamination
- Location of end points for all geologic cross sections.
- Potential pathways to surface water features within ¼ mile of the site.

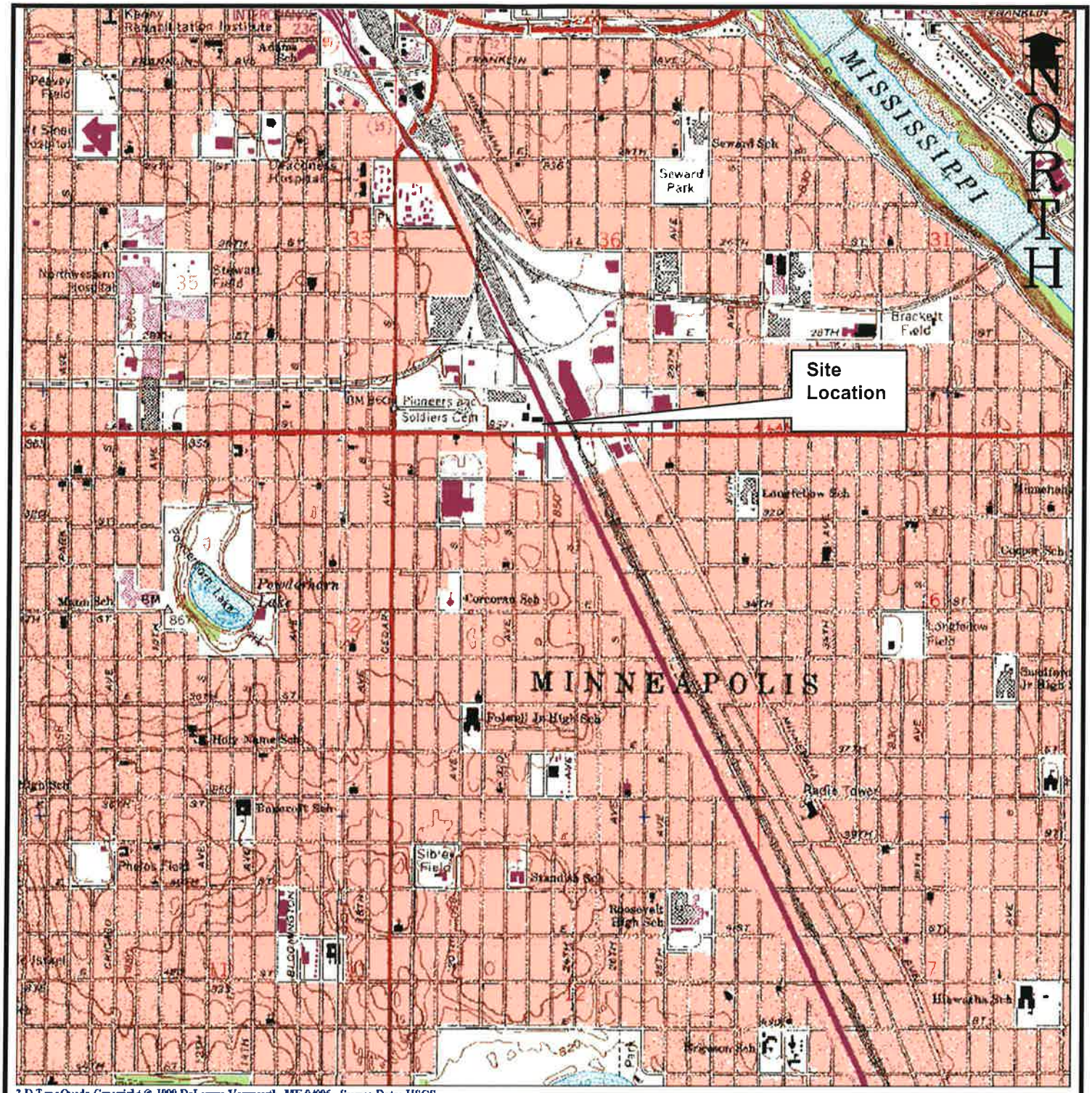
Distinguish sequential elements of investigations by dates, symbols, etc. in the key.

☐ Ground water gradient contour maps (for sites with monitoring wells) for each gauging event.

