COPY

Minnesota Pollution Control Agency

May 1, 1996

Mr. Brian Kamnikar
Office of Environmental Services
Minnesota Department of Transportation
3485 Hadley Avenue North
Oakdale, Minnesota 55128

RE: **Petroleum Tank Release Site File Closure**
Site: Winona Truck Station, 5420 West Highway 61, Winona
Site ID#: LEAK00006612

Dear Mr. Kamnikar:

We are pleased to inform you that the Minnesota Pollution Control Agency (MPCA) Tanks and Emergency Response Section (TERS) staff has determined that your investigation and/or cleanup has adequately addressed the petroleum tank release at the site listed above. Based on the information provided, the TERS staff has closed the release site file.

Closure of the file means that the TERS staff requires no additional investigation and/or clean-up work at this time or in the foreseeable future. Please be aware that file closure does not necessarily mean that all petroleum contamination has been removed from this site. However, the TERS staff has concluded that any remaining contamination, if present, does not appear to pose a threat to public health or the environment.

The MPCA reserves the right to reopen this file and to require additional investigation and/or clean-up work if new information or changing regulatory requirements make additional work necessary. If you or other parties discover additional contamination (either petroleum or nonpetroleum) that was not previously reported to the MPCA, Minnesota law requires that the MPCA be immediately notified.

You should understand that this letter does not release any party from liability for the petroleum contamination under Minn. Stat. ch. 115C (1994), or any other applicable state or federal law. In addition, this letter does not release any party from liability for nonpetroleum contamination, if present, under Minn. Stat. ch. 115B (1994), the Minnesota Superfund Law.

The monitoring wells for this site should be abandoned in accordance with the Minnesota Department of Health Well Code, Chapter 4725. If you choose to keep the monitoring wells, the Minnesota Department of Health will continue to assess a maintenance fee for each well.

Because you performed the requested work, the state may reimburse you for a major portion of your costs. The Petroleum Tank Release Cleanup Act establishes a fund which may provide partial reimbursement for petroleum tank release clean-up costs. This fund is administered by the Department of Commerce Petro Board. Specific eligibility rules are available from the Petro Board at 612/297-1119 or 612/297-4203.

If future development of this property or the surrounding area is planned, it should be assumed that petroleum contamination may still be present. If petroleum contamination is encountered during future development work, the MPCA staff should be notified immediately.

For specific information regarding petroleum contamination that may remain at this leak site, please call the TERS File Request Program at 612/297-8499. The *"Leak/Spill and Underground Storage Tank File Request Form"* (TERS Fact Sheet #36) must be completed prior to arranging a time for file review.

Thank you for your response to this petroleum tank release and for your cooperation with the MPCA to protect public health and the environment. If you have any questions regarding this letter, please call me at 507/280-2995.

Sincerely,

David H. Morrison
Project Manager

DHM/ml

cc: Jim Pomeroy - City Clerk, Winona
Edward Krall - Fire Chief, Winona
Ross Dunsmore - Winona County Environmental Health Department
William Tepley - STS Consultants, Ltd.
Petrofund Staff - Minnesota Department of Commerce

July 13, 1995

Mr. Brian Kamnikar
Project Manager
Minnesota Department of Transportation
Office of Environmental Services
3485 Hadley Avenue North
Oakdale, MN 55128

STS Project 96194-XA

Re: Remedial Investigation for Winona MnDOT Truck Station in Goodview, Minnesota
(MPCA Leak No. 6612)

Dear Mr. Kamnikar:

STS Consultants, Ltd. (STS) has completed the Remedial Investigation for the above-referenced project. This work was performed under the general criteria established in MnDOT's Work Order No. 8 of Agreement No. 69882 approved by Mr. John E. Sandahl, Director of MnDOT Engineering Services on October 28, 1994.

The results of the Remedial Investigation (RI) did not identify impacts to groundwater by petroleum related compounds or volatile organic compounds. However, limited petroleum impacted soils were encountered near the location of a former dry well and within the former gasoline tank basin.

STS recommends that an additional groundwater sampling round be performed to confirm the results of the initial groundwater sampling. Site closure should be requested from the MPCA if the additional groundwater monitoring confirms the initial sampling results. Details of the RI results and STS' recommendations are included in the report.

We have appreciated the opportunity to provide environmental engineering services to you on this project. If you or any other MnDOT representatives have questions with regard to the information contained in this report, please call us.

Respectfully,

STS CONSULTANTS, LTD.

William B. Tepley
Senior Project Manager

Robert L. DeGroot, CPG PE
Principal Engineer

WBT/dn
Encs.

STS Consultants Ltd.
Consulting Engineers

3650 Annapolis Lane
Suite 120
Minneapolis, Minnesota 55447
612.559.1900/Fax 612.559.4507

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

Remedial Investigation for
Winona MnDOT Truck Station in Goodview, Minnesota
(MPCA Leak No. 6612)

1.0 INTRODUCTION

STS Consultants, Ltd. was contracted by the Minnesota Department of Transportation (MnDOT) to perform a Remedial Investigation at the MnDOT Winona Truck Station. The site is located in the northwest quadrant of the intersection of Trunk Highway No. 61 and 54th Avenue in the City of Goodview, Minnesota, see Figure 1, Appendix A. The work was prompted as a result of petroleum contamination identified during removal of two underground storage tanks in August 1993. A report, "Underground Storage Tank Excavation Observations, MnDOT Truck Station, Winona, Minnesota" prepared for MnDOT by Huntingdon (Twin City Testing Corporation) dated October 29, 1993, details the results of the tank removals, see Appendix I. The MPCA assigned Leak No. 6612 to the site on August 3, 1993.

