Twin Ports Testing Inc.
1301 N. 3rd St. • Superior WI 54880 • 715-392-7114 • 800-373-2562 • F 715-392-7163 • www.twinportstesting.com

EXCAVATION DETAILED CORRECTIVE ACTION DESIGN REPORT (EDCAD)

JUNCTION FOOD-N-FUEL SITE

HERMANTOWN, MINNESOTA

JULY, 2012 TPT# 96E-0604
LEAK # 3534

Jack Curtis
Curtis Oil Company
4985 Miller Trunk Highway
Hermantown, Minnesota 55811

CONTENTS

MPCA Standard EDCAD Form — 4 pages

EDCAD Report Text — 10 pages

Figures

Figure 1: Site Location -- USGS Quadrangle (composite)
Figure 2: Site Diagram Showing Adjacent Site Properties
Figure 3: Site Map Showing Proposed Water Line Route
Figure 4: Site Map Showing Approximate Extent of Soil Contamination
Figure 5: Site Map Showing Branch and Spur Lines and Cross-Section Traces
Figure 6: Cross-Section Elevations
Figure 7: Site Diagram Showing Proposed Private Utility Excavations

Appendices

Appendix A: Site Maps Showing Soil Boring Locations and Estimated Soil Contaminant Plume
Soil Boring Logs
Associated Tables

Appendix B: Site Maps Showing Monitoring Well Locations and Groundwater Contaminant Plume
Associated Tables

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Excavation Detailed Corrective Action Design Report (EDCAD)

Petroleum Remediation Program
Guidance Document 7-07b

Doc Type: Corrective Action Design

Instructions: Complete this report to propose a detailed corrective action design for soil excavation when completed as a complex corrective action. See Guidance Documents 3-01 *Excavation of Petroleum Contaminated Soil and Tank Removal Sampling* and 7-01 *Corrective Action Design and Implementation* for more information and requirements. Do not revise or delete any text or questions from this report form. Items may be added if they are needed to support the corrective action design. If an item is not applicable, provide a brief explanation.

MPCA Leak ID: # 3534 Report date: 25th July 2012

Responsible Party Information

Name: Curtis Oil Company Phone: 218-729-5500
Mailing address: 4995 Miller Trunk Highway
City: Hermantown State: Minnesota Zip code: 55811
Alternate contact (if any) for responsible party: Jack Curtis, President Phone: 218-729-5500

Leak Site Information

Leak site name: Junction Food-N-Fuel Phone:
Leak site address: 5493 Miller Trunk Highway
City: Hermantown MN Zip code: 55811 County: St. Louis

Consultant (or other) Information

By signing this document, I/we acknowledge that we are submitting this document on behalf of and as agents of the responsible person or volunteer for this leak site. I/we acknowledge that if information in this document is inaccurate or incomplete, it will delay the completion of remediation and may harm the environment and may result in a reduction in Petrofund reimbursement. In addition, I/we acknowledge on behalf of the responsible person or volunteer for this leak site that if this document is determined to contain a false material statement, representation, or certification, or if it omits material information, the responsible person or volunteer may be found to be in violation of Minn. Stat. § 115.075 (2007) or Minn. R. 7000.0300 (Duty of Candor), and that the responsible person or volunteer may be liable for civil penalties.

Company name: Twin Ports Testing, Inc.
Mailing address: 1301 N. 3RD Street
City: Superior State: Wisconsin Zip code: 54880
Project manager name: Jon Hinkel, P.G. Phone: 715-392-7114
Fax: 715-392-7163 E-mail: jon.hinkel@twinportstesting.com

Report Author(s)

Print name: Jon Hinkel, P.G. Title: Senior Project Manager
Signature: [signature] Date: 25th July 2012

Print name: Title:
Signature: Date:

Report Reviewer(s)

Print name: Elizabeth J Becker Title: Administrative Coordinator

Signature: Elizabeth J Becker Date: 7/26/12

Print name: _____ Title: _____

Signature: _____ Date: _____

Name of field technician(s): _____

Section 1: Site Conceptual Model Update

Include updated cumulative tables and figures from Guidance Document 4-06 *Investigation Report Form* in Appendix A. Include documentation of additional site investigation, site monitoring, and interim corrective actions in Appendix B. Also include copies of tables, figures, or other information from the focused investigation and/or pilot test if relevant to the site conceptual model or the detailed design in Appendix C.

1. Describe any additional site investigation, site monitoring, and/or interim corrective actions completed since the last submitted report.
2. Discuss the results of the additional site investigation, site monitoring, and/or interim corrective actions.
3. Provide an updated and comprehensive site conceptual model.
4. Provide recommendations for additional site investigation, site monitoring, and/or interim corrective actions to be completed prior to EDCAD approval, including their purpose and schedule for completion.

Section 2: Detailed Corrective Action Design Overview

1. If the proposed EDCAD is different than requested by the Minnesota Pollution Control Agency, identify the differences and explain why.
2. Identify the technical lead responsible for overseeing the design, implementation, and reporting of the corrective action.
3. Discuss the reason for the proposed corrective action.
4. Discuss the corrective action goal relative to the corrective action reason.
5. If interim corrective action was completed, describe how it complements the corrective action goal.
6. Describe how the corrective action will eliminate or reduce the risk.
7. Describe any proposed complementary corrective actions, including ongoing interim corrective actions, to be completed in association with the excavation.

Section 3: Target Zone

Illustrate the target zone's geometry, geology, and hydrogeology on a site map and cross sections in Section 10.

1. Identify the primary contaminant phase targeted by the excavation and describe the geometry, geology, and hydrogeology of the target zone.
2. Describe any surface or subsurface structures or conditions that could limit access to the target zone.

Section 4: Excavation Plan

Provide a site map showing the proposed areal extent and depth contours of the final excavation and cross sections showing the soil profile, groundwater elevations, contaminant distribution, target zone, and proposed extent of excavation in Section 10.

1. Describe the excavation plan.

2. Provide the estimated in-place volume (cubic yards) of clean overburden soil to be excavated.

3. Provide the estimated in-place volume (cubic yards) of petroleum-contaminated soil to be excavated for treatment.

4. Describe how contaminated soil will be differentiated and segregated from uncontaminated soil.

5. Describe field decisions that will be used to determine the final limits of the excavation.

Section 5: Waste Generation, Handling, and Disposal

Include copies of waste disposal documents, permits, and related documentation in Appendix D.

1. Provide a dewatering plan for addressing petroleum-contaminated groundwater encountered during excavation activities, including how it will be removed, handled, and disposed of. Describe any required disposal approvals or permits. If dewatering is not planned, a contingency dewatering plan must be described in the event significant volumes of petroleum-contaminated groundwater are encountered.

2. Describe how light non-aqueous phase liquid (LNAPL) encountered during excavation or dewatering activities will be recovered, handled, measured, and disposed of.

3. Describe how contaminated soil will be handled, stored, and treated or disposed of. Identify the location of the treatment/disposal facility.

4. Describe any other wastes that will be generated, the estimated waste volumes, the handling and disposal requirements, and any required discharge or disposal permits.

Section 6: Post-Excavation Soil Sampling and Monitoring

1. Describe post-excavation soil sampling to document contamination remaining in the sidewalls and bottom of the final excavation.

2. Discuss recommendations for post-excavation monitoring (e.g., groundwater, vapor), if applicable, to measure the success of the corrective action.

Section 7: Site Restoration

1. Describe how excavated overburden soil will be reused as backfill or otherwise disposed of.

2. Describe how imported clean fill will be used as backfill and where it will be placed in the excavation.

3. Describe site restoration activities.

Section 8: Schedule

1. Provide a schedule for completing major activities, including any pre-excavation activities, the excavation itself, site restoration, and submittal of Guidance Document 3-02a *Corrective Action Excavation Report*.

Section 9: Cost-Effectiveness Evaluation

Provide an updated life-cycle cost estimate in Appendix E. Include all pre-excavation, excavation, and post-excavation activities; site restoration; and reporting. Update design phase costs to reflect actual costs.

1. Summarize the updated life-cycle cost estimate below. Describe any major assumptions that were made in order to estimate costs.

Design phase (incurred costs)	
Focused investigation stage	$_____
Pilot test stage (if applicable)	$_____
EDCAD stage	$_____
Design phase subtotal	$_____

(See Report Text page 9)

Implementation phase (estimated costs)	
Pre-excavation stage	$_____
Excavation stage	$_____
Site restoration stage	$_____
Post-excavation monitoring stage	$_____
Implementation phase subtotal	$_____
Life-cycle cost estimate total	**$**_____

(See Report Text page 9)

2. Compare the updated life-cycle cost estimate to the life-cycle cost estimates provided in Guidance Document 7-02 *Conceptual Corrective Action Design Report (CCAD)* and, if applicable, in Guidance Document 7-06 *Pilot Test Report* and discuss the results of this comparison.

3. List the corrective action alternatives evaluated in the CCAD with their corresponding and, if applicable, updated life-cycle cost estimate totals. Compare the life-cycle costs of the alternatives with the updated life-cycle cost estimate of the proposed excavation.

4. Provide justification for whether the proposed excavation remains the most cost-effective alternative for achieving the corrective action goal.

Section 10: Figures

Attach new figures specific to this report in order of discussion in the text. All figures must include a north arrow, scale, and legend as applicable. Approximate scales are not acceptable. Figures required in Appendix A should not be included in this section. New figures must include those listed below. Attach additional figures as needed and list below.

☑ One or more site maps showing (as applicable):

- ✓ Structures
- ✓ Boring and well locations (including any drinking water wells on site)
- (n.a.) Suspected source(s) of LNAPL
- ✓ Locations and depths of on-site buried utilities
- (n.a.) All past and present petroleum storage tanks, piping, dispensers, and transfer areas
- (n.a.) Horizontal extent of LNAPL
- ✓ Horizontal extent of the target zone
- ✓ Areal extent and depth contours of the final excavation

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

☑ Cross sections showing the soil profile, groundwater elevations, contaminant distribution, target zone, and proposed excavation extent.

Section 11: Tables (not applicable)

Attach new tables specific to this report in order of discussion in the text. Tables required in Appendix A should not be included in this section. List all new tables below in numerical order.

Section 12: Appendices

Attach all required or applicable appendices in the following order. Indicate those appendices that are included in this report by marking the check box. All reproduced data must be legible. Attach additional appendices as needed and list below.

☑	*Appendix A*	Cumulative ✓ and updated tables ✓ and figures from Guidance Document 4-06 *Investigation Report Form*.
(n.a.) ☐	*Appendix B*	Additional site investigation, site monitoring, and interim corrective action methods and procedures and associated documentation (boring logs, sampling information forms, laboratory analytical reports, etc.).
(n.a.) ☐	*Appendix C*	Focused investigation and/or pilot test tables, figures, and other information, if applicable.
(n.a.) ☐	*Appendix D*	Waste handling and disposal documentation and required permit/approval applications and/or acquired permit/approvals.
☐	*Appendix E*	Updated life-cycle cost estimate for the proposed corrective action and, if applicable, updated life-cycle costs estimates for non-selected alternatives.

(See Report Text, page 9)

EXCAVATION DETAILED
CORRECTIVE ACTION DESIGN REPORT
(EDCAD)

JUNCTION FOOD-N-FUEL SITE

I. SITE CONCEPTUAL MODEL UPDATE

SITE IDENTIFICATION

The Junction Food-N-Fuel Site (Figures 1 and 2) involves three properties located adjacent to each other:

- The Junction Food-N-Fuel Property
  5493 Miller Trunk Highway
  Hermantown, Minnesota
  -- owned by the Curtis Oil company (the project's Responsible Party), the property is now occupied by the Casa Latte Coffee Shop. This property contains the source area of the site's petroleum impacts. The property contains eight groundwater monitoring wells (MW-1 through MW-8) and a water supply well (PW-2).

- The Radco Property
  5497 Miller Trunk Highway
  Hermantown, Minnesota
  -- now occupied by Turbo Diesel and Electric, containing one water supply well (PW-5497).

- The MMT Heating and Cooling Property
  4621 Lindahl Road
  Hermantown, Minnesota
  -- containing one water supply well (PW-4621).

LAST SUBMITTED PROJECT DATA

The site's last groundwater monitoring rounds occurred in February, July and October, 2008. In addition, an indoor air quality air survey was conducted for the Junction Food-N-Fuel building in July, 2008. The project's last submitted report was its 2008 Annual Monitoring Report, completed June 6th, 2009, which summarizes these last groundwater and air quality data for the site. No additional site investigation work, site monitoring, and / or interim corrective actions have been undertaken at the site since these dates.

No additional site investigation, site monitoring, or interim corrective actions are recommended prior to the commencement of this proposed EDCAD.

SUMMARY OF PERTINENT SITE IMPACTS

Project data pertinent to this EDCAD are limited to those of the site's soils and groundwater.

Soils:

The bulk of the site's soil's data was generated in 1992 by Twin City Testing during a soil boring investigation (Appendix A: Site Map Showing Soil Boring Locations, Soil Boring Logs and Associated Tables). Our area of current interest lies in the southwestern portion of the site's remnant soil contaminant plume. It may be noted that Oxygen Release Compound (ORC) was applied to the site as a remediation strategy in 1998. The areas of ORC injection lie at least 50 feet northeast of our present area of interest however; the ORC application on the site is thus not expected to have had a significant effect on our area.

Soils data pertinent to this project include field screening readings above 10 parts per million (ppm) petroleum-related organic vapors from boring samples collected to depths of 9 feet from the southwest portion of the remnant contaminant plume. Such results are as follows:

SB-3:	20 to 200 ppm 2' to 9' deep
MW-3:	10 to 50 ppm from 1' to 9' deep
SB-9:	10 to 30 ppm from 4' to 8½' deep
SB-11	no readings <10 ppm
SB-12:	no readings <10 ppm

Groundwater:

A full summary of the site's groundwater impact data including a site map showing the horizontal extent of the site's remnant groundwater plume and associated data tables is presented in Appendix B. In general, site's groundwater monitoring wells showing consistent (or at least relatively consistent) petroleum impacts that register above regulatory guidelines include the following:

Junction F-N-F Property

MW-1	MW-5
MW-2	MW-8
MW-3	

Two water supply wells, belonging to the neighboring Radco and MMT properties, have shown trace detections of petroleum on a rare and intermittent basis. Most of the

detections however, have included benzene in concentrations above current regulatory standards.

Radco Water Supply Well
PW-5497

MMT Water Supply Well
PW-4621

II. DETAILED CORRECTIVE ACTION DESIGN OVERVIEW

CURRENT EDCAD DESCRIPTION

Relatively recent project attention (2009) was refocused on the impacts to the site's neighboring water supply wells as the project's final targets for corrective action. The initial plan in this regard was for Curtis Oil to replace each neighboring well with a newly drilled well for each property, with each new well to be extended to greater depth than the original, and for each well to be cased through the area of strata known to contain the site's petroleum impacts.

Approvals for the initial plan were granted in 2009 by the MPCA and Petrofund. Though the plan was accepted by the agencies, the plan was not favored by one of the site's neighboring landowners. In addition, all parties involved recognized and expressed concern that the newly proposed wells might fall short of expectations and needs regarding yield and water quality.

In a more recent development (2012) the city of Hermantown chose to extend one of its municipal water supply lines from the line's present terminus, northwestward along the Highway 53 corridor to reach the highway's intersection with Route 194, the area which contains the site's two impacted water supply wells. The city's water line extension will include spur lines leading from the main water line for private connections: Spur Line #1 will serve the Radco property; Spur Line # 4 will serve the MMT property (Figure 3). Groundwork for the city's project is presently slated to begin in early August, and is expected to reach completion by mid-September, 2012.

In consideration of the city of Hermantown's eminent water line extension into the area of the site, we are withdrawing our initial plan for the well replacements, and resubmitting this new corrective action design proposal for direct connections of the site's neighboring properties to the newly available municipal line. Under our revised plan, adequate, reliable and high quality water supplies to the two neighboring properties would be guaranteed; the potential for the site's remnant contamination continuing to enter the neighboring tenants' water supplies would be eliminated.

The full scope of the revised plan, applied to each neighboring property on an individual basis, will be as follows:

- excavate a private utility trench from the newly installed municipal water line to the neighboring property building;
- install a private water line within the utility trench, disconnect the facility's plumbing from its private water supply well, complete new connections with the municipal line;
- backfill; restore surfaces;
- abandon private water supply well (optional -- the neighboring land owner may wish to retain the private well as a non-potable water source).