☒ Well receptor survey map showing 1/2 mile radius, 500 foot radius, water supply wells, other potential sources of contamination, using a U.S. Geological Survey 7.5 minute quadrangle.

☒ Vapor survey map showing utilities and buildings with basements and monitoring locations (if a survey was required).

☐ Provide at least two (2) geologic cross sections, including utilities.



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS 700 ft Scale: 1 : 24,000 Detail: 13-1 Datum: WGS84

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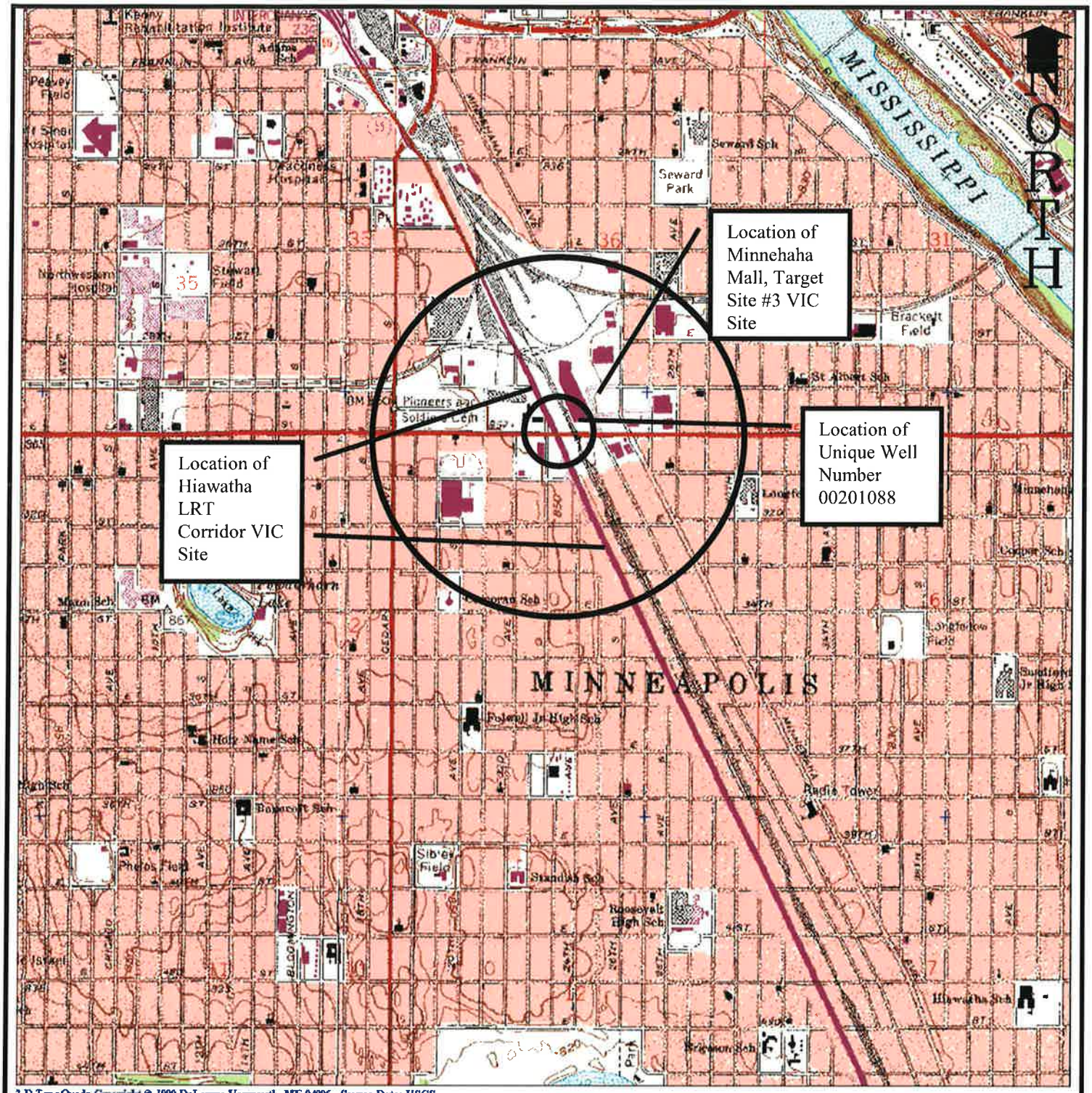
SITE LOCATION DIAGRAM
Mn/DOT Hiawatha LRT LSI
Hiawatha Avenue/East Lake Street
Minneapolis, Minnesota