The scope of work for this project consisted of performing a Remedial Investigation to attempt to define the extent and magnitude of soil and groundwater contamination. A total of seven soil borings were performed. Three monitoring wells were also installed. The boring and monitoring well locations were selected by Mr. Brian Kamnikar of MnDOT. Additionally, soil samples obtained from the soil exploration program were analyzed for specific parameters requested by Mr. Kamnikar. The subsurface exploration and monitoring well installation work was performed between February 14 and February 15, 1995. Groundwater sampling was performed on February 16, 1995.

This report presents the methods and results of the Remedial Investigation and provides recommendations for further evaluation.

2.0 PROJECT BACKGROUND

2.1 Site Location

The MnDOT Winona Truck Station is located at the northwest quadrant of the intersection of Trunk Highway 61 and 54th Avenue in Goodview, Minnesota. The partial legal description of the site is the northwest quarter of the southeast quarter of the southwest quarter of Section 18, Township 107 North, Range 7 West, in Winona County, Minnesota. The latitude/longitude coordinates are 44°03'24"/92°42'49". The site location is illustrated on Figure 1 in Appendix A.

Adjacent properties to the MnDOT Truck Station include:

- A former bituminous mix plant site (Dunn Blacktopping) to the north on property now owned by MnDOT.
- The Winona County Highway Department maintenance garage across 54th Avenue to the east.
- A weigh station to the south across Trunk Highway 61.
- Wooded land and Lake Goodview to the west.

The adjacent properties are illustrated on Figure 2 in Appendix A.

2.2 Underground Storage Tank Removals

Two underground storage tanks were removed from the site on August 3, 1993 by MnDOT personnel. One UST, a 4,000 gallon capacity STI-P_3 tank which contained unleaded gasoline (gasohol), was installed in 1987. The other UST, a 6,000 gallon capacity asphalt coated steel tank which contained diesel fuel, was installed in 1971. Both USTs were in good condition upon

removal according to the Huntingdon report. The approximate locations of the former tank systems are shown on Figure 3, Appendix A. No replacement tanks were installed.

The Huntingdon report indicated that approximately 30 to 35 cubic yards of contaminated soil were removed from each of the excavated tank basins. The contaminated soils were transported to Johnson Blacktop for thermal treatment in the spring of 1994. The results of the post-burn analysis were submitted to the MPCA, based on conversations with Mr. Brian Kamnikar of MnDOT.

The depth of excavation of the gasoline UST basin was approximately 9 feet at its west end and 12 feet (groundwater level) at its east end. The depth of excavation at the diesel UST basin was 10 feet below grade.

Residual petroleum contamination remains in-place at the east end of the gasoline UST basin, based on analytical results presented in the Huntingdon report. The contamination was due in part to gasoline spilled during removal of the UST as concluded in the Huntingdon report. Low concentrations of benzene, toluene and xylene were identified in groundwater sampled from the base of the gasoline UST basin. Minor residual contamination was present in the base of the diesel UST basin excavation based on analytical results in the Huntingdon report.

The causes of the petroleum impacts as identified in the Huntingdon report included:

- Product spilled during removal of the gasoline UST and existing impacts.
- Over-filling or fuel dispensing at the diesel fuel UST and pump island.

Total quantities of petroleum products released at the pump island and underground storage tank locations was not known based on the information presented in the Huntingdon report. Approximately 2 to 3 gallons of gasoline was released during removal of the gasoline UST.

3.0 EXPLORATION PROCEDURES

3.1 Soil Boring and Monitoring Well Locations

The soil boring locations were selected by Mr. Brian Kamnikar of MnDOT at locations of potential concern. Soil boring B-1 was located near the center of the diesel UST/pump island excavation. Soil boring B-2 was located in the approximate center of the former gasoline UST basin. Soil borings B-3, B-4 and B-5 were placed on the north, east and west sides of the gasoline UST basin. Soil boring B-6 was placed approximately midway and to the south of the diesel and gasoline UST basins. B-7 was placed approximately midway and to the north of the diesel and gasoline UST basins.

Boring B-3 was located adjacent to a former dry well. This dry well received discharge from trench grates within the building.

Monitoring well MW-1 was placed southwest of the gasoline UST basin along the south property fence. Monitoring well MW-2 was placed north of the diesel UST basin adjacent to a storage shed. Monitoring well MW-3 was placed east of the diesel UST basin near the northwest corner of the maintenance shop. The locations of the soil borings and monitoring wells are illustrated on Figure 3 in Appendix A.

The elevations of the soil borings and monitoring wells were determined relative to a Minnesota Highway Department (MHD) disk stamped 8506 C1 located in the front yard of the MnDOT building. The elevation of MHD 8506 C1 is 667.32 feet mean sea level based on information provided by MnDOT.

3.2 Subsurface Exploration

The subsurface exploration included drilling seven soil borings (B-1 through B-7) and installing three monitoring wells (MW-1, MW-2 and MW-3). The soil exploration activities were conducted during February 14 to February 15, 1995.

The soil borings were drilled with an all-terrain CME-750 drill rig. The drill rig and sampling train were steam cleaned to reduce the risk of cross-contamination between borings prior to the start of the exploration program and periodically during drilling operations. Clean augers were used to drill and install each boring/well.