Due to its proximity to the site's remnant soil and groundwater contamination plumes, the private utility trench excavation for the Radco property may encounter significantly impacted soils and / or groundwater. Such soils or groundwater accumulation may require off-site disposal.

Responsibility for the field work as outlined above will be that of the Curtis Oil company. Owners of the Radco and MMT properties and their tenants will be expected to grant property access for the field work's completion. In addition, Curtis Oil will be responsible for the municipal assessment charges for each connection to the newly installed main water line.

Following the completion of the above outlined scope, as well as our follow-up reporting, we anticipate that the MPCA will grant closure to the site. The last task for the project will then be the abandonment of the site's groundwater monitoring wells.

The technical lead responsible for overseeing the design, implementation and reporting of the revised corrective action will be:

Jon Hinkel, P.G.
Twin Ports Testing, Inc.
1301 N. 3rd Street
Superior, Wisconsin 54880
715-392-7114
jon.hinkel@twinportstesting.com

III. TARGET ZONES (A TOTAL OF TWO)

The site's target zones are the site's two neighboring properties:

- The Radco Property
  5497 Miller Trunk Highway
  During the private utility trench excavation, significantly contaminated soils and / or groundwater may be encountered due to the trench's proximity to the site's remnant contaminant plumes (note Figures 4, 5 and 6). The excavation's advancement will need to be monitored for environmental impacts. Off-site disposal of impacted material may be required. No surface or subsurface structures exist in the area that would limit access to the target zone.

- The MMT Property:
  4621 Lindahl Road

  Due to its distance from the site's contaminant plumes, we do not anticipate encountering impacted material during the private utility trench excavation. No environmental monitoring is recommended during the excavation process. The excavator will be informed of the site's characteristics however, and will be instructed halt operations and to notify the project's technical lead should suspect material be encountered. No surface or subsurface structures exist in the area that would limit access to the target zone.

IV. EXCAVATION PLAN

Two excavation trenches will be excavated, each leading from the planned municipal water main to private hook-up points on the site's neighboring properties (Figure 7).

Radco Property Trench:

The Radco trench will be excavated from Spur #1 off the planned water main to the Radco property's water supply well. The trench will be extended approximately 170' and will have cross-section dimensions of approximately 3' wide x 9' deep (the trench may be excavated somewhat wider at its end points to facilitate the private line connections). The trench will cross approximately 90 feet of asphalt pavement which will need to be replaced during the site's restoration. Upon the trench's completion, a new private water line will be laid along the trench's base, with its connections made prior to the trench's backfilling.

Relative to the site's estimated remnant soil contaminant plume, the path of the Radco trench appears to lie somewhat beyond the plume's boundary, and thus may not intercept any significantly impacted soil. Due to uncertainties regarding the plume's actual boundary location and present contaminant concentrations near the area of trenching, excavation in the vicinity of the remnant plume will be monitored for petroleum hydrocarbons by an environmental technician using a portable photoionization detector (PID: equipped with a 10.6 eV lamp and calibrated to an isobutylene standard prior to field activities). Monitoring will consist of periodic collection and sealing of soil samples from the excavated material in plastic bags, an allowance of 10-minute holding time minimums for each sample, and an insertion with the PID probe into each sample bag, and a recording of each sample's headspace reading from the PID's display. Any sample areas associated with readings of 10 parts per million (ppm) or greater petroleum-related organic vapors will be separated from the trench's adjacent stockpile, transferred onto plastic sheeting, and covered with plastic sheeting for later off-site disposal. Any soils thus removed from the excavation will be replaced with uncontaminated backfill imported from off site. Contaminated soil disposal options include local landfilling (several facilities available) or soil composting at a facility in Schroeder, Minnesota. The determination of which

disposal option to use will be made based on comparative bid pricing (bids yet to be collected). For the purposes of planning, we will assume that 10 cubic yards of contaminated soil will be identified and will require disposal from the Radco property trench. Should no such soil be identified, the procedures to follow associated with the contaminated soil contingency will be cancelled.

MMT Property Trench

The MMT trench will excavated from Spur #4 off the planned water main to the MMT building's water supply inlet. The trench will be extended approximately 100' and will have cross-section dimensions of approximately 3' wide x 9' deep (the trench may be excavated somewhat wider at its end points to facilitate the private line connections). The trench will cross approximately 20 feet of asphalt pavement which will need to be replaced during the site's restoration. Upon the trench's completion, a new private water line will be laid along the trench's base, with its connections made prior to the trench's backfilling.

Relative to the site's estimated remnant soil contaminant plume, the path of the MMT trench appears to lie well beyond the plume's boundary, and is thus not expected to intercept any of the site's significantly impacted soil. No environmental monitoring is therefore planned during the MMT trench's, excavation. Should evidence of petroleum impacts be encountered by crewmen during the MMT trench's excavation such as petroleum odors or soil staining, an environmental technician will be called to the site to conduct monitoring similar to that described for the Radco trenching. Contaminated soil separation and disposal could then follow. For the purpose of planning, we will assume that no evidences of petroleum impacts will be encountered during the MMT trenching.

In general, additional follow-up procedures to be applied to both the Radco and the MMT properties will be as follows:

- The present water supply wells of each property will be disconnected from their respected facilities.
- The water supply wells will be formally abandoned and sealed by an MDH certified well driller.

V. WASTE GENERATION, HANDLING AND DISPOSAL

Potential Water Accumulations

Should groundwater or surface water enter either the Radco or the MMT excavations, such that the volume of water impedes the project's completion, the following procedures will be followed:

- A field determination will be made regarding the likelihood of petroleum impacts to accumulated water in the trench. The determination will be based on the appearance of surface sheening and petroleum odors, and also on the location of the water's accumulation relative to the known extent of the site's remnant contaminant plumes.

- Should the accumulated water appear likely to be contaminated, a water sample will be collected and analyzed for gasoline and diesel range organics (GRO & DRO) and benzene, ethylbenzene, toluene and xylenes (BTEX parameters). The analyses will be run on a 'quick-turn' basis
- Dependent upon the analyses results, a determination will be made regarding proper disposal of the accumulated water. Options include:
  - -- unregulated surface discharge for non-detection results
  - -- discharge to municipal sanitary sewer line for GRO and DRO concentrations < 10ppm, and total BTEX concentrations < 10ppm
  - -- collection by a local disposal company using a tanker pump-truck for GRO or DRO or total BTEX concentrations > 10ppm

Significant volumes of water accumulating within the trenches are not anticipated during the project's brief period of open excavations. For the purpose of planning, we will assume that any water that accumulates within the excavations does not present a problem requiring the above outlined contingencies.

Potential for Encounter with LNAPL

Throughout the site's history of environmental investigation and remediation, LNAPL does not appear to have been encountered on site. In addition, the areas planned for excavation lie beyond the currently estimated extents of the soil and groundwater contaminant plumes. In consideration of these aspects, we do not anticipate encountering LNAPL during the trench excavations.

Contaminated Soil Handling

Should portions of the site's excavated soils be determined as contaminated, (i.e. yield field screening readings of 10 ppm or higher petroleum-related organic vapors) such soils will be separated and stockpiled onto plastic sheeting, and covered with plastic sheeting for later disposal off site. Contaminated soil disposal options include local landfilling and soil composting. Facilities providing such services include:

Voyager Landfill (operated by Waste Management)
Highway 53, Canyon, Minnesota

Vonco Landfill (operated by Veit Companies)
West Duluth, Minnesota

Shamrock Landfill
Cloquet, Minnesota

Lamb's LLC Soil Composting Facility
Schroeder, Minnesota

The determination of which disposal option to use will be made based on comparative bid pricing (bids yet to be collected).

Other Waste Materials

No other waste materials are expected to be generated during the trench excavation process.

VI. POST-EXCAVATION SOIL SAMPLING AND MONITORING

No post-excavation soil sampling and monitoring is planned for the site.

VII. SITE RESTORATION

The site surfaces affected by the trench excavations consist of the following:

Radco Property:

- asphalt pavement -- approximately 90 feet of trench length
- gravel -- approximately 40 feet of trench length
- lawn grass -- approximately 40 feet of trench length

MMT Property:

- asphalt pavement -- approximately 20 feet of trench length
- gravel approximately -- approximately 60 feet of trench length
- lawn grass -- approximately 10 feet of trench length

Restoration of the site will require replacement of disturbed surface materials in a manner to match the original surface materials and their placements.

VIII. SCHEDULE

The city's new water line extension project is expected to begin August 20th and to reach completion in early October, 2012. The site's private water line installations may proceed at any time following the city's project completion in early October. The private water line installations are expected to require a maximum of one week to complete. Following completions of the private line installations, the site's two water supply wells may be abandoned and sealed, which is expected to require one day to complete. Scheduling of actual dates will follow notifications of contract awards.

IX. COST-EFFECTIVENESS EVALUATION

Beyond the Design Phase work, the project costs provided below are estimates only, based largely on our knowledge of pricing of somewhat similar projects having occurred in the recent past. More reliable pricing will become available upon the collection of competitive contractor bids for the services and materials required. In addition, the itemized tasks / estimated costs provided below follow from several assumptions stated above, namely that no soils or water accumulations will be encountered during the project's field work requiring special separation, testing, transport and disposal. Should such instances occur, all parties concerned will be notified immediately, the appropriate contingency provisions will be put into place, and the resulting additional costs will be handled through change-orders.

<u>Design Phase</u>	
EDCAD compilation by environmental consultant	$ 1945.75 (expended)
Bid solicitation, agency and concerned party update communications, scheduling, contractor coordination by environmental consultant	$ 1500.00
<u>Implementation Phase</u>	
Trench excavations, private connections to main water line, site restorations by general contractor (both Radco and MMT properties)	$ 16,000.00
Excavation monitoring and documentation by environmental consultant	$ 1000.00
Abandonment and sealing both impacted water supply wells by MDH licensed well drilling firm	$ 1200.00
City assessment charges for private connections to the new water main (both Radco and MMT properties)	$ 46,192.00
<u>Reporting Phase</u>	
Project report completion and submission to MPCA by environmental consultant	$ 2000.00
'Life Cycle' Estimated Total	**$ 69,850.00**

Of additional note, the estimated total presented above would advance the project to the point of the MPCA's reconsideration of the site for closure. Assuming that the MPCA will indeed grant closure upon our completion of the above itemized scope, the site's groundwater monitoring wells will still need to be abandoned and sealed, and a Petrofund application will need to be completed and submitted on behalf of Curtis Oil for project reimbursement. The costs of these last two task items have not been included in the estimate provided above.

As no preliminary CCAD was completed for this project, no associated 'life cycle' CCAD cost comparison to our estimate provided above is provided.

The original corrective action plan was to replace the site's two impacted water supply wells with new wells. The estimated cost associated with this original plan was approximately $53,600.00 (2009 pricing). Due to numerous concerns outlined above (Section II) as well as the fairly close proximity of the site to the city's existing water main, the original plan was questioned and the project was stalled. Though the recent alternative appears more expensive, all parties concerned are in agreement as to its advantages (namely, a guarantee of satisfactory results with no need for additional follow-up groundwater monitoring and periodic reporting) and favor it as the first choice of action.

This EDCAD report was completed 25th July 2012.

Jon Hinkel, P.G.
Senior Project Manager
Environmental Department

FIGURES

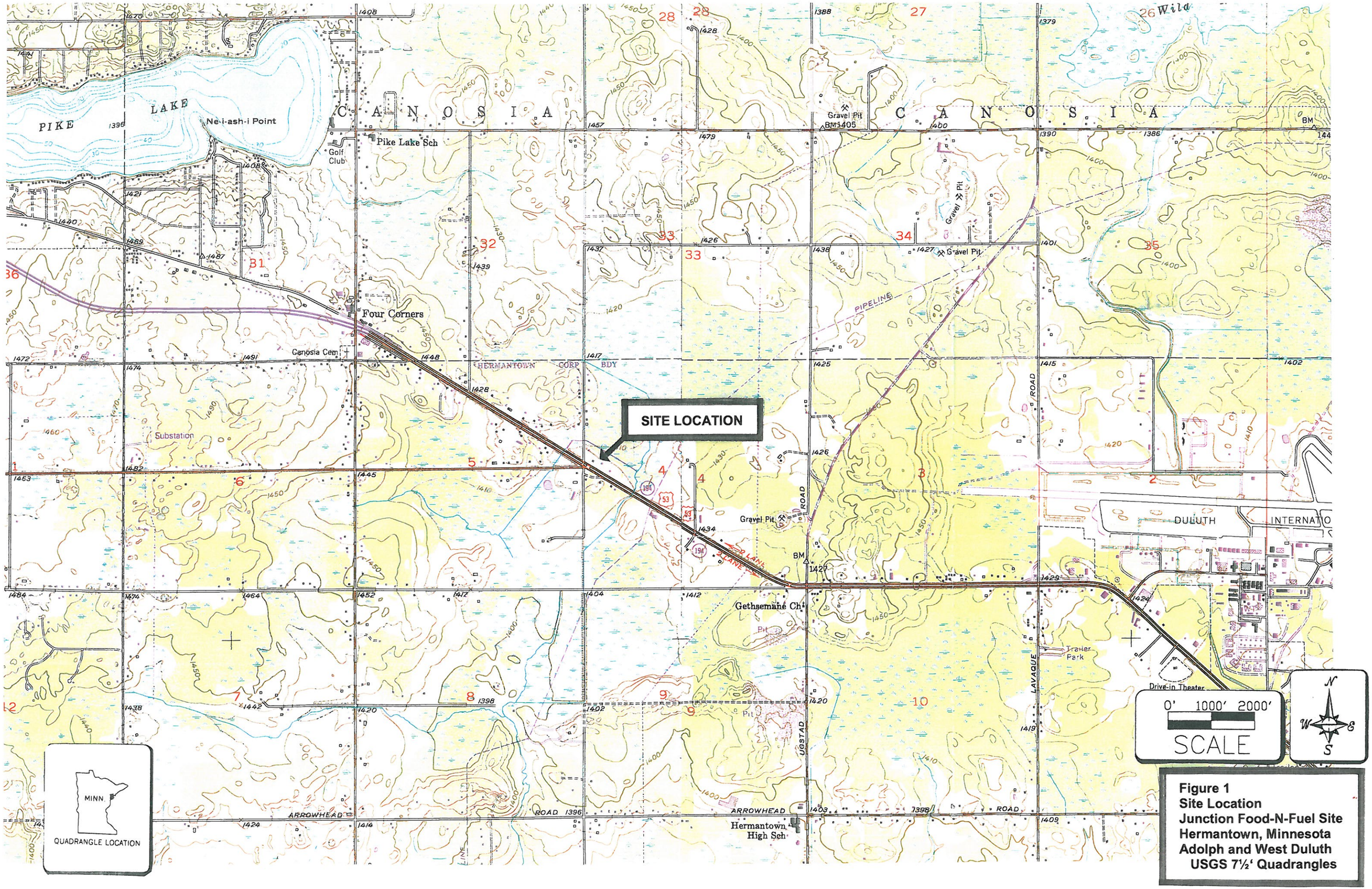
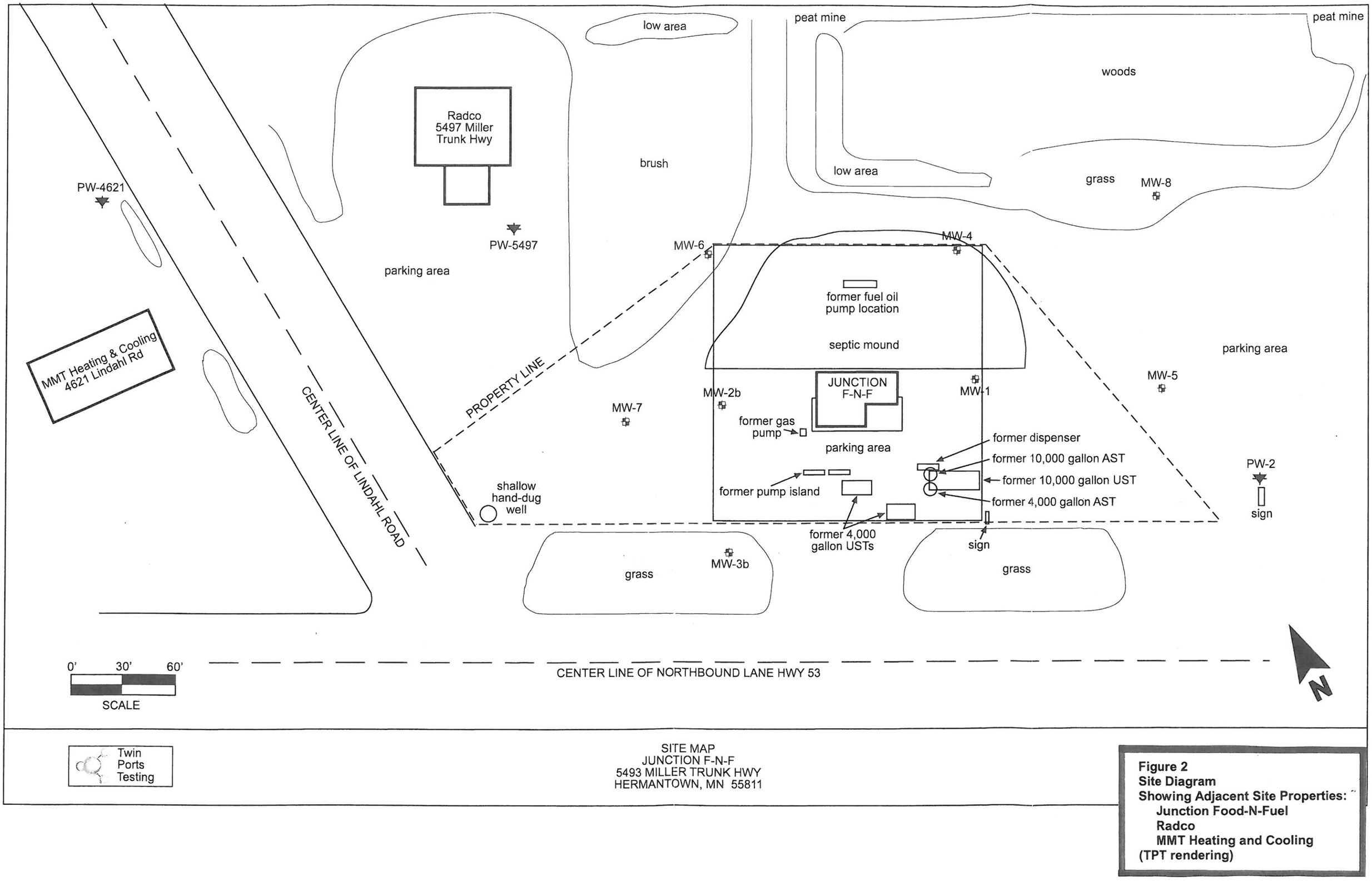