Drawn:	AJC	5/13/2004
Revised:	TJG	11/16/04
Approved:	RLD	
PROJECT NUMBER	**99552-XA**	
FIGURE NUMBER	**1**	



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500 FEET AND 1/2 MILE RADIUS DIAGRAM
Mn/DOT Hiawatha LRT LSI
Hiawatha Avenue/East Lake Street
Minneapolis, Minnesota

Drawn:	AJC	5/19/2004
Revised:	TJG	11/16/04
Approved:	RLD	
PROJECT NUMBER	**99552-XA**	
FIGURE NUMBER	**3**	

Section 14: Tables

Table 1
Tank Information

Tank #	UST or AST	Capacity	Contents	Year Installed	Status*	Condition
001	UST	1,000 gallons	Used or Waste Oil	Unknown	Removed	Unknown

*Indicate: *removed (date), abandoned in place (date), or currently used, upgraded tank, installation of new tank.*
Notes:

Table 2
Results of Soil Headspace Screening

Depth (ft.)	Soil Boring B-1	B-2	B-3	B-4	B-5	B-6	B-1A	B-3A
0-3	1	1	1	<1	<1	1	<1	<1
3-7	<1	<1	<1	<1	<1	<1	<1	<1
7-11	<1	<1	<1	<1	<1	<1	<1	<1
11-15	<1	<1	<1(11-14)	<1	<1	<1	<1	<1
15-19	1 (15-18)	<1(15-18)	**EOB-14**	<1	<1	<1 (15-18)	<1	<1
19-20	<1 (18-19)	**EOB-18**		<1	<1	2 (18-20)	<1	<1
20-22	**EOB–19**			<1	1	**EOB-20**	<1	<1
22.5-24.5				**EOB-22**	**EOB-22**		<1	<1
25-27							<1	<1
							EOB -27	**EOB -27**

List instruments used and discuss field methods and procedures in Appendix C.
Notes:
Photovac PID – 10.6 eV lamp calibrated to 100 ppm isobutylene.
Background PID readings were 0-2 units.
EOB = End of Boring

Table 3
Analytical Results of Soil Samples

Boring, Depth(ft)	Date Sampled	Benzene	Toluene	Ethylbenzene	Xylenes	GRO	DRO	Lab Type
B-1 (19)	4/15/04	<0.28	<0.28	<0.28	<0.84	<5.6	**28**	Fixed Base
Duplicate of B-1 (labeled B-12)	4/15/04	<0.29	<0.29	<0.29	<0.87	NA	<9.5	Fixed Base
B-2 (18)	4/15/04	<0.27	<0.27	<0.27	<0.80	NA	<8.8	Fixed Base
B-3 (14)	4/15/04	<0.27	<0.27	<0.27	<0.81	NA	**730**	Fixed Base
B3-A (20')	10/7/04	<0.05	<0.05	<0.05	<0.15	NA	<10	Fixed Base
B3-A (27')	10/7/04	<0.05	<0.05	<0.05	<0.15	NA	<10	Fixed Base
B-4 (22)	4/15/04	<0.28	<0.28	<0.28	<0.84	NA	**17**	Fixed Base
B-5 (22)	4/15/04	<0.27	<0.27	<0.27	<0.80	NA	<9.4	Fixed Base
B-6 (20)	4/15/04	<0.27	<0.27	<0.27	<0.81	NA	<9.3	Fixed Base
Trip Blank	4/15/04	<0.25	<0.25	<0.25	<0.75	NA	NA	Fixed Base

Report results in mg/kg. Use less than symbols to show detection limit. Indicate mobile or fixed based in the lab type column.