The boreholes were advanced by use of continuous flight hollow stem augers. Representative soil samples were obtained using the split-barrel sampling procedure in general conformance with ASTM Specification D-1586. The split-barrel sampler was cleaned between sampling intervals in a solution of water and Alconox detergent. The split-spoon samplers were rinsed with clean water to remove detergent residual. The boreholes were tremie grouted upon completion.

Soil samples obtained from the boreholes were classified in the field by an environmental geologist in accordance with the Unified Soil Classification System (USCS). Soil boring logs showing the soil types, strata changes and sampling intervals are included in Appendix B.

3.3 Soil Sample Screening

The soil samples obtained from the boreholes were screened for the presence of volatile organic compounds (VOCs) using an HNU Model 101 photoionization (PID) meter equipped with a 10.2 eV lamp calibrated to an isobutylene gas considered a benzene reference. The head space screening procedure was conducted in general conformance with the Minnesota Pollution Control

Agency (MPCA) "Field Screening Procedure" Fact Sheet No. 14 dated April 1993. The HNU meter readings are reported as HNU meter units in the photoionization detector reading column on the soil boring logs.

3.4 Soil Chemical Analyses

A total of eight soil samples were selected by MnDOT for chemical analysis. Soil samples were obtained from each soil boring near the soil/water table interface located approximately 18.5 feet below grade. A soil sample was also obtained from the interval having the highest PID reading in boring B-3 at approximately 10 feet. The soil samples from soil borings B-1, B-2, B-4, B-5, B-6 and B-7 were analyzed for gasoline range organics (GRO), methyl-tert-butyl ether (MTBE), and benzene, toluene, ethylbenzene and total xylenes (BTEX). The soil sample from soil boring B-1 was also analyzed for diesel range organics (DRO). The soil sample from soil boring B-3 at a depth of approximately 10 feet was submitted for chemical analysis of GRO, volatile organic compounds (VOCs) and RCRA metals. In addition a soil sample from the soil/groundwater interface at soil boring B-3 was analyzed for VOCs. Samples for chemical analysis were selected from specific borings and depths determined by MnDOT personnel following review of the field data.

The samples submitted for chemical analysis were removed immediately from the split-barrel sampler and were placed and sealed in jars provided by the analytical laboratory. The soil samples were collected following the MPCA "Soil and Groundwater Analytical Sample Collection Procedures" Fact Sheet No. 15 dated April 1993. Decontaminated stainless steel utensils were used in handling the samples and clean disposable nitrile gloves were worn for each sample. The samples were placed in a cooler with ice and transported to Legend Technical Services, Inc. along with an STS chain of custody record. Copies of the laboratory results and chain of custody records are included in Appendix G.

3.5 Monitoring Well Installation

Three groundwater monitoring wells were installed by STS at locations requested by MnDOT personnel. The monitoring wells were constructed with 2 inch diameter 0.010 slot stainless steel well screens with black iron riser pipe. The top of the riser pipe extends approximately 2 feet above the ground surface. The well screen was surrounded with a graded sand pack which extended between 3 to 4 feet above the top of each screen section. The top of the filter packs were filled with a neat cement grout to the ground surface. A locking protective casing was installed over each of the monitoring wells and three steel knockdown protection posts were placed around each well. The well construction is shown on boring logs for MW-1, MW-2 and MW-3.

Monitoring well installation permits were obtained by STS from the Winona County Environmental Services Department. A well record was also completed and submitted to the Minnesota Department of Health (MDH) for each monitoring well. Copies of the boring logs, well permits and well records are included in Appendix B. Table A in Appendix C summarizes the construction data for the monitoring wells.

3.6 Groundwater Sampling

The monitoring wells were developed and sampled on February 16, 1995 by an STS environmental geologist in general accordance with MPCA sampling protocols. A minimum of five well volumes of water were removed from each well prior to sampling. Temperature, pH and specific conductance readings were taken until each well stabilized. Well development and water sampling information forms are included in Appendix H. Trip blanks, prepared by the laboratory, accompanied the geologist in the field and were returned to the laboratory for analysis. Field blank samples were also prepared at the time of sampling. The water level within the monitoring wells were within the screened section at the time of sampling.

The monitoring well water samples, field blanks and trip blanks were analyzed for volatile organic compounds (VOCs) by MDH Method 465-D, diesel range organics (DRO) and gasoline range organics (GRO). The water samples were placed in clean glass containers with Teflon septum and screw-on closures. The samples were placed in a cooler with ice and transported to Legend Technical Services, Inc. A chain of custody record was used to document the sample delivery.

3.7 Field Hydraulic Conductivity Testing

Field hydraulic conductivity testing (slug testing) was conducted by STS on each of the monitoring wells on February 16, 1995. Slug testing consisted of performing rising and falling head tests to determine the horizontal conductivity of the materials in the vicinity of the well screen. Slug testing was performed using an electronic data logger to obtain water level readings at regular intervals, as the water levels were artificially raised and lowered using the slug.

Slug test data was analyzed using the method developed by Bouwer and Rice (1976). The solution method is included as part of a computer software package entitled "AQTESOLV", as developed by Duffield and Rumbaugh (1991). The graphical plot of drawdown measurements versus time, along with input parameters, are included in Appendix B. The Bouwer and Rice (1976) method was written for a water table system. The method includes an equivalent radius which estimates the borehole radius, accounting for the filter pack materials.