Figure 1
Site Location
Junction Food-N-Fuel Site
Hermantown, Minnesota
Adolph and West Duluth
USGS 7½' Quadrangles



Twin Ports Testing

SITE MAP
JUNCTION F-N-F
5493 MILLER TRUNK HWY
HERMANTOWN, MN 55811

Figure 2
Site Diagram
Showing Adjacent Site Properties:
Junction Food-N-Fuel
Radco
MMT Heating and Cooling
(TPT rendering)

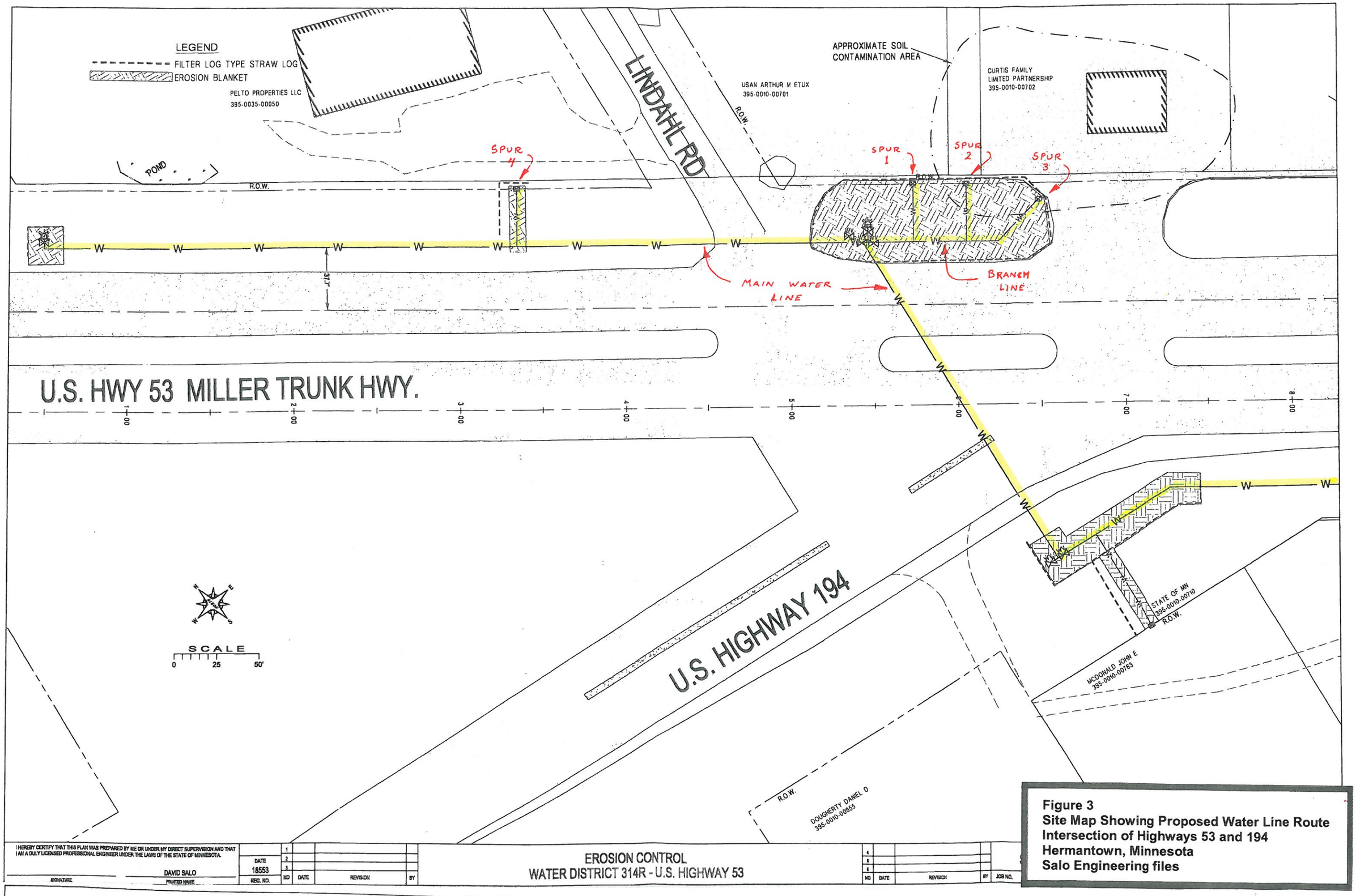
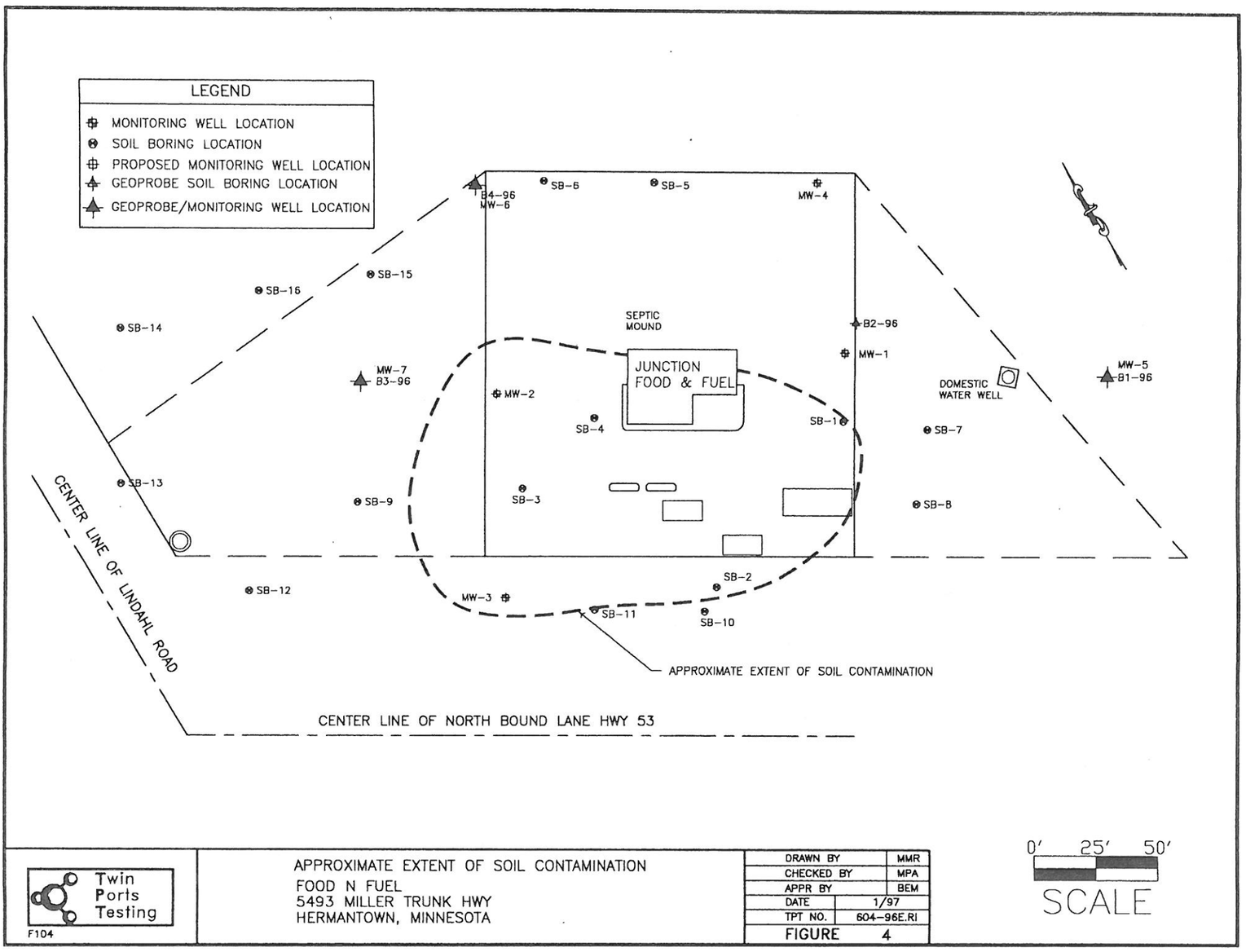


Figure 3
Site Map Showing Proposed Water Line Route
Intersection of Highways 53 and 194
Hermantown, Minnesota
Salo Engineering files