Notes:

BOLD = Result above laboratory reporting limit

NA=Not Analyzed

Table 4
Other Contaminants Detected in Soils (Petroleum or Non-petroleum Derived)

Boring, Depth (ft)	Date Sampled	Barium	Chromium	Lead	Lab Type
B-1	4/15/04	**19.7**	**4.73**	**3.15**	Fixed Base

Report results in mg/kg. Indicate other contaminants (either petroleum or non-petroleum derived) detected in soil collected from borings.

Notes:

Table 5
Water Level Measurements and Depths of Water Samples Collected from Borings

	Soil Boring							
	B-1	**B-2**	**B-3**	**B-4**	**B-5**	**B-6**	**B-1A**	**B-3A**
Static Water level depth (ft)	--	--	--	--	18.9	--	21	20.5
Sampled Depth (ft)	--	--	--	--	18.9	--	21	20.5

Describe in Appendix C, the methods and procedures used to measure water levels in borings.
Notes:
--=Groundwater Not Encountered

Table 6
Analytical Results of Water Samples Collected from Borings

Boring Number	Date Sampled	Sampled Depth (ft.)	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	GRO	DRO	Lab Type
B-5	4/15/04	18.9	<1.0	<1.0	<1.0	<3.0	<1.0	NA	<100	Fixed Base
B-1A	10/7/04	21	<0.5	<1.0	<1.0	<1.0	<1.0	NA	**130**	Fixed Base
Trip Blank	4/15/04	--	<1.0	<1.0	<1.0	<3.0	<1.0	NA	NA	Fixed Base
Field Blank	4/15/04	--	<1.0	<1.0	<1.0	<3.0	<1.0	NA	NA	Fixed Base
Field Blank	10/7/04	--	<0.5	<1.0	<1.0	<1.0	<1.0	NA	NA	Fixed Base
Lab Blank (GP-12)	4/15/04	18.9	<1.0	<1.0	<1.0	<3.0	<1.0	NA	NA	Fixed Base
HRL	--	--	10	1000	700	10000	--	--	--	--
HBV	--	--	--	--	--	--	--	--	200*	--

Report results in µg/L. Use less than symbols to show detection limit. Indicate mobile or fixed based in the lab type column.
Notes:
NA=Not Analyzed
HRL = Health Risk Limits, Established by Minnesota Department of Health
HBV = Health Based Values, Established by Minnesota Department of Health
* HBV for Total Petroleum Hydrocarbons (TPH)

Table 7
Other Contaminants Detected in Water Samples
Collected from Borings (Petroleum or Non-petroleum Derived)

Boring Number	Date Sampled	Acetone
B-5	4/15/04	<5.0
B-1A	10/07/04	<20
Trip Blank	4/15/04	<5.0
Field Blank	4/15/04	**5.9**
Lab Blank (B-12)	4/15/04	<5.0
HRL (µg/L)	--	700

Report results in µg/L. Indicate other contaminants (either petroleum or non-petroleum derived) detected in water samples collected from the borings, temporary wells or push probes.
Notes:

Table 8
Monitoring Wells Were Not Installed At This Site
Monitoring Well Completion Information

Well Number	Unique Well Number	Date Installed	Surface Elevation	Top of Riser Elevation	Bottom of Well (Elevation)	Screen Interval (Elev. - Elev.)

Notes: (location and elevation of benchmark)

Table 9
NOT APPLICABLE - Monitoring Wells Were Not Installed At This Site
Water Level Measurements in Wells

Well Number	Date Sampled	Depth of Water from Top of Riser	Product Thickness	Depth of Water Below Grade	Relative Groundwater Elevation	Water Level Above Screen (Y/N)

Describe in Appendix C, the methods and procedures used to measure water levels.
Notes:

Table 10
NOT APPLICABLE - Monitoring Wells Were Not Installed At This Site
Analytical Results of Water Samples Collected from Wells

Well #	Date Sampled	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	GRO	DRO	Lab Type
MW-1									
MW-2									
MW-3									
MW-4									
Trip Blank									
Field Blank									
Lab Blank HRL(µg/L)		10	1000	700	10000				

Report results in µg/L. Use less than symbols to show detection limit. Indicate mobile or fixed based in the lab type column.
Notes

Table 11
NOT APPLICABLE - Monitoring Wells Were Not Installed At This Site
Other Contaminants Detected in Water Samples
Collected from Wells (Petroleum or Non-petroleum Derived)