3.8 Groundwater Receptor Survey

A groundwater receptor survey was conducted for the area within a one mile radius of the project site. The Minnesota Geological Survey (MGS) files were reviewed to obtain copies of well records. Additional contacts performed for the survey included the Public Works Director for the

City of Goodview, local well drillers and the MnDOT representative for the site. Appendix F contains the well logs and the documentation forms for all contacts that were made during the well search.

3.9 Vapor Risk Assessment

A "petroleum vapor risk assessment and survey" was performed in general accordance with the protocol outlined on the MPCA Fact Sheet No. 22 dated April 1993. A modified vapor survey was performed due to the low potential for vapor impacts. An explosimeter was not used in the assessment because no evidence of vapors or odors associated with the leaksite were noted during the survey.

4.0 EXPLORATION RESULTS

4.1 Area Geology and Hydrogeology

The overburden geology of the Winona area consists of alluvium (sand and gravel, silt, and clay deposited in channels and floodplains of modern streams) and glacial outwash terraces (gravel and sand) associated with the Mississippi River (Hobbs, 1984). The uppermost bedrock unit underlying the site is the Cambrian Eau Claire Formation (sandstone and siltstone) and Cambrian Mt. Simon Sandstone (Mossler and Book, 1984). Younger sandstone and limestone bedrock units present throughout southeastern Minnesota have been eroded within the Mississippi River Valley. The valley fill sediments are approximately 150 feet thick under Goodview (Mossler and Book, 1984). Drinking water aquifers in the Goodview area consist of sand layers within the alluvium and the Cambrian Eau Claire formation and Mt. Simon bedrock aquifers.

4.2 Soil Conditions

The generalized soil profile consists of asphalt materials and granular base underlain by fine to coarse sand to the termination depth of the soil borings. Sandy fill materials to a depth of 2 to 4 feet were generally observed with the exception of greater fill depths at the locations of the former UST basins. Detailed soil descriptions at each of the soil boring and monitoring well locations are presented on the individual boring logs in Appendix B. The soil conditions are also depicted on profile diagram presented on Figure 4 in Appendix A. The profile alignments are provided on Figure 5.

4.3 Soil Sample Screening

The soil sample screening results are summarized on Table 1 on the following page. No elevated PID meter readings were detected in soil samples from soil borings B-1, B-4, B-5, B-6 and B-7

and at monitoring wells MW-1, MW-2 and MW-3. Elevated PID meter readings were observed for samples from soil boring B-2 at approximately the groundwater level. Elevated PID meter readings were also observed for soil samples from soil boring B-3 between a depth of approximately 9 feet to the groundwater level. The elevated PID meter readings at approximately 10 feet depth at soil boring B-3 corresponded with gray soil staining. The record of PID readings are also provided on the boring logs in Appendix B.

TABLE 1
Summary Table of HNU Meter Analysis[1]
From Soil Borings

Approximate Depth (Feet)	B-1	B-2	B-3	B-4	B-5	B-6	B-7	MW-1	MW-2	MW-3
0.5 - 2.5	1	1	1	1	1	1	1	1	1	1
2.5 - 4.5	1	1	1	1	1	1	1	1	1	1
5.0 - 7.0	1	1	1	1	1	1	1	1	1	1
7.5 - 9.5	1	1	1	1	1	1	1	1	1	1
10.0 - 12.0	1	1	200*	1	1	1	1	1	1	1
12.5 - 14.5	1	1	50	1	1	1	1	1	1	1
15.0 - 17.0	1	1	23	1	1	1	1	1	1	1
17.5 - 19.0	1*	180*	110*	1*	1*	1*	1*	1	1	1
19.5 - 21.0	1	150	110	1	1	1	1	1	1	1
22.5 - 24.5	EOB	EOB	EOB	EOB	EOB	EOB	EOB	1	1	1
EOB								EOB	EOB	EOB

EOB = end of boring
[1] HNU meter was equipped with a 10.2 eV lamp calibrated to a benzene reference.
* A separate sample from this interval was submitted for chemical analysis.

4.4 Groundwater Conditions

Groundwater readings were obtained from the top of the monitoring well risers on February 16, 1995. The results of the water level measurements are presented on the water level summary sheet (Table B) included in Appendix C. Groundwater was located at a depth of approximately 18 to 20 feet below grade level during the drilling operations.

Figure 6 in Appendix A indicates the estimated groundwater flow direction on February 16, 1995. Groundwater appears to flow to the northwest towards Lake Goodview. The measured difference of less than 0.1 feet in groundwater elevation between the three wells indicates small changes in groundwater elevation would likely affect the estimated groundwater flow direction. Changes in groundwater elevation and possibly flow direction can be expected with time, season, weather conditions, pumping activities, the influence of underground utilities, and/or variations in the water level of the Mississippi River.

Groundwater elevation data was obtained from McGhie & Betts Environmental Services, Inc. for MnDOT property adjacent to the north side of the project site. The groundwater levels were measured on January 31, 1995. The elevation data indicates a groundwater flow direction to the north-northwest. These data support the groundwater flow direction estimated for the project site.

5.0 CHEMICAL TEST RESULTS

5.1 Soil Chemical Analyses

Laboratory analyses were performed on eight soil samples for chemical parameters selected by MnDOT. Tables 2, 3 and 4 on the following pages summarize the analytical results. Table 2 presents BTEX, MTBE, GRO and DRO, Table 3 presents VOCs and Table 4 presents metals concentrations. The laboratory test result report from Legend Technical Services, Inc. is included in Appendix G.