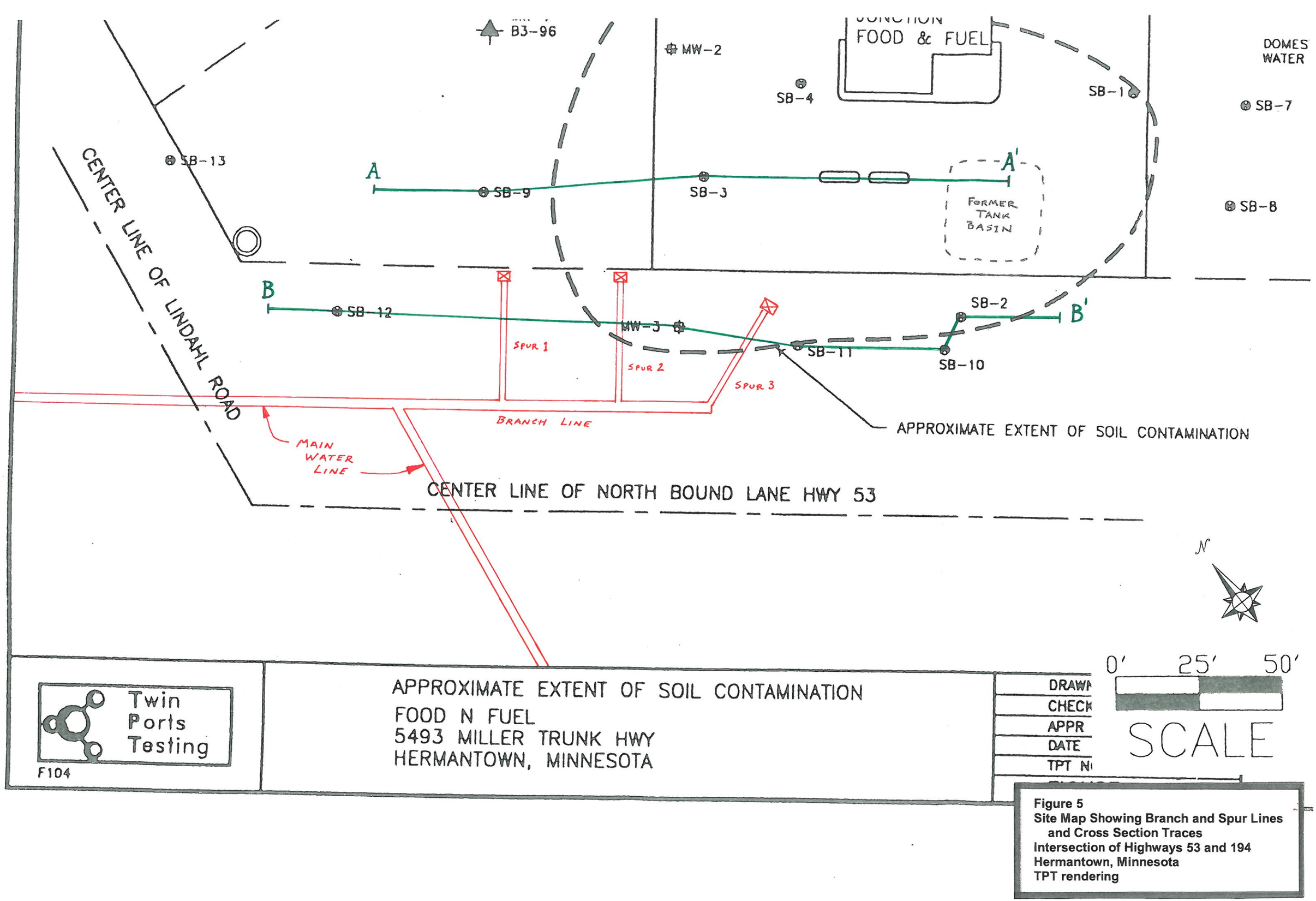
Twin Ports Testing

F104

APPROXIMATE EXTENT OF SOIL CONTAMINATION
FOOD N FUEL
5493 MILLER TRUNK HWY
HERMANTOWN, MINNESOTA

DRAWN BY	MMR
CHECKED BY	MPA
APPR BY	BEM
DATE	1/97
TPT NO.	604-96E.RI
FIGURE	4

0′ 25′ 50′
SCALE



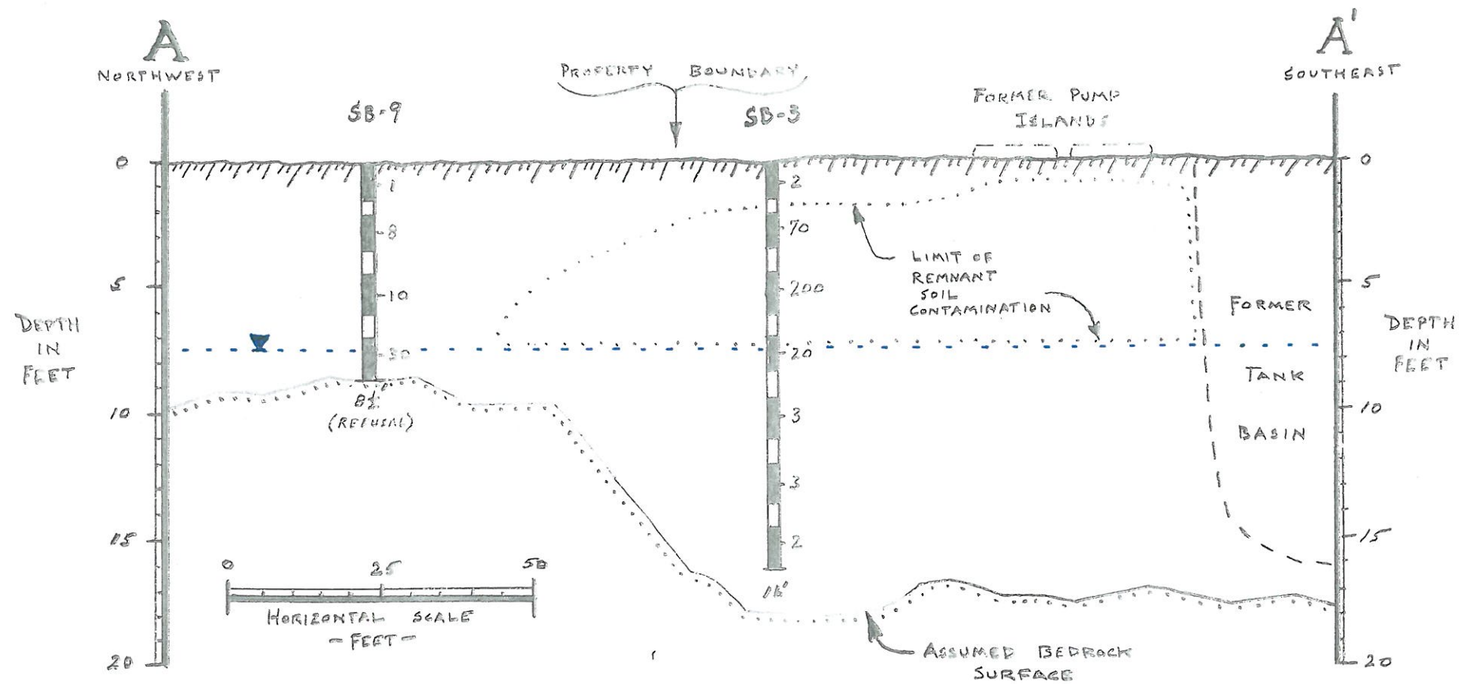
Twin Ports Testing

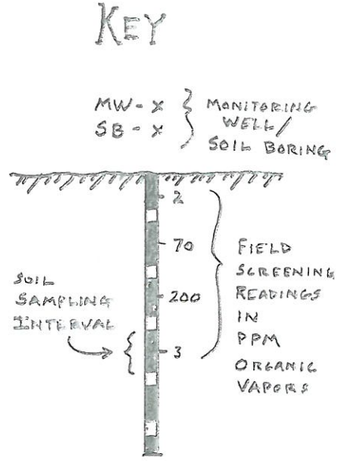
F104

APPROXIMATE EXTENT OF SOIL CONTAMINATION
FOOD N FUEL
5493 MILLER TRUNK HWY
HERMANTOWN, MINNESOTA

DRAWN
CHECK
APPR
DATE
TPT N

Figure 5
Site Map Showing Branch and Spur Lines and Cross Section Traces
Intersection of Highways 53 and 194
Hermantown, Minnesota
TPT rendering





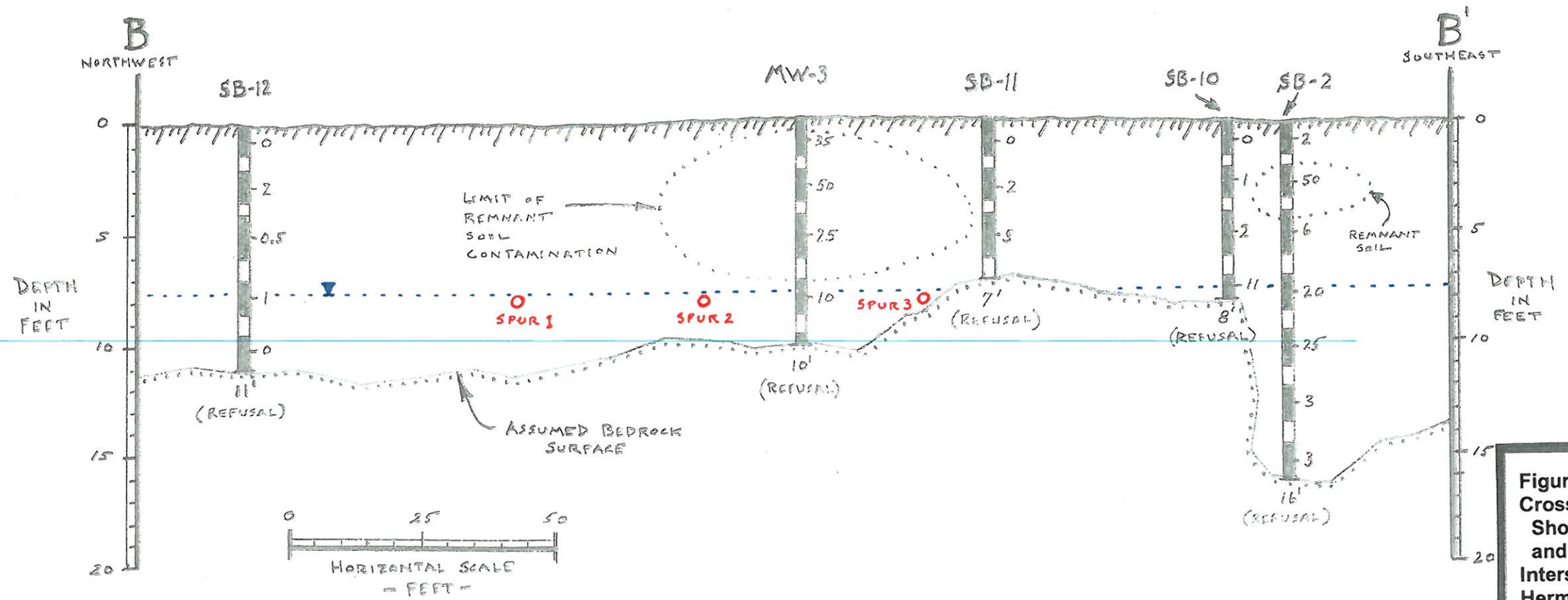


Figure 6
Cross Section Elevations
Showing Spur Line Locations
and Available Soil Impact Data
Intersection of Highways 53 and 194
Hermantown, Minnesota
TPT rendering

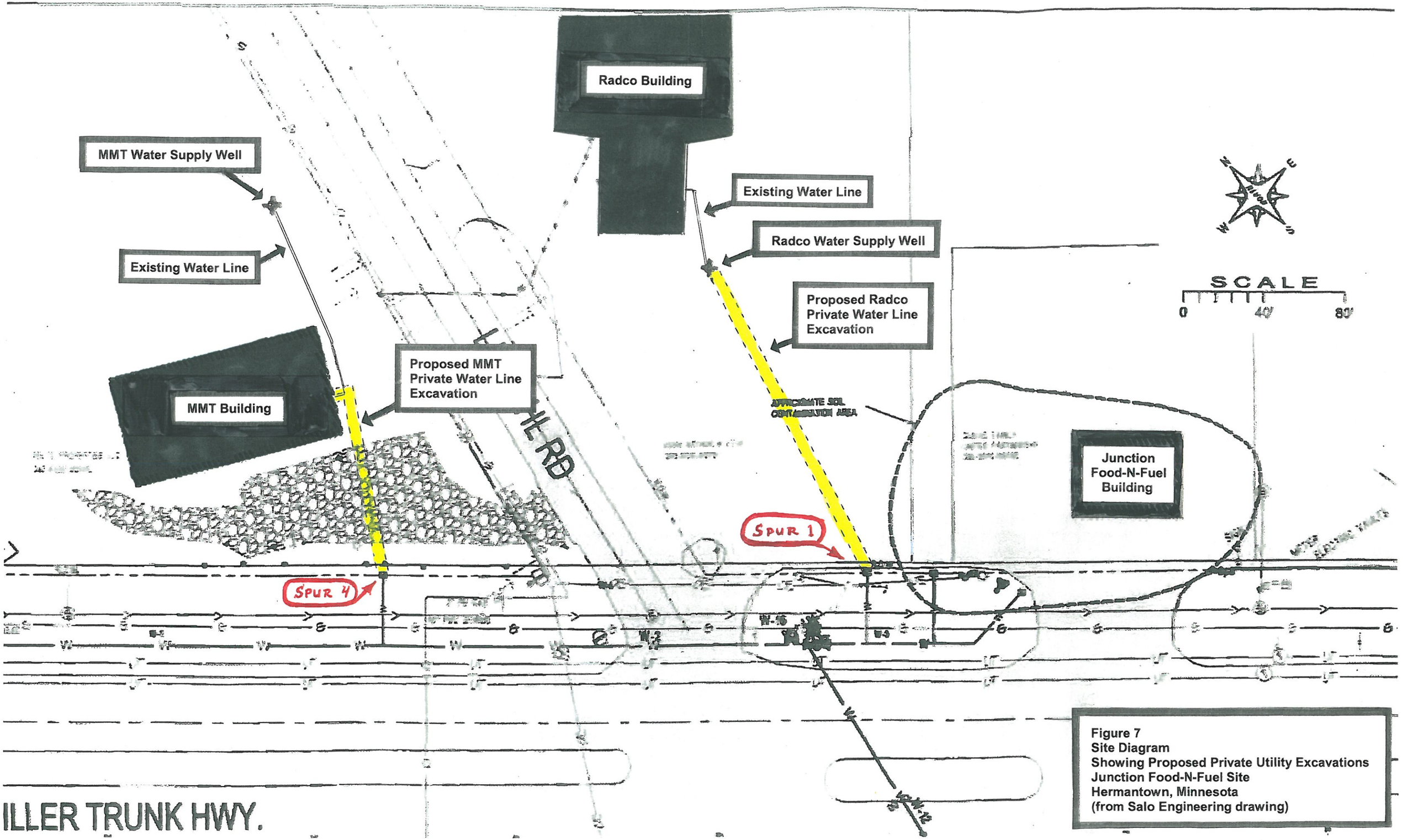


Figure 7
Site Diagram
Showing Proposed Private Utility Excavations
Junction Food-N-Fuel Site
Hermantown, Minnesota
(from Salo Engineering drawing)

APPENDICES

APPENDIX A

Site Maps Showing Soil Boring Locations
and Soil Contaminant Plume
Soil Boring Logs
Associated Tables

BY G.L.W. DATE 3-31-92 SUBJECT FOOD N FUEL SHEET NO ... OF ...
CHKD BY ... DATE ... 5493 MILLER TRUNK HWY. JOB NO 6400-92-066
HERMANTOWN, MN.

Figure #3

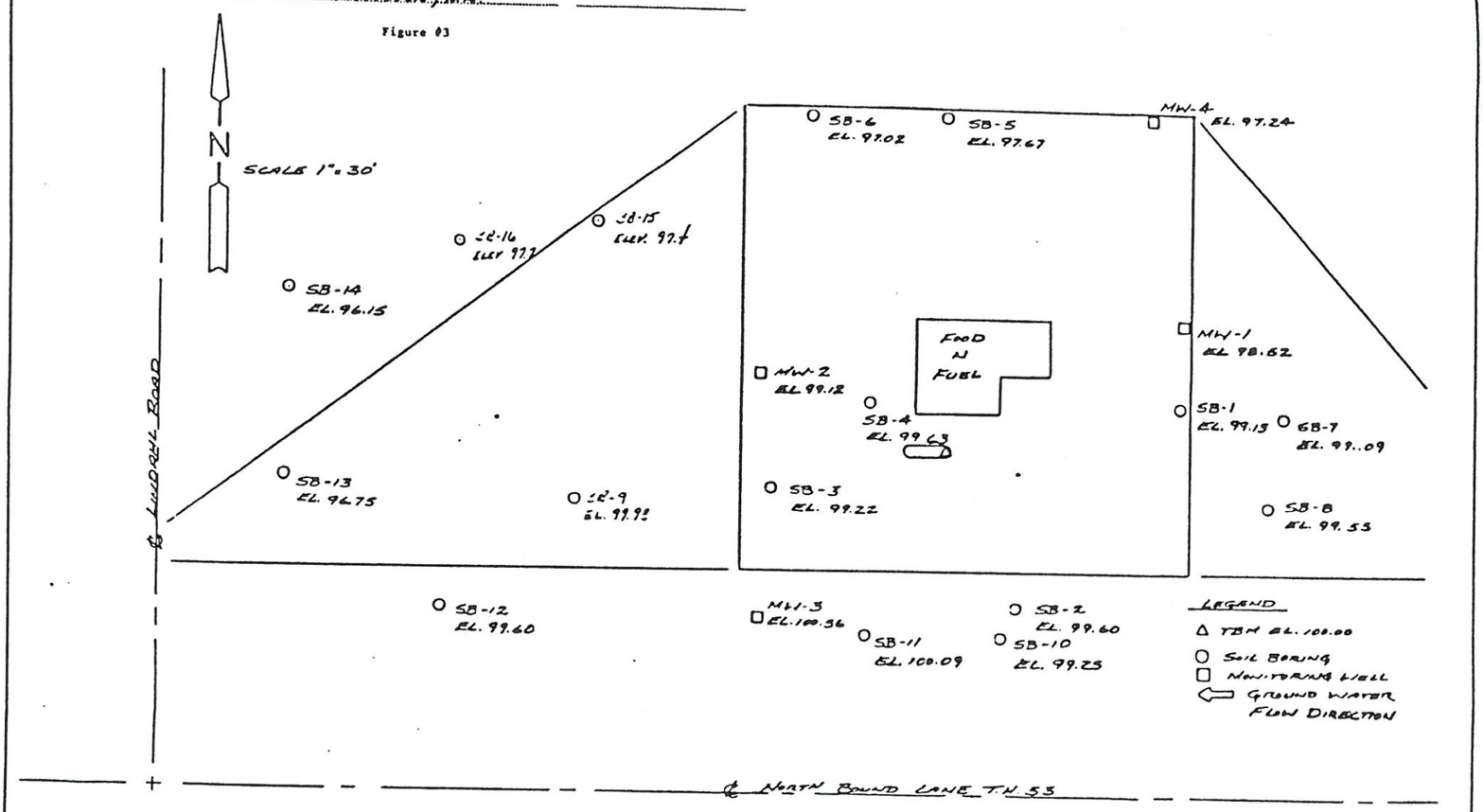
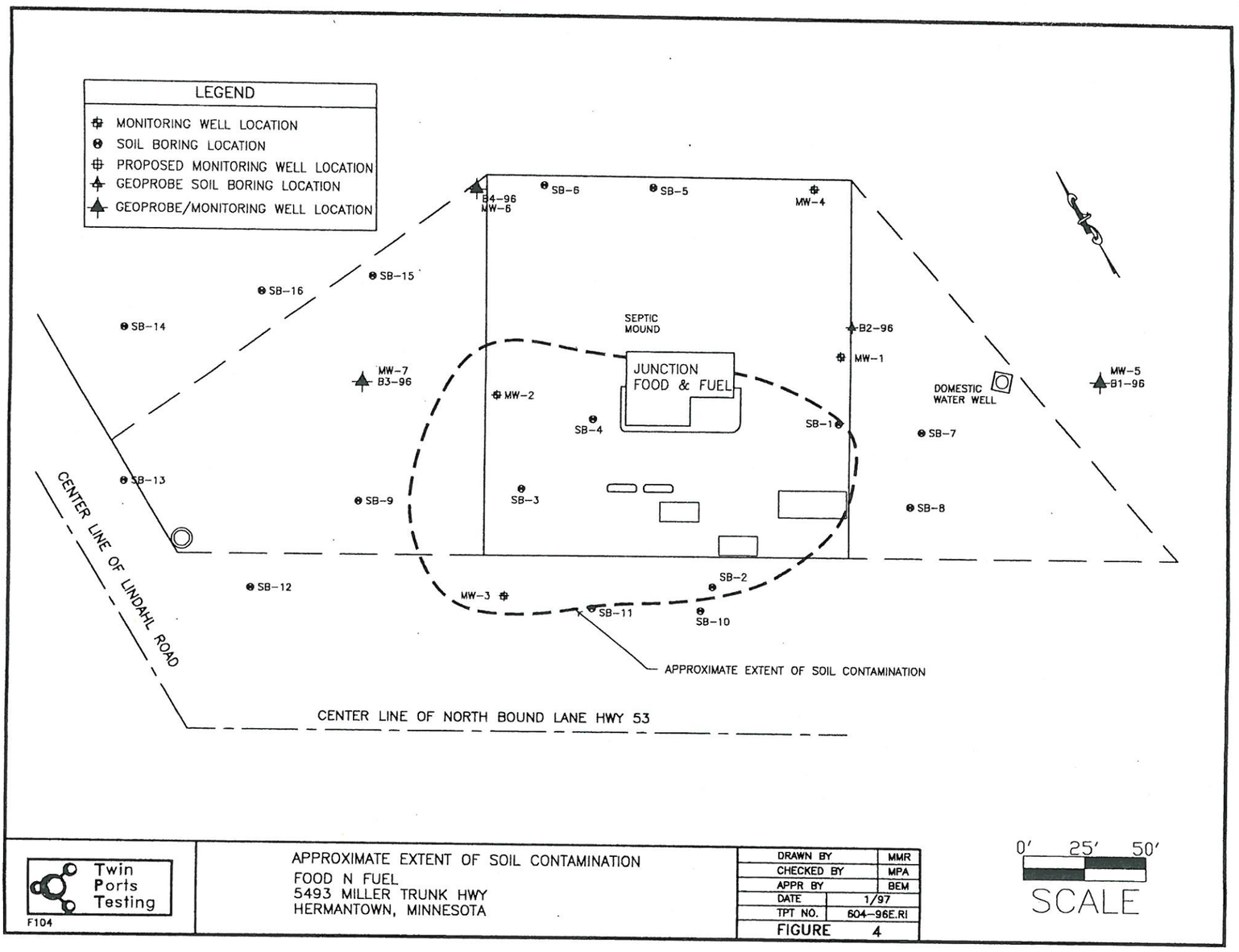