Well Number	Date Sampled	1,2 DCA	EDB
MW 1			
MW-2			
MW-3			
Field Blank			
Trip Blank			
Lab Blank			
HRL (µg/L)		4	0.004

Report results in µg/L. Indicate other contaminants (either petroleum or non-petroleum derived) detected in water samples collected from the borings, temporary wells or push probes.
Notes:

Table 12
NOT APPLICABLE - Monitoring Wells Were Not Installed At This Site
Natural Attenuation Parameters

Monitoring Well	Sample Date	Temp. °C	pH	Dissolved Oxygen (mg/L)	Nitrate (mg/L)	(Fe II) (mg/L)	(H_2S, HS^-) (mg/L)
MW-1							
MW-2							
MW-3							
MW-4							

In Appendix C, describe the methods and procedures used.
Notes:

Table 13
Properties Located Within 500 Feet of the Release Source.

# (From Map)	Property Address	Water Well (Y or N)	How Determined*	Well Use**	Public Water Supply (Y or N)	Confirmed By City (Y or N)	Basement Or Sumps (Y or N)	Possible Petroleum Sources (Y or N)	Comments (including property use)
1	2500 East Lake Street	Y	Visual	Commercial	Y	N	Unknown	Y	Target Store
2	2225 East Lake Street	N	Visual	NA	Y	N	Unknown	NA	Community Center
3	East Lake Street (West of Project Site)	N	Visual	NA	Y	N	Unknown	NA	Liquor Store

**E.g., visual observation, personal contact, telephone, returned postcard, assumed (i.e., no postcard returned).*
***E.g., domestic, industrial, municipal, livestock, lawn/gardening, irrigation.*

Table 14
Water Supply Wells Located Within 500 Feet of the Release Source and Municipal or Industrial Wells Within ½ Mile

Unique Well #	Ground Elevation	Total Depth (ft)	Base of Casing (ft)	Static Elevation	Aquifer	Use	Owner	Distance & Direction from source
201088	840	427	256	NA	Multiple*	Industrial	Unknown	500 feet east

*Notes: * Prairie du Chien and Jordan Aquifers*

Table 15
Results of Vapor Monitoring

Location # and description	Date	PID reading (ppm)	Percent of the LEL
VP-1 – Storm sewer basin	4/15/04		0
VP-2 Storm sewer basin	4/15/04		0
VP-3 – Storm sewer basin	4/15/04		0
VP-4 – Sewer manhole	4/15/04		0
VP-5 – Sewer manhole	4/15/04		0
VP-6 – Sewer manhole	4/15/04		0
VP-7 – Sewer manhole	4/15/04		0

Notes: Location numbers must match locations on the site map. Provide a brief description of the monitoring point (e.g., sump, basement corner, sanitary sewer manhole, storm sewer basin, etc.).

Section 15: Appendices

Attach the following appendices.