No concentrations of BTEX, MTBE, or GRO were detected in soil samples obtained from soil borings B-1, B-4, B-5, B-6 and B-7. Samples from these soil borings were obtained at approximately the soil/groundwater interface. No DRO was detected in the sample obtained from soil boring B-1 at the former diesel UST basin. DRO was not analyzed for in the other soil samples.

Toluene, ethylbenzene and total xylenes were identified at concentrations ranging from 0.3 to 0.8 parts per million (ppm) in the sample obtained from soil boring B-2 near the soil/groundwater interface. GRO was identified in the samples from borings B-2 and B-3 at concentrations of 190 ppm and 3,000 ppm, respectively. A laboratory notation indicated that the chromatographic profiles for the GRO for these two samples were similar to fuel oil.

Results for the VOC analysis of the soil sample from 10 feet depth at soil boring B-3 indicates the presence of several petroleum-related compounds, see Table 3. No VOCs were detected for the soil sample obtained at the soil/groundwater interface (17 to 19 feet) at soil boring B-3.

Table 4 summarizes the results of the soil sample obtained from soil boring B-3 at a depth of approximately 10 feet which was analyzed for eight (8) RCRA metals. The reported metal concentrations are less than the average concentrations of metals naturally occurring in soils.

Table 2
Summary of Soil Sample Chemical Analysis*
BTEX, MTBE, GRO, DRO

Boring No.	B-1	B-2	B-3	B-4	B-5	B-6	B-7		
Sample No.	S-9	S-9	S-5	S-8	S-8	S-8	S-8	Method	
Depth	17.0-18.5'	17.0-18.5'	9.5-11.5'	17.5-19.5'	17.0-19.0'	17.0-19.0'	17.0-19.0'	Blank	PQL
Units	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Parameter									
Benzene	<	<	N/A	<	<	<	<	<	0.05
Toluene	<	0.30	N/A	<	<	<	<	<	0.05
Ethylbenzene	<	0.80	N/A	<	<	<	<	<	0.05
Total Xylenes	<	0.50	N/A	<	<	<	<	<	0.05
Methyl-tert-butyl ether	<	<	N/A	<	<	<	<	<	0.05
Gasoline Range Organics	<	190**	3000**	<	<	<	<	<	5.0
Diesel Range Organics	<	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.0
HNU Reading	1	180	200	1	1	1	1	1	--
Date Sampled	2/14/95	2/14/95	2/14/95	2/15/95	2/15/95	2/15/95	2/15/95		

< = less than method detection limit
ppm = parts per million
-- = not applicable
PQL = Practical Quantitation Limit
MDH 465D VOCs = Minnesota Department of Health Method 465-D, List of Volatile Organic Compounds
N/A = not analyzed for this parameter
* Laboratory analysis by Legend Technical Services, Inc.
** Laboratory note indicated "chromatographic profile is similar to fuel oil".

Table 3
Summary of Soil Sample Chemical Analysis*
VOCs

Boring No.	B-3	B-3		
Sample No.	S-5	S-8	Method	
Depth	9.5-11.5'	17.0-19.0'	Blank	PQL
Units	(ppm)	(ppm)	(ppm)	(ppm)
Parameter				
Ethylbenzene	9.7	<	<	0.50
o-Xylene	1.1	<	<	0.50
Isopropyl benzene	5.9	<	<	0.50
n-Propyl benzene	16	<	<	0.50
1,3,5-Trimethylbenzene	10	<	<	0.50
tert-Butyl benzene	6.2	<	<	0.50
sec-Butylbenzene	39	<	<	0.50
p-Isopropyltoluene	2.4	<	<	0.50
n-Butylbenzene	36	<	<	0.50

< = less than method detection limit
ppm = parts per million
PQL = Practical Quantitation Limit
MDH 465D VOCs = Minnesota Department of Health Method 465-D, List of Volatile Organic Compounds
* Laboratory analysis by Legend Technical Services, Inc.

Table 4
Summary of Soil Sample Chemical Analysis*
Total Metals

Boring No.	B-3		Concentration of Naturally Occurring Metals in Soils**
Sample No.	S-5		
Depth	9.5-11.5'	PQL	Average (Range)
Units	(ppm)	(ppm)	(ppm)
Parameter			
Arsenic	1.1	1.0	7.2 (<0.1-97)
Barium	5.0	5.0	580 (10-5000)
Cadmium	<0.5	0.50	0.06 (0.01-0.7)
Chromium	7.5	2.5	54 (3-2000)
Lead	2.5	2.5	19 (<10-700)
Mercury	<0.13	0.13	0.089 (<0.01-4.6)
Selenium	<1.0	1.0	0.39 (<0.1-4.3)
Silver	<0.50	0.50	0.01-5 (0.1)***

< = less than method detection limit
ppm = parts per million
PQL = Practical Quantitation Limit
* Laboratory analysis by Legend Technical Services, Inc.
** Shacklette and Boerngen, 1984.
*** Overcash, 1979.

5.2 Groundwater Chemical Analyses

No volatile organic compounds were detected in groundwater samples obtained from the monitoring wells, the trip blank, or the method blank. Methylene chloride was detected in the field blank at a concentration of 190 parts per billion (ppb). The methylene chloride detected may be the result of laboratory contamination. 1,1,1-Trichloroethane was also detected in the field blank at a concentration of 1.0 ppb. The source of the 1,1,1-trichloroethane in the blank is unknown. No other VOC compounds were identified in the field blank.