Figure #3

twin city testing corporation



Twin Ports Testing

F104

APPROXIMATE EXTENT OF SOIL CONTAMINATION
FOOD N FUEL
5493 MILLER TRUNK HWY
HERMANTOWN, MINNESOTA

DRAWN BY	MMR
CHECKED BY	MPA
APPR BY	BEM
DATE	1/97
TPT NO.	604-96E.RI
FIGURE	4

0′ 25′ 50′
SCALE

Table 1

Surface Elevations

Location	Elevation	Refusal Elevation
SB-1	99.13'	83.13
SB-2	99.60'	83.60
SB-3	99.22'	None
SB-4	99.63'	None
SB-5	97.67'	89.37
SB-6	97.02'	91.02
SB-7	99.09'	89.09
SB-8	99.55'	91.25
SB-9	99.93'	91.43
SB-10	99.25'	91.25
SB-11	100.09'	93.09
SB-12	99.60'	88.60
SB-13	96.75'	91.45
SB-14	96.15'	88.75
SB-15	97.40'	86.90
SB-16	97.70'	88.20
MW-1	98.52'	80.22
MW-2	99.12'	None
MW-3	100.56'	90.56
MW-4	97.24'	81.04

Table 2

Water Levels

Location	Depth Below Surface (ft)	Elevation
SB-1	8.2'	90.93
SB-2	7.5'	92.10
SB-3	9.8'	89.42
SB-4	13.0'	86.63
SB-5	4.2'	93.47
SB-6	4.0'	93.02
SB-7	None	--
SB-8	None	--
SB-9	7.5'	92.43
SB-10	None	--
SB-11	None	--
SB-12	8.0'	91.60
SB-13	None	--
SB-14	None	--
SB-15	8.0'	89.40
SB-16	9.3'	88.40
MW-1	5.63'	92.89
MW-2	6.13'	92.59
MW-3	7.13'	93.43
MW-4	4.17'	91.07

TOR 98.52
TOR 98.72
TOR 100.56
TOR 95.24

Table #3
Vapor Screening Results on Soil Samples

Depth	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9
0-1.5	1	2	2	30	0	0	0	0	1
2-3.5	5	50	70	30	6	3	1	1	8
4.5-6	30	6	200	17	2	5	0	2	10
7-8.5	20	20	20	30	3	--	1	1	30
9.5-11	8	25	3	16	--	--	--	--	--
12-13.5	3	3	3	12	--	--	--	--	--
14.5-16	--	3	2	1	--	--	--	--	--

Table 3 (cont)
Vapor Screening Results on Soil Samples

Depth	SB-10	SB-11	SB-12	SB-13	SB-14	SB-15	SB-16	MW-1	MW-2	MW-3	MW-4
0-1.5	0	0	0	0	0	0	0	0.8	30	35	6
2-3.5	1	2	2	0	0	0	0	0.5	50	50	1
4.5-6	2	5	0.5	0	0	2	0	0.5	130	25	5
7-8.5	11	10	1	--	0	9	0	2	150	10	1
9.5-11	--	--	0	--	--	4	--	0.8	200	--	0
12-13.5	--	--	--	--	--	--	--	0.5	25	--	--
14.5-16	--	--	--	--	--	--	--	0	3	--	--

Table 4
Chemical Analysis on Soil Samples

Food & Fuel Store
Hermantown, Minnesota
8400-92-066

Boring	Depth	Sample ID	THG	MTBE	Benzene	Toluene	Ethyl Benzene	Xylene
MW-1	14.5-16	3840	100	ND	.003	.008	.008	.055
MW-2	12-13.5	3841	1.2	ND	.027	.095	.041	.084
SB-4	7-8.5	3842	49	ND	.077	.073	.480	1.300
SB-4	12-13.5	3843	11	ND	.470	1.700	.200	1.300
SB-6	4.5-6	4391	0.013		.002	ND	ND	ND
SB-9	7-8.5	4392	18		ND	30	41	ND
SB-11	2-3.5	4393	ND		ND	ND	ND	ND
SB-12	2-3.5	4967	ND	ND	ND	ND	ND	ND
SB-13	4.5-6	4968	ND	ND	ND	ND	ND	ND
SB-14	7-8.5	4969	ND	ND	ND	ND	ND	ND
SB-15	9.5-11	5073	.500	--	.370	.019	.096	.290
SB-16	9.5-11	5074	ND	--	ND	ND	ND	ND

Table #5

Chemical Analyses of Water Samples

Well	MW-1	MW-2	MW-3	MW-4	Creek Water Sample
Sample ID	4271	4272	4273	4274	5072
THG	2.8	310	27	ND	ND
Benzene	.110	33	4.100	ND	ND
Toluene	.007	42	3.100	ND	ND
Ethyl Benzene	.078	4.3	.800	ND	ND
Xylenes	.170	17	.630	.002	ND

3.5 Ground Water Receptor

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-1

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

SURFACE ELEVATION 99.1

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly sand with gravel, fine grained, brown, medium dense to dense (SP-SM)	Fill			1	FA					
			18		2	SB					
			16		3	SB					
			15	▼	4	SB					
9.5	SILTY SAND, moist, brown, dense (SM)		26		5	SB					
12.5	SILTY SAND, water bearing, brown, dense (SM)	Glacial Till	21		6	SB					
14.5	WEATHERED ROCK	Bedrock			7	SB					
16.0	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/1	9:15	16'	14.5'			10.5'
2/1	9:45	16'	14.5'			8.2'

START 2-1-92 COMPLETE 2-1-92 @ 10:00

METHOD 3 1/4" HSA to 14.5'

CREW CHIEF P Kilpela

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-2

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 99.6)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LAB TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly sand, with gravel, fine grained, brown, medium dense (SP-SM)	Fill			1	FA					
			14		2	SB					
4.5	FILL, mostly silty sand, brown, loose (SM)		7		3	SB					
7.5	SILTY SAND, moist, brown, medium dense to very dense (SM)	Glacial Till	12	▼	4	SB					
			45		5	SB					
12.5	SILTY SAND, water bearing, brown, very dense (SM)		43		6	SB					
14.5	SAND, with gravel, water bearing, fine		17/Bounce		7	SB					

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/1	11:40	16'	14.5'			12.5'
2/1	12:00	16'	14.5'			7.5'

START 2-1-92 COMPLETE 2-1-92 @ 12:10

METHOD 3 1/4" HSA to 14.5'

CREW CHIEF P Kilpela

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-2 CONTINUED

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	grained, brown, very dense (SP-SM)										
16.0	REFUSAL										

twin city testing
corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-3

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 99.2)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly sand, with gravel, fine grained, brown, medium dense (SP-SM)	Fill			1	FA					
			9		2	SB					
4.5	SILTY SAND, with some organics, brown, loose (SM)	Topsoil	7		3	SB					
7.5	SILTY SAND, with gravel, brown, medium dense (SM)	Glacial Till	13		4	SB					
9.5	SILTY SAND, moist to wet, brown, dense (SM)		17	▼	5	SB					
			27		6	SB					
14.5	SILTY SAND, with gravel, brown, very		35		7	SB					

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/3	11:30	16'				13.5'
2/3	2:15	16'				9.8'

START 2-3-92 COMPLETE 2-3-92 @ 11:30

METHOD 3 1/4" HSA to 14.5'

CREW CHIEF P Kilpela

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-3 CONTINUED

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	dense (SM)										
16.0	END OF BORING										

twin city testing
corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-4

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 99.6)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly sand, with gravel, fine grained, brown, loose (SP-SM)	Fill			1	SB					
			8		2	SB					
4.5	SILTY SAND, with gravel, trace organics, brown, medium dense (SM)		11		3	SB					
			10		4	SB					
9.5	SILTY SAND, with gravel, moist, brown, dense to very dense (SM)	Glacial Till	16		5	SB					
			35	▼	6	SB					
			23		7	SB					

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/3	1:30	16'				13'

START 2-3-92 COMPLETE 2-3-92 @ 2:00

METHOD 3 1/4" HSA to 14.5'

CREW CHIEF P Kilpela

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-4 CONTINUED

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
16.0	END OF BORING										

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-5

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 97.7)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, sand, little gravel, brown, medium dense (SP)	Fill			1	SB					
			12		2	SB					
4.0	PEAT, black, soft (PT)	Swamp Deposits	2		3	SB					
			4		4	SB					
8.3	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/25	1:10	8.2	8.3	8.3		None
2/25	1:27	8.2	8.3	8.0		None
2/26	3:30	8.2	8.3	7.5		4.2'

START 2-25-92 COMPLETE 2-26-92 @ 1:00

METHOD 3 1/4" HSA to 8.3'

CREW CHIEF D Dallman

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-6

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 97.0)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly sand, very loose, moist, brown (SP)	Fill	3		1	SB					
4.0	PEAT, black, soft (PT)	Swamp Deposits	2	▼	2	SB					
6.0	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/26	3:07	6'		5.5'		4'
2/26	3:11	6'		4.3'		4'

START 2-26-92 COMPLETE 2-26-92 @ 3:06

METHOD 3 1/4" HSA to 4'

CREW CHIEF D Dallman

twin city testing
corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-7

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 99.1)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly sand, with gravel, fine grained, brown (SP-SM)	Fill			1	FA					
			17		2	SB					
			15		3	SB					
7.0	SILTY SAND, moist, brown, dense (SM)	Glacial Till	20		4	SB					
10.0	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/28		10'				None

START 2-28-92 COMPLETE 2-28-92 @ 8:45

METHOD 3 1/4" HSA to 2'

CREW CHIEF D Dallman

twin city testing
corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-8

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 99.6)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly sand, with gravel, fine grained, brown (SP-SM)	Fill			1	FA					
2.5	SANDY CLAY, with gravel, rather stiff, brown (CL)	Glacial Till	60		2	SB					
4.5	SANDY CLAY, with gravel, medium stiff, brown (CL)		22		3	SB					
8.3	REFUSAL		21		4	SB					

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/28		8.3'				None

START 2-28-92 COMPLETE 2-28-92 @ 9:15

METHOD 3 1/4" HSA to 6.3'

CREW CHIEF D Dallman

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-9

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 99.9)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LAB TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly sand, with gravel, fine grained, brown (SP-SM)	Fill			1	SB					
					2	SB					
4.5	SILTY SAND, with gravel, fine grained, medium dense to soft, brown (SM)	Glacial Till	12		3	SB					
7.0	SILTY SAND, with some gravel, fine grained, wet, medium dense, brown (SM)		18	▼	4	SB					
8.5	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/28	10:00	8 1/2'				7.5'

START 2-28-92 COMPLETE 2-28-92 @ 10:05

METHOD 3 1/2" HSA to 7.5'

CREW CHIEF D Dallman

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-10

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 99.3)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly silty sand, with gravel, fine grained, brown, medium dense (SP-SM)	Fill			1	SB					
			14		2	SB					
			16		3	SB					
8.0	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/28		8'				None

START 2-28-92 COMPLETE 2-28-92 @ 11:45

METHOD 3 1/4" HSA to 4'

CREW CHIEF D Dallman

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-11

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 100.1)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	qu or RQD
	FILL, mostly sand, with gravel, fine grained, brown (SP-SM)	Fill			1	FA					
2.0	SILTY SAND, with gravel, fine grained, dense, brown (SP-SM)	Glacial Till	30		2	SB					
			26		3	SB					
7.0	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/28		7'				None

START 2-28-92 COMPLETE 2-28-92 @ 12:10

METHOD 3 1/4" HSA to 2.5'

CREW CHIEF D Dallman

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-12

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 99.6)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	SILTY SAND, with a little gravel, loose to dense, brown, moist to wet (SM)	Glacial Till			1	SB					
			6		2	SB					
			10		3	SB					
			24	▼	4	SB					
			28		5	SB					
11.0	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
3/30	12:46	11'	None	10'		9'
3/30	2:10	11'	None	8'		7.6'

START 3-30-92 COMPLETE 3-30-92 @ 12:45

METHOD 3 1/4" HSA to 11'

CREW CHIEF D Dallman

twin city testing
corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-13

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 96.8)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LAB TESTS W	D	LL	PL	Qu or RQD
	SILTY SAND, with a little gravel, brown, moist, very loose (SM)	Glacial Till	8		1	SB					
					2	SB					
4.0	WEATHERED ROCK		.2/25		3	SB					
5.3	REFUSAL										

WATER LEVEL MEASUREMENTS						
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL

START 3-30-92 COMPLETE 3-30-92 @ 2:00

METHOD 3 1/4" HSA to 5.3'

CREW CHIEF D Dallman

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-14

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 96.2)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly gravel, sand, peat, with silt, brown to black, organics very dense	Fill	43		1	SB					
					2	SB					
4.0	SILTY SAND, trace of gravel, some clayey sand, brown, very loose to very dense (SM-SC)	Glacial Till	4		3	SB					
7.4	REFUSAL		bounce		4	SB					

WATER LEVEL MEASUREMENTS						
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL

START 3-30-92 COMPLETE 3-30-92 @ 2:35

METHOD 3 1/4" HSA to 7.4'

CREW CHIEF D Dallman

twin city testing
corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-15

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 97.4)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly silty sand with a little gravel, brown, moist, medium dense to dense				1	SB					
2.0	GRAVEL, coarse grained, medium dense (GP)	Fill	11		2	SB					
4.0	PEAT, black, medium dense (PT)		7		3	SB					
5.0	CLAY WITH SILT, grey, medium dense (CL)	Swamp Deposits									
7.0	SILT WITH SAND, brown, wet, loose to medium dense (SW-SP)		9	▼	4	SB					
		Glacial Till	7		5	SB					
10.5	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
4/6	10:17	10.5'	9'	10.5'		8.4'
4/6	10:21	10.5'	None	9'		8'

START 4-6-92 COMPLETE 4-6-92 @ 10:16

METHOD 3 1/4" HSA to 9'

CREW CHIEF D Dallman

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. SB-16

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL — SURFACE ELEVATION 97.7	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly silty sand with a little gravel, brown, moist, medium dense	Fill	9		1	SB					
					2	SB					
4.0	SILTY CLAY, brown, loose (CL)		6		3	SB					
7.0	SILTY SAND WITH A LITTLE GRAVEL, brown, moist to wet, dense	Glacial Till	28		4	SB					
9.5	REFUSAL		28	▼	5	SB					

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
4/6	12:00	9.5'	9'			9.3'

START 4-6-92 COMPLETE 4-6-92 @ 12:07

METHOD 3 1/4" HSA to 9'

CREW CHIEF D Dallman

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. MW-1

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 98.5)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LAB TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly sand, with gravel, fine grained, brown, loose (SP-SM)				1	FA					
			8		2	SB					
4.5	FILL, mostly sand, moist, brown, medium dense (SP-SM)	Fill	9		3	SB					
			10		4	SB					
9.5	SILTY SAND, with gravel, moist, brown, medium dense (SM)		11	▼	5	SB					
12.5	SILTY SAND, wet, brown, dense (SM)	Glacial Till	16		6	SB					
			24		7	SB					
18.3	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
1/31	1:30	16'	14.5'			14'
1/31	1:50	16'	18.5'			10'

START 1-31-92 COMPLETE 1-31-92 @ 3:00

METHOD 4 1/4" HSA to 18.4'