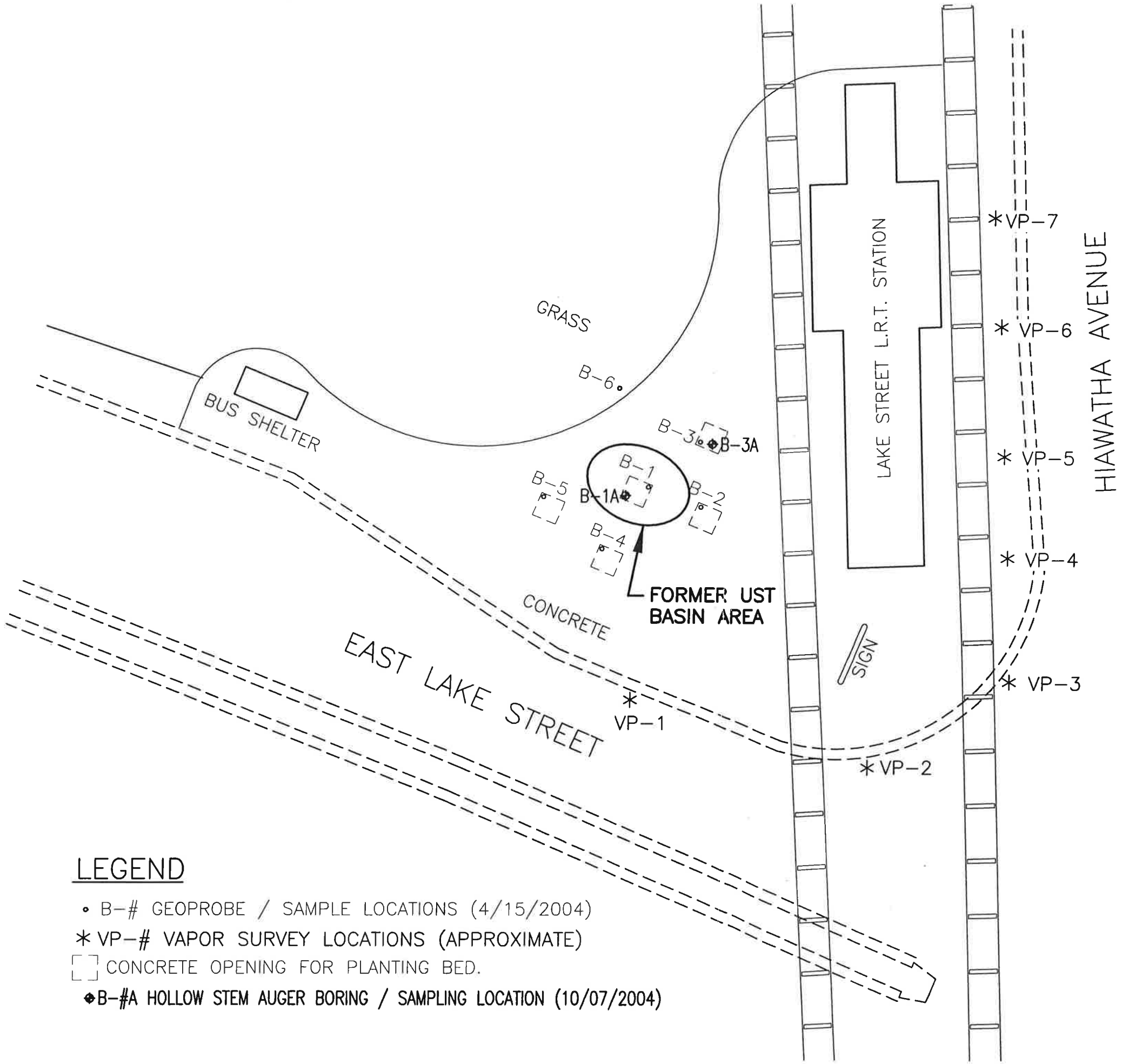
☐ *Appendix A* Excavation Report Worksheet for Petroleum Release Sites.
A fax transmittal of laboratory results for soil samples obtained below the UST is attached. The Excavation Report was not completed because the contract between the consultant and the State had expired.

☒ *Appendix B* Laboratory Analytical Reports for Soil and Ground Water. Include laboratory QA/QC data and laboratory certification number.

☒ *Appendix C* Methodologies and Procedures, Including Field Screening of Soil, Other Field Analyses, Soil Boring, Soil Sampling, Well Installation, and Water Sampling.

☒ *Appendix D* Geologic Logs of Soil Borings, Including Construction Diagrams of Temporary and Permanent Wells, and Copies of the Minnesota Department of Health Well Record.

☒ *Appendix E* Copies of Water Supply Well Logs With Legible Unique Numbers.



LEGEND

- ∘ B-# GEOPROBE / SAMPLE LOCATIONS (4/15/2004)
- * VP-# VAPOR SURVEY LOCATIONS (APPROXIMATE)
- [ ] CONCRETE OPENING FOR PLANTING BED.
- ◆B-#A HOLLOW STEM AUGER BORING / SAMPLING LOCATION (10/07/2004)

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BORING / SAMPLE LOCATION DIAGRAM
MnDOT HIAWATHA LRT LSI
HIAWATHA AVENUE / EAST LAKE STREET
MINNEAPOLIS, MINNESOTA

Drawn :	TAK	11/10/2004
Checked:	BWT	11/10/2004
Approved:	RLD	11/10/2004
PROJECT NUMBER	699552XA	
FIGURE NUMBER	2	