No GRO or DRO concentrations were detected in groundwater samples obtained from the monitoring wells, the trip blank, the field blank or the method blank. The groundwater chemical analysis laboratory report is found in Appendix G.

6.0 POTENTIAL HEALTH RISK EVALUATION

6.1 Groundwater Receptor Survey

A total of 23 well records were obtained for wells within a one mile radius of the site. Eleven of the well records were obtained from the Minnesota Geological Survey (MGS) and are copies of the actual well records submitted by well drillers. Twelve of the records were obtained by use of the GWATER Groundwater Clearinghouse System available through computer modem from the Minnesota State Planning Agency, Land Management Information Center. Figure 7 in Appendix A shows the location of the water wells, each identified by the Minnesota unique well number. Appendix F contains the available MGS records of the wells and the GWATER information. A summary table of the well data is provided in Table C, Appendix C.

Two municipal wells (112210 and 219171) are located approximately 4,000 feet east of the project site. The municipal wells are cased to depths of 199 and 205 feet below the ground surface. The wells are open hole in bedrock extending approximately 200 and 240 feet below the base of the casings. Two public supply wells (235536 and 449410) are located to the south and southwest of the project site in upland areas estimated to be up-gradient from the project site. Two industrial wells (218075 and 218076) are located approximately 4,000 feet north of the project site. The industrial wells are cased approximately 160 to 165 feet below ground surface and are open hole into the Mt. Simon bedrock 335 to 350 feet below the base of the casings. One commercial well (219170), identified as a flowing well, is located approximately 2,000 feet north of the project site. The flowing well is cased to a depth of approximately 145 feet and is open hole into the Mt. Simon bedrock to a depth of approximately 90 feet below the base of the casing. No domestic wells were identified down-gradient (north-northeast) of the project site. Monitoring wells were identified at the Winona County Highway Department located approximately 500 feet southeast of the project site. Groundwater in the monitoring wells was approximately 15 feet below ground surface.

Mr. Otto Wandrasch, MnDOT's Winona area representative, reported that no water well was located on the project site to his knowledge. A well on MnDOT property (formerly Dunn Blacktopping) north of the project site will be abandoned according to Mr. Wandrasch.

Mr. Greg Volkert, Public Works Director for the City of Goodview, was contacted regarding the presence of water wells in the vicinity of the project site and future plans for the City water supply system. Mr. Volkert indicated that the truck station is served by public utilities and that water service extends approximately one mile to the west of the project site. Existing municipal wells show no contamination. Mr. Volkert indicated that the municipal wells are all in excess of 400 feet deep. Mr. Volkert indicated several private wells exist at locations near the project site including a well at the Winona County Highway Department, a well at a location southwest across Highway 61 from the project site and approximately five wells approximately 2,000 feet northeast of the project site along 6th Street. No additional information concerning the private wells was provided by Mr. Volkert. The location of wells identified by Mr. Volkert are shown on Figure 7 and listed on Table C. Mr. Volkert also indicated that the City of Goodview has no plans to drill new water supply wells in the near future.

STS contacted two water well drillers who had installed water wells within a one mile radius of the project site. Mr. Carl Schultz (retired) of Schultz Well Drilling indicated that all wells he drilled while in business were registered. He had no records of unregistered wells for the Goodview area. Mr. Earl Drussell of Drussell Well Drilling reported that a number of unregistered wells exist in the vicinity of the project site. Mr. Drussell indicated that a 6 inch diameter 60 to 80 feet deep well installed in the 1960s was located at the project site. Mr. Drussell also reported that an 8 inch diameter well was located at the former Dunn Blacktopping north and adjacent to the MnDOT Truck Station. Mr. Drussell recalled a well at a former drive-in theater located approximately 2,000 feet northeast of the project site. Mr. Drussell believed that this well

was likely never sealed. Mr. Drussell knew of a 4 inch diameter well at Mississippi Welders located approximately 2,000 feet east of the project site. Mr. Drussell believed that the Mississippi Welders well was probably 60 feet deep. Mr. Drussell recalled that a deep well likely exists at a ready mix plant north of the County Highway Building. Mr. Drussell had no records of unregistered wells for the Goodview area. Mr. Drussell related that sand deposits are approximately 140 to 180 feet deep in the area of the project site.

6.2 Hydraulic Conductivity Testing and Evaluation

The results of slug testing summarized on Table D (Appendix C) range from 0.004 cm/sec to 0.27 cm/sec, with a geometric mean of 0.02 cm/sec. The native sand soils are of high permeability as indicated by water levels recovering within 0.4 minutes (24 seconds) in all wells. The hydraulic conductivity values obtained from slug testing are considered an estimate due to the short duration of recovery following water level displacement. The consistent hydraulic conductivity results support that aquifer materials have a hydraulic conductivity of 10^{-1} to 10^{-2} cm/sec.

The horizontal hydraulic gradient for the upper quaternary sand unit was calculated using the February 16, 1995 data, along the inferred groundwater flow direction. The average horizontal hydraulic gradient is estimated to be $6x10^{-4}$ feet/feet across the site. The calculations for the hydraulic gradient are provided on Table E in Appendix C. The horizontal hydraulic gradient slopes toward the northwest indicating the inferred direction of groundwater flow.

The groundwater flow velocity for the quaternary unit was estimated at approximately 41 feet/year toward the northwest. The groundwater flow velocity was calculated using the mean hydraulic conductivity, observed hydraulic gradient in the inferred direction of groundwater flow and an assumed effective porosity.