CREW CHIEF P Kilpela

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. MW-2

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 99.1)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	SAND, with gravel, fine grained, brown, medium dense (SP-SM)				1	SB					
			12		2	SB					
4.5	SILTY SAND, with gravel, brown, medium dense (SM)		12		3	SB					
		Glacial Till	9		4	SB					
9.5	SILTY SAND, with cobbles, moist, brown, very dense (SM)		45		5	SB					
12.5	SILTY SAND, with gravel, water bearing, brown, very dense (SM)		47		6	SB					
					7	SB					
16.0	END OF BORING										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/1	2:40	16'	16.5'			16.3'

START 2-1-92 COMPLETE 2-1-92 @ 2:50

METHOD 4 1/4" HSA to 16.5'

CREW CHIEF P Kilpela

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. MW-3

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 100.6)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL	PL	Qu or RQD
	FILL, mostly sand, with gravel, some organics, brown, loose (SP-SM)	Fill			1	SB					
			7		2	SB					
4.5	SILTY SAND, with gravel, brown, medium dense to very dense (SM)	Glacial Till	10		3	SB					
			13		4	SB					
10.0	REFUSAL		45		5	SB					

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/3		10'				8'

START 2-3-92 COMPLETE 2-3-92

METHOD @

CREW CHIEF P Kilpela

twin city testing
corporation

LOG OF TEST BORING

JOB NO. 8400-92-066 VERTICAL SCALE 1" = 2' BORING NO. MW-4

PROJECT MILLER TRUNK FOOD & FUEL - DULUTH MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 97.2)	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE NO.	SAMPLE TYPE	LAB TESTS W	D	LL	PL	Qu or RQD
	FILL, sand, little gravel, moist, loose, brown (SP)	Fill	7		1	FA					
					2	SB					
3.8	PEAT, soft, brown-black (PT)	Swamp Deposits	2		3	SB					
			7	▼	4	SB					
8.5											
9.0	ORGANIC SILT, wet, brown (OL)										
	SILT, brown, soft to medium (ML)		3		5	SB					
			7		6	SB					
			6		7	SB					
16.2	REFUSAL										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
2/25	3:20	9'	7'	9'		6.5'

START 2-25-92 COMPLETE 2-25-92 @ 10:10

METHOD 4 1/4" HSA to 9'

CREW CHIEF D Dallman

twin city testing
corporation

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 2/1/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID SB-1 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	1		0-20	
S-2	2-3.5	2		0-20	
S-3	4.5-6	30		0-200	
S-4	7-8.5	20	50	0-200	
S-5	9.5-11	8		0-20	
S-6	12-13.5	3		0-20	Water Table

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 2/1/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0.2 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID SB-2 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	2		0-20	
S-2	2-3.5	5		0-20	
S-3	4.5-6	6		0-20	
S-4	7-8.5	20		0-200	
S-5	9.5-11	25		0-200	
S-6	12-13.5	3		0-20	Water Table
S-7	14.5-16	3		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 2/3/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0.5 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID SB-3 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	2		0-20	
S-2	2-3.5	70		0-200	
S-3	4.5-6	200		0-2000	
S-4	7-8.5	20		0-200	
S-5	9.5-11	3		0-20	
S-6	12-13.5	3		0-20	Water Table
S-7	14.5-16	2		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 2/3/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 1.0 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID SB-4 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	30		0-200	
S-2	2-3.5	30		0-200	
S-3	4.5-6	17		0-20	
S-4	7-8.5	30		0-200	
S-5	9.5-11	16		0-20	
S-6	12-13.5	12		0-20	Water Table
S-7	14.5-16	1		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

Project MILLER TRUNK FOOD & FUEL Date _____

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) 0 ppm

Background Reading Location Lab

Note Possible Interferences None

Soil Boring ID SB-5 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	0		0-20	
S-2	2-3.5	6		0-20	
S-3	4.5-6	2		0-20	
S-4	7.5-9	3		0-20	

Comments: _____

Form completed by: D Dallman Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) ppm

Background Reading Location Lab

Note Possible Interferences None

Soil Boring ID SB-6 Other

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	0		0-20	
S-2	2-3.5	3		0-20	
S-3	4.5-6	5		0-20	Water Table

Comments:

Form completed by: D Dallman Reviewed by:

Project MILLER TRUNK FOOD & FUEL Date 2/28/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID SB-7 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	0		0-20	
S-2	2-3.5	1		0-20	
S-3	4.5-6	0		0-20	
S-4	7-8.5	1		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 2/28/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID SB-8 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	0		0-20	
S-2	2.5-4	1		0-20	
S-3	4.5-6	2		0-20	
S-4	7-8.5	1		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 2/28/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID SB-9 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-2	1		0-20	
S-2	2.5-4	8		0-20	
S-3	4.5-6	10		0-20	
S-4	7.5-9	30		0-200	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 2/28/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID SB-10 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-2	0		0-20	
S-2	2.5-4	1		0-20	
S-3	4.5-6	2		0-20	
S-4	7-8.5	11		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 2/28/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID SB-11 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	0		0-20	
S-2	2-3.5	2		0-20	
S-3	4.5-6	5		0-20	
S-4	7-8.5	10		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 3/30/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 3/30/92 Lamp 10.2 eV

Background Reading (pre) _____ ppm (post) _____ ppm

Background Reading Location Lab

Note Possible Interferences None

Soil Boring ID SB-12 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5'	0		0-20	
S-2	2-3.5'	0		0-20	
S-3	4-5.5'	0.5		0-20	
S-4	7-8.5'	1		0-20	
S-5	9.5-10.5	0		0-20	

Comments: _____

Form completed by: D Dallman Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 3/30/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 3/30/92 Lamp 10.2 eV

Background Reading (pre) _____ ppm (post) _____ ppm

Background Reading Location Lab

Note Possible Interferences None

Soil Boring ID SB-13 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5'	0		0-20	
S-2	2-3.5'	0		0-20	
S-3	4-5.3'	0		0-20	

Comments: _____

Form completed by: D Dallman Reviewed by: _____

Project MILLER TRUNK FOOD & FUEL Date 3/30/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 3/30/92 Lamp 10.2 eV

Background Reading (pre) _____ ppm (post) _____ ppm

Background Reading Location Lab

Note Possible Interferences None

Soil Boring ID SB-14 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5'	0		0-20	
S-2	2-3.5'	0		0-20	
S-3	4-5.5'	0		0-20	
S-4	7-7.4'	0		0-20	

Comments: _____

Form completed by: D Dallman Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date _____

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 4/6/92 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) PI 101 ppm

Background Reading Location Lab

Note Possible Interferences None

Soil Boring ID SB-15 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	0		0-20	
S-2	2-3.5	0		0-20	
S-3	4.5-6	2		0-20	
S-4	7-8.5	9		0-20	
S-5	9-10.5	4		0-20	

Comments: _____

Form completed by: D Dallman Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date _____

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 4/6/92 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) PI 101 ppm

Background Reading Location Lab

Note Possible Interferences None

Soil Boring ID SB-16 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	0		0-20	
S-2	2-3.5'	0		0-20	
S-3	4.5-6'	0		0-20	
S-4	7-8.5'	0		0-20	

Comments: _____

Form completed by: D Dallman Reviewed by: _____

Project MILLER TRUNK FOOD & FUEL Date 1/31/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID MW-1 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	0.8		0-20	
S-2	2-3.5	0.5		0-20	
S-3	4.5-6	0.5		0-20	
S-4	7-8.5	2.0		0-20	
S-5	9.5-11	0.8		0-20	
S-6	12-13.5	0.5		0-20	Water Table
S-7	14.5-16	0		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

Project MILLER TRUNK FOOD & FUEL Date 2/1/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID MW-2 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	30		0-200	
S-2	2-3.5	50		0-200	
S-3	4.5-6	130		0-200	
S-4	7-8.5	150		0-200	
S-5	9.5-11	200		0-2000	
S-6	12-13.5	25		0-200	Water Table
S-7	14.5-16	3		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date 2/3/92

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) _____ ppm

Background Reading Location Pickup truck cab

Note Possible Interferences Pickup truck & drill rig, gas station

Soil Boring ID MW-3 Other _____

Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	0-1.5	35		0-200	
S-2	2-3.5	50		0-200	
S-3	4.5-6	25		0-200	
S-4	7-8.5	10		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

HNU LOG

Project MILLER TRUNK FOOD & FUEL Date _____

Location DULUTH, MINNESOTA WO# 8400-92-066

Calibration Date 10/30/91 Lamp 10.2 eV

Background Reading (pre) 0 ppm (post) _____ ppm

Background Reading Location Lab

Note Possible Interferences None

Soil Boring ID MW-4 Other _____

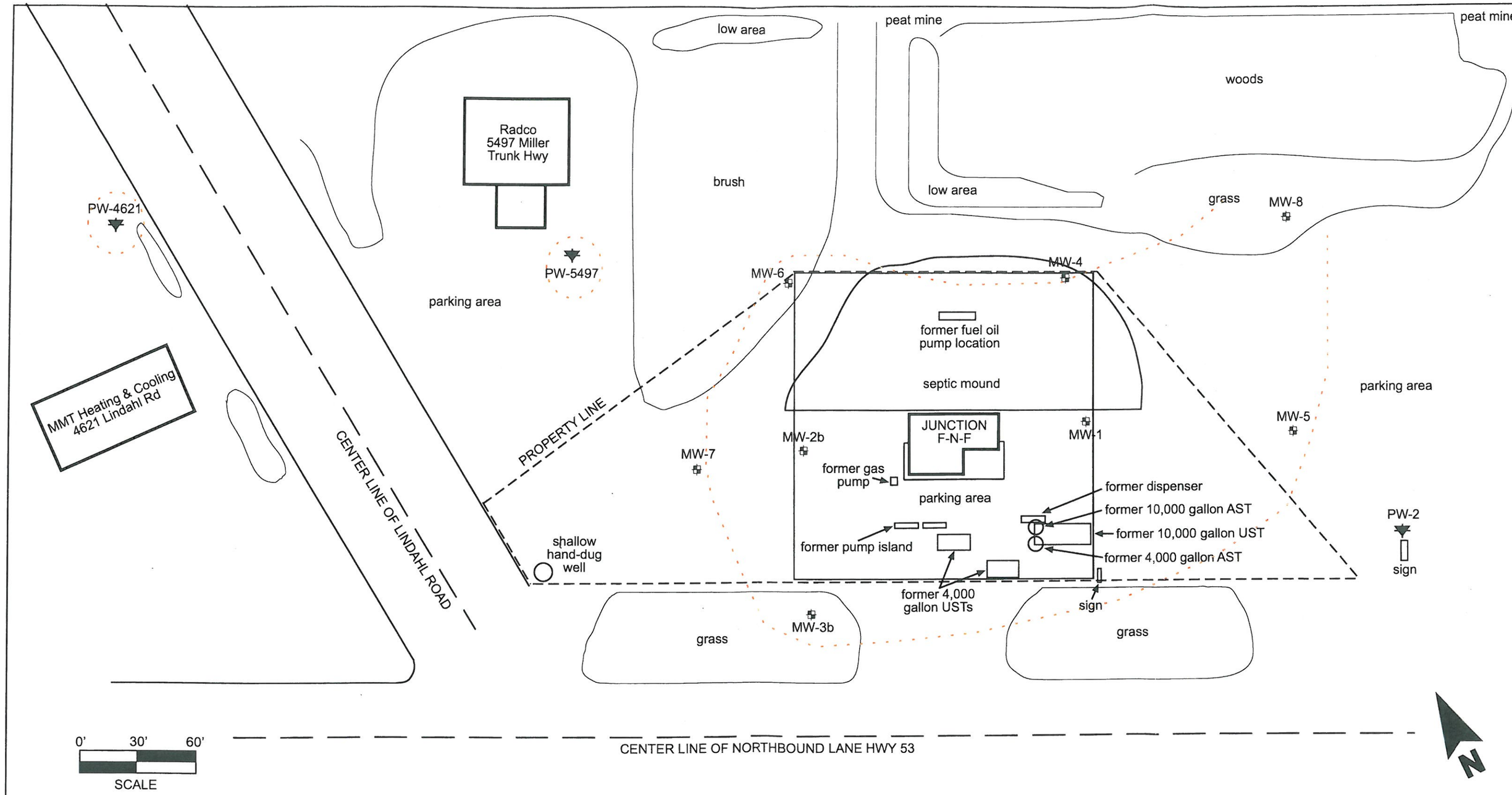
Sample ID	Depth Below Surface (feet)	Stable (ppm)	High Peak (ppm)	Inst. Scale	Notes
S-1	2-3.8	6		0-20	
S-2	3.8-4	1		0-20	
S-3	4-6	5		0-20	
S-4	7-8.5	1		0-20	
S-5	8.5-9	0		0-20	

Comments: _____

Form completed by: M Hamlin Reviewed by: _____

APPENDIX B

Site Map Showing Monitoring Well Locations and Groundwater Contaminant Plume Associated Tables



Twin Ports Testing

APPROXIMATE EXTENT OF GROUNDWATER CONTAMINATION
JUNCTION F-N-F
5493 MILLER TRUNK HWY
HERMANTOWN, MN 55811

Figure 7

Table 11 - Analytical Results of Water Samples Collected from Wells
Junction Food-N-Fuel, MPCA Leak #3534

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		**10**	**1,000**	**700**	**10,000**	--	--	--	--
MW-1	3/3/1992	**110**	7	78	170		2,800		
MW-1	5/7/1992	**3,700**	**3,100**	500	4,300		22,000		
MW-1	8/19/1992	**6,700**	**5,400**	**1,400**	8,800		89,000		
MW-1	12/21/1992	**5,600**	**1,800**	470	6,500		26,000		
2/93-2/96									
MW-1	3/11/1996	**7,600**	880	**1,500**	**10,000**		34,000		
MW-1	6/27/1996	**7,600**	**2,900**	**1,300**	**14,000**		44,000		
MW-1	9/30/1996	**8,700**	**4,800**	**1,900**	**14,000**		43,000		
MW-1	4/14/1997	**70**	26	18	140	<5	400		
MW-1	9/19/1997	**4,400**	**1,430**	**994**	6,740	<250	21,800		
MW-1	12/17/1997	**5,700**	**1,200**	**1,200**	8,000		27,000		
MW-1	3/24/1998	**3,300**	970	**820**	5,700	<20	21,000		
MW-1	7/1/1998	**3,100**	**1,100**	**840**	6,200	<20	18,000		
MW-1	10/6/1998	**3,800**	850	**940**	6,800		21,000		
MW-1	1/26/1999	**6,800**	**2,500**	**1,500**	9,600	<50	36,000		
MW-1	10/26/1999	**3,200**	420	600	4,120	<25	15,000		
MW-1	3/7/2000	**1,400**	100	390	2,080		7,200		
MW-1	9/5/2000	**2,100**	**15,000**	**1,800**	**12,800**	<130	48,000		
MW-1	12/27/2000	**2,900**	900	**1,100**	8,900	<25	26,000		
MW-1	4/13/2001	**1,400**	340	590	2,970	<10	14,000		
MW-1	6/19/2001	**910**	110	280	1,870	<10	6,000		
MW-1	9/27/2001	**2,600**	330	630	4,330	<20	13,000		
MW-1	12/20/2001	**1,900**	250	460	3,070		11,000		
MW-1	4/17/2002	**2,000**	240	**770**	5,600		18,000		
MW-1	6/17/2002	**400**	80	130	870		2,000		
MW-1	9/10/2002	**520**	46	170	930		3,200		
MW-1	2/12/2003	**2,200**	170	**800**	6,500		20,000		
MW-1	5/21/2003	**3,500**	230	**720**	5,030	<25	14,000		
MW-1	9/17/2003	**2,900**	230	650	4,540	<25	14,000		
MW-1	12/16/2003	**4,300**	240	**1,200**	9,500	27	25,000		
MW-1	4/28/2004	**2,300**	130	520	3,240	<20	10,000		
MW-1	8/9/2004	**2,700**	150	600	3,950	<20	13,000		
MW-1	10/11/2004	**3,500**	170	**810**	5,900		17,000		
MW-1	12/27/2004	**3,000**	140	**930**	6,650	<20	21,000		