A Hydrogeologic Setting and Groundwater Characterization Worksheet for this site is provided in Appendix E.

6.3 Vapor Risk Assessment Results

There has been no evidence of impacts of petroleum vapors to buildings or utilities as a result of the petroleum release at the site. The on-site buildings are slab-on-grade and contain no basements. Underground utilities identified in the area included storm sewer manholes on the south and west sides of the MnDOT building, sanitary sewer manholes at the corner of Highway 61 and 54th Avenue and the corner of 54th Avenue and 9th Street, and trench drains in the maintenance garage.

The manhole or catch basin covers at each identified sanitary and storm sewer location were removed and the air within was screened with an HNU meter. No HNU meter deflections or petroleum odors were observed in the manholes on or adjacent to the site as an indication of vapor collection. No HNU meter deflections were observed in the floor drains in the maintenance garage.

The risk of vapor impacts at the site appears to be low based on the distribution of contamination determined from the soil exploration results and the results of the vapor survey.

7.0 DISCUSSION/CONCLUSIONS

7.1 Soil Impacts

The soil borings conducted during the site exploration and the previous information obtained during the tank removals define the extent of soil impacts. No residual soil impacts were identified at the former diesel fuel UST basin. Soil impacts near the former gasoline UST basin appear to be associated with spillage during tank removal and a former dry well which was located approximately 20 feet northeast of the east end of the gasoline UST basin.

Soil impacts associated with the spillage in the east end of the gasoline tank basin appear to have been excavated to groundwater level which was 12 feet deep at the time of tank removal. No soil impacts were identified in soil boring B-2 in natural unsaturated soils between the excavation depth of the tank basin to just above the soil/groundwater interface based on PID meter readings. Soil impacts existed at the soil/groundwater interface at a depth of approximately 19 feet based on PID meter readings and chemical analysis results obtained at soil borings B-2 and B-3. The chemical analysis of soil at the soil/groundwater interface indicates impacts may be due to petroleum product with characteristics more similar to fuel oil than gasoline.

Soil impacts beginning at a depth of approximately 10 feet at soil boring B-3 located between the gasoline UST basin and the former dry well appear to be associated with the dry well. The dry well formerly received discharge from trench grates within the building. In addition, the chromatographic pattern exhibited by the GRO analysis resembled fuel oil rather than gasoline. The gasoline tank, which was installed in 1987, showed no visible indications of leakage according to the Huntingdon report. Soil discoloration at a depth of 10 to 12 feet at soil boring

B-3 indicates long-term contamination existed, not the result of short-term impacts associated with the 2 to 3 gallons of gasoline which reportedly spilled during tank removal activities.

Petroleum related VOCs were identified at a depth of approximately 10 feet at soil boring B-3. The source of the VOCs is likely associated with discharges to the dry well. No VOCs were identified at the soil/groundwater interface at soil boring B-3.

The concentrations of RCRA metals identified in the soil samples from approximately 10 feet depth at soil boring B-3 are within the range of naturally occurring concentrations of these metals. As such, the reported metal concentrations appear to be naturally occurring or background levels.

7.2 Groundwater Impacts

No VOCs, GRO or DRO compounds were identified in groundwater samples obtained from the monitoring wells. Possible groundwater impacts identified by the Huntingdon report do not appear to have migrated to the monitoring wells. The water table hydraulic gradient appears to be slight based on groundwater level measurements obtained on February 15, 1995. High hydraulic conductivity of aquifer materials indicates potential for rapid movement of contaminants, however the hydraulic gradient minimizes movement. Based on the results of the soil screening at the soil/groundwater interface obtained during the soil exploration, extensive movement of contamination away from the release site does not appear to have occurred.

7.3 Health Risk Evaluation

The groundwater receptor survey identified a number of potential drinking water receptors within one mile down-gradient of the site. The closest documented down-gradient well is approximately 2,000 feet from the site. Well construction is not known for several of the down-gradient wells. Mr. Drussell of Drussell Well Drilling reported that a 6 inch diameter well exists at the project site; however, no written document exists for this well. The potential for impacts to these wells from the MnDOT release site appears low. This is based upon distance to the well from the release site and lack of identified contamination in the monitoring wells.

There are no known impacts of petroleum vapors to buildings or utilities at the site. Risk of future vapor impacts appears low.

8.0 RECOMMENDATIONS

The results of the Remedial Investigation indicate that the extent of soil and groundwater impacts associated with the MnDOT Winona Truck Station has been defined. Soil impacts appear to exist associated with former use of a dry well to dispose of water from within the maintenance facility and within the gasoline tank basin. However impacts appear to be limited. We recommend that an additional round of groundwater samples should be obtained to confirm the results of the initial sampling round.

Site closure should be requested from the MPCA if the additional round of groundwater sampling confirms the previous sampling results.

9.0 GENERAL QUALIFICATIONS

The analysis and recommendations submitted herein are based on the data presented in this report. This report has been prepared in accordance with generally accepted engineering practices to assist MnDOT in the evaluation of the site. No other warranty, expressed or implied, is made. The scope of this report is limited to the specific project and location described herein and represents our understanding of the significant aspects in reference to a site. Interpretations in this report were made based on some information obtained from other organizations. This information was assumed to be reliable and was not reviewed for accuracy.