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		10	1,000	700	10,000	--	--	--	--
MW-1	4/1/2005	**2,700**	89	**890**	5,639		22,000		
MW-1	8/11/2005	**2,900**	130	660	320	<10	12,000		
MW-1	12/30/2005	**3,400**	100	990	6,300	<25	21,000		
MW-1	3/23/2006	**2,600**	100	580	3,400	<25	11,000		
MW-1	6/29/2006	**3,100**	110	910	6,000	<25	20,000		
MW-1	10/6/2006	**2,300**	82	510	3,300	<20	12,000		
MW-1	1/12/2007	**2,700**	100	740	4,815	11	16,000		
MW-1	3/31/2007	**1,500**	70	460	2,900	<20	11,000		
MW-1	7/23/2007	**2,500**	110	590	3,228	17	14,000		
MW-1	9/28/2007	**2,300**	97	520	3,200	<25	12,000		
MW-1	2/22/2008	**2,110**	109	623	3,760	10.3	13,600		
MW-2a	3/3/1992	**33,000**	**42,000**	**4,300**	**17,000**		310,000		
MW-2a	5/7/1992	**17,000**	**14,000**	**1,500**	6,500		67,000		
MW-2a	8/19/1992	**27,000**	**28,000**	**3,400**	**14,000**		270,000		
MW-2a	12/21/1992	**27,000**	**30,000**	**3,400**	**14,000**		100,000		
2/93-2/96									
MW-2a	3/11/1996	**43,000**	**53,000**	**5,000**	**24,000**		190,000		
MW-2a	6/27/1996								
MW-2a	9/30/1996	**25,000**	**29,000**	**4,200**	**19,000**		100,000		
MW-2a	4/14/1997								
MW-2a	9/19/1997	**23,000**	**26,500**	**3,170**	**13,900**	<1000	94,700		
MW-2a	12/17/1997	**28,000**	**32,000**	**3,400**	**15,900**		110,000		
MW-2a	3/24/1998	**25,000**	**31,000**	**3,200**	**14,600**	<250	110,000		
MW-2a	7/1/1998	**27,000**	**31,000**	**3,400**	**14,900**	<200	96,000		
MW-2a	10/6/1998	**17,000**	**19,000**	**1,800**	9,800		65,000		
MW-2a	1/26/1999	**22,000**	**25,000**	**2,500**	**12,200**	<200	94,000		
MW-2a	10/26/1999	**21,000**	**23,000**	**2,300**	**11,000**	<200	89,000		
MW-2a	3/7/2000	**23,000**	**26,000**	**2,900**	**13,000**		97,000		
MW-2a	9/5/2000	**20,000**	**23,000**	**2,600**	**11,900**	<200	78,000		
MW-2a	12/27/2000	**22,000**	**27,000**	**3,000**	**14,400**	<200	89,000		
MW-2a	4/13/2001	**18,000**	**21,000**	**2,900**	**13,900**	<200	89,000		
MW-2a	6/19/2001	**16,000**	**18,000**	**2,200**	**10,600**	<130	66,000		
MW-2a	9/27/2001	**18,000**	**20,000**	**2,500**	**10,900**	<130	67,000		
MW-2a	12/20/2001	**20,000**	**25,000**	**2,800**	**13,600**		86,000		
MW-2a	4/17/2002	**1,200**	1,300	200	910		2,000		
MW-2a	6/17/2002	**13,000**	**14,000**	**1,700**	7,600		46,000		

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		10	1,000	700	10,000	--	--	--	--
MW-2a	9/10/2002	**15,000**	**17,000**	**2,100**	10,200		62,000		
MW-2a	2/3/2003	monitoring well removed							
MW-2b	2/12/2003	**10,000**	750	**1,200**	4,920	<50	22,000		
MW-2b	5/21/2003	**1,900**	120	370	3,140	<20	8,300		
MW-2b	9/17/2003	**6,100**	210	**820**	3,592	<50	15,000		
MW-2b	12/16/2003	**5,300**	240	600	1,730	<40	9,800		
MW-2b	4/28/2004	**3,400**	510	520	2,220	<40	9,800		
MW-2b	8/9/2004	**4,700**	130	610	2,542	<25	10,000		
MW-2b	10/11/2004	**1,800**	30	210	720		4,300		
MW-2b	12/27/2004	**4,200**	100	450	1500	<50	9,200		
MW-2b	4/1/2005	**890**	<10	110	110		1,600		
MW-2b	8/11/2005	**3,000**	79	430	1,421	<10	6,800		
MW-2b	12/30/2005	**6,000**	380	**710**	2,700	<25	14,000		
MW-2b	3/23/2006	**3,100**	150	440	1,800	<25	7,400		
MW-2b	6/29/2006	**10,000**	510	**1,200**	4,000	<120	21,000		
MW-2b	10/6/2006	**4,600**	490	**780**	3,750	<50	16,000		
MW-2b	1/12/2007	**6,100**	750	**770**	2,590	<25	16,000		
MW-2b	3/31/2007	**11,000**	640	**1,200**	3,600	<100	25,000		
MW-2b	7/23/2007	**5,000**	280	**800**	3,170	<50	12,000		
MW-2b	9/28/2007	**6,300**	340	**1,100**	4,690	<50	19,000		
MW-2b	2/28/2008	**10,700**	704	**1,360**	4,340	<50	23,800		
MW-3a	3/3/1992	**4,100**	**3,100**	**800**	630		27,000		
MW-3a	5/7/1992	**14**	21	45	100		1,600		
MW-3a	8/19/1992	**150**	100	280	730		12,000		
MW-3a	12/21/1992	**150**	50	98	400		3,800		
2/93-2/96									
MW-3a	3/11/1996	**12**	5	9	19		570		
MW-3a	6/27/1996	6	<5	19	21		700		
MW-3a	9/30/1996	**10**	7	26	43		580		
MW-3a	4/14/1997	<5	<5	<5	<15	<5	120		
MW-3a	9/19/1997	8.4	1.2	9.7	10.2	<10	220		
MW-3a	12/17/1997	4.6	<1	<1	<2		59		
MW-3a	3/24/1998	**16**	8.2	34	54.6	1.3	650		
MW-3a	7/1/1998	**12**	1.9	16	15.8	3.5	380		
MW-3a	10/6/1998	**13**	1.3	4.7	7.1		250		

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		**10**	**1,000**	**700**	**10,000**	--	--	--	--
MW-3a	1/26/1999	6.8	2.5	15	18.5	<1	19		
MW-3a	10/26/1999	monitoring well removed							
MW-3b	2/12/2003	**460**	100	**1400**	1,640	<10	8,100		
MW-3b	5/21/2003	**34**	28	13	27.7	<1	730		
MW-3b	9/17/2003	**84**	13	51	24.8	4.2	760		
MW-3b	12/16/2003	**25**	1.7	11	<3.7	3.4	310		
MW-3b	4/28/2004	**46**	24	19	20.8	5.3	500		
MW-3b	8/9/2004	<1	<1	<1	<3	<1	<50		
MW-3b	10/11/2004	8.8	<1	3.3	<3		98		
MW-3b	12/27/2004	6.8	<1	8.5	8.5	<1	140		
MW-3b	4/1/2005	**30**	16	410	268		2,200		
MW-3b	8/11/2005	**11**	<1	<1	<3	<1	<50		
MW-3b	12/30/2005	5	<1	<1	<2	<1	<50		
MW-3b	3/23/2006	1	<1	<1	<2	<1	<50		
MW-3b	6/29/2006	6	2.4	39	17	<1	200		
MW-3b	10/6/2006	7.4	<1	11	15.9	<1	170		
MW-3b	1/12/2007	5.4	<1	1.7	<2	<1	72		
MW-3b	3/31/2007	**12**	7.6	140	72	3.5	800		
MW-3b	7/23/2007	**27**	<1	<1	<2	1.7	810		
MW-3b	9/27/2007	5.7	<1	<1	<3	<1	<50		
MW-3b	2/28/2008	1.1	<1	<1	<3	<1	<50		
MW-4	3/3/1992	<1	<1	<1	<1		<10		
MW-4	5/7/1992	<1	2	<1	5		780		
MW-4	8/19/1992	<1	<1	<1	<1		170		
MW-4	12/21/1992	<1	<1	<1	<1		<10		
2/93-2/96									
MW-4	3/11/1996	<5	<5	<5	<15		<100		
MW-4	6/27/1996	<5	<5	<5	<15		<100		
MW-4	9/30/1996	<5	<5	<5	<15		<100		
MW-4	4/14/1997	<5	<5	<5	<15	<5	<100		
MW-4	9/19/1997	<1	<1	<1	<3	<10	<100		
MW-4	12/17/1997	<1	<1	<1	<2		<50		
MW-4	3/24/1998	<1	<1	<1	<2	<1	<50		
MW-4	6/25/1998	<1	<1	<1	<2	<1	<50		
MW-4	10/6/1998	<1	<1	<1	<2		<50		

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		10	1,000	700	10,000	--	--	--	--
MW-4	1/26/1999	<1	<1	<1	<2	<1	<50		
MW-4	10/26/1999	<1	<1	<1	<3	<1	<50		
MW-4	3/7/2000	<1	12	<1	<3		<50		
MW-4	9/5/2000	<1	26	<1	2.2	<1	<50		
MW-4	12/27/2000	<1	2.5	<1	1.4	<1	<50		
MW-4	4/13/2001	<1	<1	<1	<3	<1	<50		
MW-4	6/19/2001	<1	<1	<1	1.9	<1	<50		
MW-4	9/27/2001	<1	<1	<1	4.3	<1	<50		
MW-4	12/20/2001	<1	<1	<1	1.8		<50		
MW-4	4/17/2002	<1	<1	<1	<3		<50		
MW-4	6/17/2002	<1	<1	<1	<3		<50		
MW-4	9/10/2002	<1	<1	<1	<3		<50		
MW-4	2/11/2003	<1	<1	<1	<3	<1	<50		
MW-4	5/24/2003	3.8	<1	<1	<3	<1	<50		
MW-4	9/17/2003	<1	<1	<1	<3	<1	<50		
MW-4	12/16/2003	<1	<1	<1	<3	<1	<50		
MW-4	4/28/2004	<1	<1	<1	<3	<1	<50		
MW-4	8/9/2004	<1	<1	<1	<3	<1	<50		
MW-4	10/11/2004	<1	<1	<1	<3		<50		
MW-4	12/27/2004	<1	<1	<1	<3	<1	<50		
MW-4	4/1/2005	<1	<1	<1	<3		<50		
MW-4	8/11/2005	<1	<1	<1	<3	<1	<50		
MW-4	12/30/2005	<1	<1	<1	<2	<1	<50		
MW-4	3/23/2006	<1	<1	<1	<2	<1	<50		
MW-4	6/29/2006	<1	<1	<1	<2	<1	<50		
MW-4	10/6/2006	<1	<1	<1	<2	<1	<50		
MW-4	1/12/2007	<1	<1	<1	<2	<1	<50		
MW-4	3/31/2007	<1	<1	<1	<2	<1	<50		
MW-4	7/23/2007	<1	<1	<1	<2	<1	<50		
MW-4	9/27/2007	<1	<1	<1	<3	<1	<50		
MW-4	2/28/2008	<1	<1	<1	<3	<1	<50		
MW-5	6/27/1996	<5	<5	<5	<15		<100		
MW-5	9/30/1996	<5	<5	<5	<15		<100		
MW-5	4/14/1997	<5	<5	<5	<15	<5	<100		
MW-5	9/19/1997	<5	<1	<1	<1	<10	<100		
MW-5	12/17/1997								

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		10	1,000	700	10,000	--	--	--	--
MW-5	3/24/1998								
MW-5	6/25/1998								
MW-5	10/6/1998	<1	<1	<1	<2		<50		
MW-5	1/26/1999	<1	<1	<1	<2	<1	<50		
MW-5	10/26/1999	<1	<1	<1	<2	<1	<50		
MW-5	3/7/2000	2.6	<1	<1	<2	<1	<50		
MW-5	9/5/2000	**140**	1.9	10	3.1	<1	260		
MW-5	12/27/2000	**21**	<1	<1	<2	<1	<50		
MW-5	4/13/2001	3.2	<1	<1	<2	<1	<50		
MW-5	6/19/2001	1.4	<1	<1	<2	<1	<50		
MW-5	9/27/2001	1.2	<1	<1	<2	<1	<50		
MW-5	12/20/2001	1	<1	<1	<2		<50		
MW-5	4/17/2002	3.4	<1	<1	<2		<50		
MW-5	6/17/2002	1.9	<1	<1	<2		<50		
MW-5	9/10/2002	<1	<1	<1	<2		<50		
MW-5	2/11/2003	**22**	<1	<1	<2		<50		
MW-5	5/21/2003	3.8	<1	<1	<3	<1	<50		
MW-5	9/17/2003	**230**	15	26	30	<1	480		
MW-5	12/16/2003	**14**	<1	<1	<3	<1	<50		
MW-5	4/28/2004	3	<1	<1	<3	<1	<50		
MW-5	8/9/2004	**80**	7	7.4	3.7	<1	150		
MW-5	10/11/2004	**15**	<1	<1	<3		<50		
MW-5	12/27/2004	**41**	<1	<1	<3	<1	<50		
MW-5	4/1/2005	5.4	<1	<1	<3		<50		
MW-5	8/11/2005	**210**	34	31	31.5	<1	430		
MW-5	12/30/2005	7	<1	<1	<2	<1	<50		
MW-5	3/23/2006	1	<1	<1	<2	<1	<50		
MW-5	6/29/2006	1	<1	<1	<2	<1	<50		
MW-5	10/6/2006	<1	<1	<1	<2	<1	<50		
MW-5	1/12/2007	<1	<1	<1	<2	<1	<50		
MW-5	3/31/2007	<1	<1	<1	<2	<1	<50		
MW-5	7/23/2007	**39**	<1	2.5	<2	<1	52		
MW-5	9/27/2007	8.7	<1	<1	<3	<1	<50		
MW-5	2/28/2008	<1	<1	<1	<3	<1	<50		
MW-6	6/27/1996	**29**	<5	<5	<15		<100		
MW-6	9/30/1996	6	<5	<5	<15		<100		

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		10	1,000	700	10,000	--	--	--	--
MW-6	4/14/1997	<5	<5	<5	<15	<5	<100		
MW-6	9/19/1997	<5	<5	<5	<15	<5	<100		
MW-6	12/17/1997	<5	<5	<5	<15	<5	<100		
MW-6	3/24/1998	<1	<1	<1	<2		<50		
MW-6	6/25/1998	<1	<1	<1	<2	<1	<50		
MW-6	10/6/1998	<1	<1	<1	<2	<1	<50		
MW-6	1/26/1999	<1	<1	<1	<2	<1	<50		
MW-6	10/26/1999	<1	<1	<1	<2	<1	<50		
MW-6	3/7/2000	3.4	<1	<1	<3		<50		
MW-6	9/5/2000	<1	<1	<1	<2	<1	<50		
MW-6	12/27/2000	<1	<1	<1	<2	<1	<50		
MW-6	4/13/2001	<1	<1	<1	<2	<1	<50		
MW-6	6/19/2001	<1	<1	<1	<2	<1	<50		
MW-6	9/27/2001	<1	<1	<1	<2	<1	<50		
MW-6	12/20/2001	<1	<1	<1	<2	<1	<50		
MW-6	4/17/2002	<1	<1	<1	<2		<50		
MW-6	6/17/2002	<1	<1	<1	<2		<50		
MW-6	9/10/2002	<1	<1	<1	<2		<50		
MW-6	2/11/2003	1.1	<1	<1	<2		<50		
MW-6	5/21/2003	2.4	<1	<1	<3	<1	<50		
MW-6	9/17/2003	<1	<1	<1	<3	<1	<50		
MW-6	12/16/2003	<1	<1	<1	<3	<1	<50		
MW-6	4/28/2004	<1	<1	<1	<3	<1	<50		
MW-6	8/9/2004	**28**	2.7	5.8	1.2	2.2	180		
MW-6	10/11/2004	<1	<1	<1	<3		<50		
MW-6	12/27/2004	<1	<1	<1	<3		<50		
MW-6	4/1/2005	<1	<1	<1	<3		<50		
MW-6	8/11/2005	<1	<1	<1	<3	<1	<50		
MW-6	12/30/2005	<1	<1	<1	<2	<1	<50		
MW-6	3/23/2006	<1	<1	<1	<2	<1	<50		
MW-6	6/29/2006	<1	<1	<1	<2	<1	<50		
MW-6	10/6/2006	<1	<1	<1	<2	<1	<50		
MW-6	1/12/2007	<1	<1	<1	<2	<1	<50		
MW-6	3/31/2007	<1	<1	<1	<2	<1	<50		
MW-6	7/23/2007	<1	<1	<1	<2	<1	<50		
MW-6	9/27/2007	<1	<1	<1	<3	<1	<50		
MW-6	2/28/2008	<1	<1	<1	<3	<1	<50		

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		10	1,000	700	10,000	--	--	--	--
MW-7	6/27/1996	<5	<5	<5	<15		<100		
MW-7	9/30/1996	<5	<5	<5	<15		<100		
MW-7	4/14/1997	<5	<5	<5	<15	<5	<100		
MW-7	9/19/1997	<5	<5	<5	<15	<5	<100		
MW-7	12/17/1997	<5	<5	<5	<15	<5	<100		
MW-7	3/24/1998	<1	<1	<1	<2	<1	<50		
MW-7	6/25/1998	<1	<1	<1	<2	<1	<50		
MW-7	10/6/1998	<1	<1	<1	<2	<1	<50		
MW-7	1/26/1999	<1	<1	<1	<2	<1	<50		
MW-7	10/26/1999	<1	<1	<1	<2	<1	87		
MW-7	3/7/2000	<1	<1	<1	<2		<100		
MW-7	9/5/2000	<1	<1	<1	<2	<1	110		
MW-7	12/27/2000	<1	<1	<1	<2	<1	810		
MW-7	4/13/2001								
MW-7	6/19/2001	<1	<1	<1	<2	<1	130		
MW-7	9/27/2001	<1	<1	<1	<2	<1	<50		
MW-7	12/20/2001	<1	<1	<1	<2		<50		
MW-7	4/17/2002	<1	<1	<1	<2		<50		
MW-7	6/17/2002	<1	<1	<1	<2		<50		
MW-7	9/10/2002	<1	<1	<1	<2		<50		
MW-7	2/11/2003	<1	<1	<1	<2		<50		
MW-7	5/21/2003	<1	<1	<1	<3	<1	<50		
MW-7	9/17/2003	<1	<1	<1	<3	<1	<50		
MW-7	12/16/2003	<1	<1	<1	<3	<1	<50		
MW-7	4/28/2004	<1	<1	<1	<3	<1	<50		
MW-7	8/9/2004	<1	<1	<1	<3	<1	<50		
MW-7	10/11/2004	<1	<1	<1	<3		<50		
MW-7	12/27/2004	<1	<1	<1	<3		<50		
frozen	4/1/2005								
MW-7	8/11/2005	<1	<1	<1	<3	<1	<50		
MW-7	12/30/2005	<1	<1	<1	<2	<1	<50		
MW-7	3/23/2006	<1	<1	<1	<2	<1	<50		
MW-7	6/29/2006	<1	<1	<1	<2	<1	<50		
MW-7	10/6/2006	<1	<1	<1	<2	<1	<50		
MW-7	1/12/2007	<1	<1	<1	<2	<1	<50		
MW-7	3/31/2007	<1	<1	<1	<2	<1	<50		

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		10	1,000	700	10,000	--	--	--	--
MW-7	7/23/2007	<1	<1	<1	<2	<1	<50		
MW-7	9/27/2007	<1	<1	<1	<3	<1	<50		
MW-7	2/28/2008	<1	<1	<1	<3	<1	<50		
MW-8	2/12/2003	**250**	11	60	376	<2	1,200		
MW-8	5/21/2003	2.8	<1	1.8	10	<1	<50		
MW-8	9/17/2003	**47**	1.3	<1	<3	<1	<50		
MW-8	12/16/2003	**140**	1.1	<1	<3	<1	190		
MW-8	4/28/2004	2	<1	<1	<3	<1	<50		
MW-8	8/9/2004	**190**	17	12	9.3	<1	370		
MW-8	10/11/2004	**360**	13	22	<3		610		
MW-8	12/27/2004	**93**	<1	2.5	<3	<1	140		
MW-8	4/1/2005	2.4	<1	<1	<3		<50		
MW-8	8/11/2005	**200**	21	14	6.8	<1	320		
MW-8	12/30/2005	**18**	<1	<1	<2	<1	<50		
MW-8	3/23/2006	<1	<1	<1	<2	<1	<50		
MW-8	6/29/2006	<1	<1	<1	<2	<1	<50		
MW-8	10/6/2006	**120**	<1	<1	<2	<1	220		
MW-8	1/12/2007	3.2	<1	<1	<2	<1	<50		
MW-8	3/31/2007	<1	<1	<1	<2	<1	<50		
MW-8	7/23/2007	**14**	<1	<1	<2	<1	<50		
MW-8	9/28/2007	**93**	<1	<1	<3	<1	120		
MW-8	2/28/2008	<1	<1	<1	<3	<1	<50		
Field Blank	3/11/1996	<5	<5	<5	<15		<100		
Field Blank	9/30/1996	<5	<5	<5	<15		<100		
Field Blank	9/19/1997	<1	<1	<1	<3		<50		
Field Blank	10/6/1998	<1	<1	<1	<3		<50		
Field Blank	1/26/1999	<1	<1	<1	<3	<1	<50		
Field Blank	10/26/1999	<1	<1	<1	<3	<1	<50		
Field Blank	3/7/2000	<1	<1	<1	<3		<50		
Field Blank	9/5/2000	<1	<1	<1	<3	<1	<50		
Field Blank	12/27/2000	<1	<1	<1	<3	<1	<50		
Field Blank	4/13/2001	<1	<1	<1	<3	<1	<50		
Field Blank	6/19/2001	<1	<1	<1	<3	<1	<50		
Field Blank	9/27/2001	<1	<1	<1	<3	<1	<50		
Field Blank	12/20/2001	<1	<1	<1	<3	<1	<50		

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		10	1,000	700	10,000	--	--	--	--
Field Blank	9/17/2003	<1	<1	<1	<3	<1	<50		
Field Blank	11/20/2003	<1	<1	<1	<3	<1	<50		
Field Blank	12/16/2003	<1	1.8	<1	<3	<1	<50		
Field Blank	4/28/2004	<1	<1	<1	<3	<1	<50		
Field Blank	8/9/2004	<1	<1	<1	<3	<1	<50		
Field Blank	10/11/2004	<1	<1	<1	<3	<1	<50		
Field Blank	11/4/2004	<1	<1	<1	<3	<1	<50		
Field Blank	12/27/2004	<1	<1	<1	<3	<1	<50		
Field Blank	4/1/2005	<1	<1	<1	<3	<1	<50		
Field Blank	8/11/2005	<1	<1	<1	<3	<1	<50		
Field Blank	12/30/2005	<1	<1	<1	<2	<1	<50		
Field Blank	3/23/2006	<1	<1	<1	<2	<1	<50		
Field Blank	6/29/2006	<1	<1	<1	<2	<1	<50		
Field Blank	10/6/2006	<1	<1	<1	<2	<1	<50		
Field Blank	1/12/2007	<1	<1	<1	<2	<1	<50		
Field Blank	3/31/2007	<1	<1	<1	<2	<1	<50		
Field Blank	7/23/2007	<1	<1	<1	<2	<1	<50		
Field Blank	9/27/2007	<1	<1	<1	<3	<1	<50		
Field Blank	2/28/2008	<1	<1	<1	<3	<1	<50		
Field Blank	7/14/2008	<1	<1	<1	<3	<1	<50		
PW-1	5/7/1992	<1	<1	<1	<1		<10		
PW-1	8/19/1992	<1	<1	<1	<1		<10		
PW-1	12/21/1992	<1	<1	<1	<1		<10		
2/93-2/96									
PW-1	3/11/1996	**15**	<5	<5	<15		<100		
PW-1	4/3/1996	**91**	8	<5	<15				
PW-1	6/27/1996								
PW-1	9/30/1996	**22**	<5	<5	<15		<100		
PW-1	4/17/1997	**240**	100	<5	<15		430		
PW-1	9/19/1997	**27.3**	<1	<1	<3	<10	<100		
PW-1	12/1/1997	monitoring well removed							
PW-2	12/17/1997	<1	<1	<1	<2				
PW-2	3/24/1998	<1	<1	<1	<2	<1	<50		
PW-2	6/25/1998	<1	<1	<1	<2	<1	<50		
PW-2	2/11/2003	<1	<1	<1	<2	<1	<50		

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		10	1,000	700	10,000	--	--	--	--
PW-2	5/21/2003	<1	<1	<1	<1	<1	<50		
PW-2	10/11/2004	<1	<1	<1	<3		<50		
PW-2	11/17/2004	<1	<1	<1	<3	<1	<50		
PW-2	8/11/2005	<1	<1	<1	<3	<1	<50		
PW-2	9/28/2007	<1	<1	<1	<3	<1	<50		
PW-2	2/22/2008	<1	<1	<1	<3	<1	<50		
PW-2	7/14/2008	<1	<1	<1	<3	<1	<50		
PW-4621	1/12/2007	<1	<1	<1	<2	<1	<50		
PW-4621	3/31/2007	<1	<1	<1	<2	<1	<50		
PW-4621	7/23/2007	<1	<1	<1	<2	<1	<50		
PW-4621	9/28/2007	<1	<1	<1	<3	<1	<50		
PW-4621	2/22/2008	<1	<1	<1	<3	<1	<50		
PW-4621	7/14/2008	**7.4**	<1	<1	<3	<1	**67.6**		
PW-4621	10/6/2008	<1	<1	<1	<3	<1	<50	<47	**640** [1]
PW-5497	9/17/2003	<1	<1	<1	<3	<1	<50		
PW-5497	11/4/2004	<1	<1	<1	<3	<1	<50		
PW-5497	8/11/2005	<1	<1	<1	<3	<1	<50		
PW-5497	10/6/2006	<1	<1	<1	<3	<1	<50		
PW-5497	9/28/2007	1.5	<1	<1	<3	<1	<50		
PW-5497	2/22/2008	**12.4**	<1	<1	<3	<1	<50		
PW-5497	3/19/2008	<1	<1	<1	<3	<1	<50		
PW-5497	7/14/2008	<1	<1	<1	<3	<1	<50		
PW-5497	10/6/2008	**9.8**	<1	<1	<3	<1	<50	**140**	**610** [1]
PW-5492	9/17/2003	<1	<1	<1	<3	<1	<50		
PW-5492	11/4/2004	<1	<1	<1	<3	<1	<50		
PW-5492	8/11/2005	<1	<1	<1	<3	<1	<50		
PW-5492	10/6/2006	<1	<1	<1	<3	<1	<50		
PW-5492	9/28/2007	<1	<1	<1	<3	<1	<50		
PW-5492	7/14/2008	<1	<1	<1	<3	<1	<50		
PW-5506, A	11/4/2004	<1	<1	<1	<3	<1	<50		
PW-5506, A	8/11/2005	<1	<1	<1	<3	<1	<50		
PW-5506, A	10/6/2006	<1	<1	<1	<3	<1	<50		
PW-5506, A	9/28/2007	<1	<1	<1	<3	<1	<50		

Well #	Date sampled	Benzene ug/L	Toluene ug/L	Ethyl-benzene ug/L	Xylenes ug/L	MTBE ug/L	GRO ug/L	DRO ug/L	DRO (with Silica Gel Cleanup) ug/L
HRL		**10**	**1,000**	**700**	**10,000**	--	--	--	--
PW-5506, A	7/14/2008	<1	<1	<1	<3	<1	<50		
PW-5506, B	11/4/2004	<1	<1	<1	<3	<1	<50		
PW-5506, B	10/6/2006	pump broken							
PW-5506, B	7/23/2007	pump broken							
PW-5506, B	9/28/2007	dry							
WW-1	11/20/2003	<1	<1	<1	<3		<50	160	
WW-2	11/20/2003	**12**	<1	<1	<3		<50	140	
WW-3	11/20/2003	8	<1	<1	<3		<50	<100	

Notes:
< = below detection limits.
[1] = the silica gel cleanup blank yielded 74 ug/L DRO.
Results in bold equal or exceed the HRL.
[ ] =Not analyzed for.
Twin City Testing, Inc. managed this project through 1993. Twin Ports Testing, Inc. took over the project in 1996.

Table 12 - Other Contaminants Detected in Water Samples Collected from Wells
Junction Food-N-Fuel, MPCA Leak #3534

Well #	Date sampled	Methyl isobutyl ketone ug/L	Acetone ug/L	1,2,4-tri-methyl-benzene ug/L	Styrene ug/L	Chloro-form ug/L	Ethyl ether ug/L	n-Butyl benzene ug/L	Chloro-methane ug/L	Trichloro-trifluoro-ethane ug/L	Dichloro-difluoro-methane ug/L	1,2-Di-chloro-ethane ug/L	naph-thalene ug/L	bromo-dichloro-methane ug/L	Tri-chloro-fluoro-methane ug/L	Iso-propyl benzene ug/L	n-Propyl benzene ug/L	1,3,5-tri-methyl-benzene ug/L	tert-Butyl benzene ug/L	sec-Butyl benzene ug/L	p-iso-propyl toluene ug/L
MW-1	1/6/1998	<	<	<	0.8*	11.6*	<	1.2*	<	<	<	<	<	<	1.5*	<	<	<	<	0.7*	<
MW-2a	1/6/1998	<	<	0.9*	0.8*	12.7*	<	1.2*	<	<	<	<	<	<	1.5*	<	<	<	<	0.7*	<
	4/6/1998	<	<	7.7	<	<	<	<	<	<	<	<	<	<	<	<	1.5*	2.0*	<	<	<
MW-2b	2/12/2003		<250	530	<50	<50	<50	<50	<50	<50	<50	<50	66	<50	<50	<50	65	140	<50	<50	<50
	5/21/2003		<100	380	<20	<20		<20	<20		<20	<20	24	<20	<20	26	26	140	<20	<20	<20
MW-3a	1/6/1998	<	<	<	0.8*	12.1*	<	0.5*	<	<	<	<	<	<	1.3*	<	<	<	<	<	<
MW-3b	2/12/2003		<50	850	<10	<10	<10	<10	<10	<10	<10	<10	150	<10	<10	110	280	460	<10	<10	23
	5/21/2003		80	55	<1	<1		6.6	<1		<1	<1	2.4	<1	<1	1.9	6.1	31	<1	<1	<1
MW-4	1/6/1998	<	<	29.5	0.8*	<	<	14.2	<	<	<	<	<	<	1.3*	2.8*	4.2*	8.6	1.4*	3.9	3.1*
	4/6/1998	<	<	0.6*	<	<	5.4*	4	<	<	<	<	10	<	<	1.0*	1.5*	0.8*	<	1.5*	<
MW-5	1/6/1998	<	<	1.4*	0.8*	<	<	2.3*	<	1.3*	<	<	<	<	<	0.8*	0.9*	0.5*	<	<	0.6*
	4/6/1998	<	<	3.8*	0.7*	<	<	0.4*	<	<	<	<	11.8	<	<	1.7*	1.4*	0.6*	<	1.6*	<
MW-6	1/6/1998	<	<	<	0.8*	<	<	1.4*	<	<	<	<	<	<	<	<	<	<	<	<	<
	4/6/1998	<	<	7.7	<	<	<	<	<	<	<	<	<	<	<	<	1.5*	2.0*	<	<	<
MW-7	1/6/1998	<	<	<	0.8*	<	<	1.3*	<	1.2*	<	2.4*	<	1.3*	<	<	<	0.6*	<	<	<
	4/6/1998	<	<	0.9*	<	<	<	<	<	<	<	3.5	<	<	<	<	<	<	<	<	<
MW-8	2/12/2003		<10	81	<2	<2		<2	<2	<2	<2	<2	7.4	<2	<2	3.4	4.2	18	<2	<2	<2
	5/21/2003		5.2	5.3	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.5	<1	<1	<1
Field Blank	12/17/1997		8.8	<1	<1	2.5	<5	<1	<2	<1	<2	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1
PW-1	8/4/1997	1.4	<	<	<	<	<	<	<	<	<	<	<	<	1.4	<	<	<	<	<	<
	1/6/1998	<	<	<	0.8*	11.3*	<	0.5*	54.1	1.5*	<	<	<	<	<	<	<	0.8*	<	11.3*	<
	4/9/1998	<	<	<	1.0*	1.1*	<	<	12.4*	<	32.9*	0.8*	<	<	<	<	<	1.0*	<	1.1*	<
PW-2	12/17/1997		<5	<1	<1	1.1		<1	<2	<1	<2	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1
	2/12/2003		350*	<2	<2	<2		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
PW-5506A	7/14/2008		<5	<1	<1	<5	<1	<1	<1		7.0	<1	<5	<1	<1	<1	<1	<1	<1	<1	<1

Notes:
< = below detection limits.
* = see individual laboratory report for notes concerning results.
Results in bold equal or exceed the HRL.
[ ] = Not analyzed for.