REFERENCES

C. W. Fetter, Applied Hydrogeology, Merril Publishing, 1988.

Minnesota Geologic Survey, Bedrock Geology Plate, Geologic Atlas, Winona County, Minnesota, County Atlas C-2, John H. Mossler and Paul R. Book, 1984.

Minnesota Geological Survey, Surficial Geology Plate, Geologic Atlas, Winona County, Minnesota, County Atlas C-2, Harold C. Hobbs, 1984.

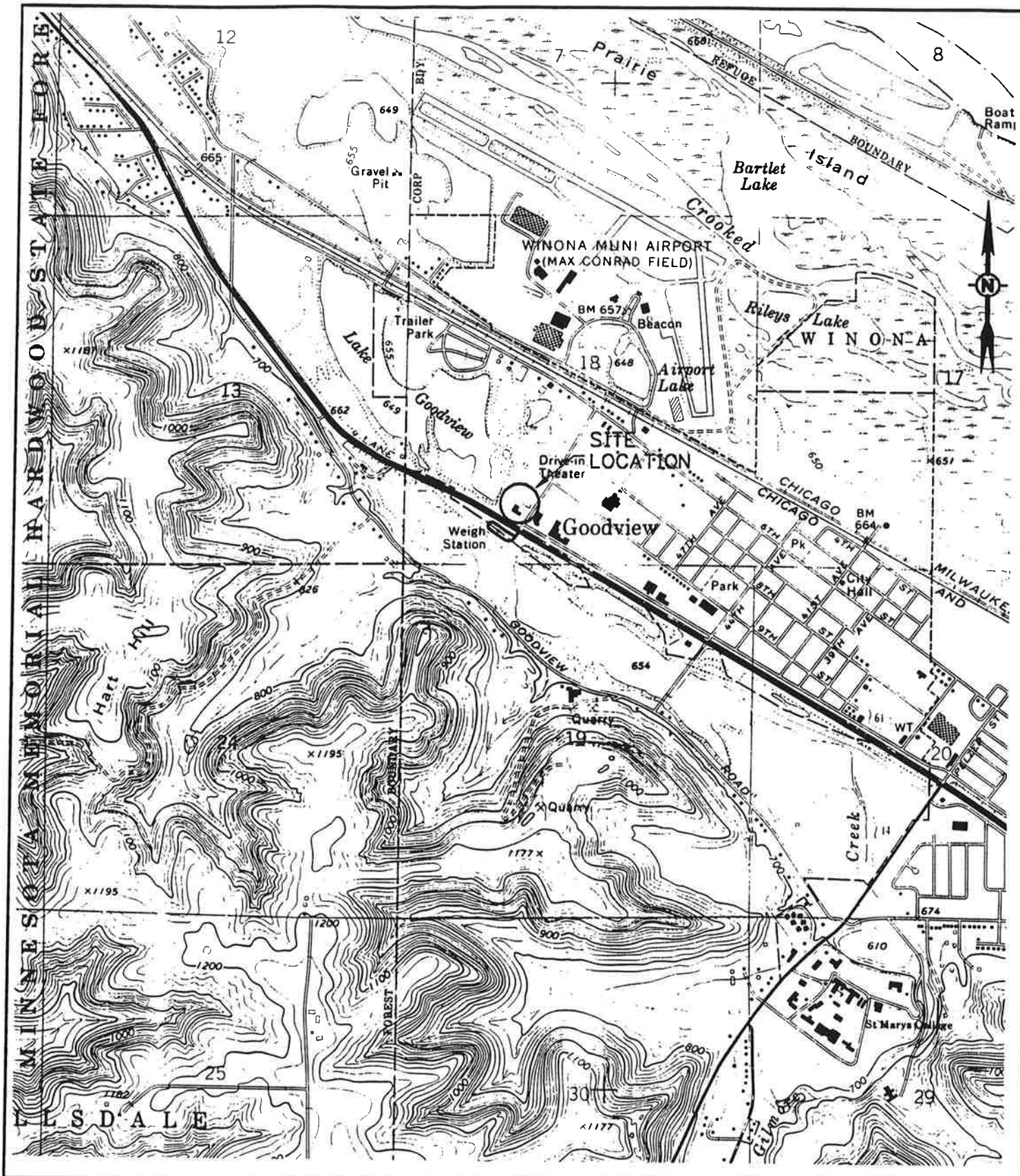
Overcash, M. R., and Pal, D., 1979, Design of Land Treatment Systems for Industrial Wastes - Theory and Practice, Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1979.

Shacklette, H. T., and J. G. Boerngen, 1984, "Element Concentrations in Soils and Surficial Materials of the Continuos United States", U.S. Geological Survey Professional Paper 1270, U.S. Government Printing Office, Washington, DC in Minnesota Pollution Control Agency "Procedures for Establishing Soil Clean-up Levels" - Version 1.

"Underground Storage Tank Excavation Observations, MnDOT Truck Station, Winona, Minnesota", Huntingdon Report TCT No. 4700 93-185, dated October 29, 1993.

APPENDIX A

List of Figures



LEGEND

BASE MAP: U.S.G.S. WINONA WEST QUADRANGLE,
7.5 MINUTE SERIES
1972

0' 2000'
SCALE: 1"=2000'

SITE LOCATION DIAGRAM

Project: WELL RECEPTOR SURVEY		AutoCAD File: 96194LOC	Checked by: GJR
Client: MnDOT – WINONA TRUCK STATION		STS Project No: 96194–XA	Approved by: RLD
Location: WINONA, MN		Client Proj. No:	
CAD Operator: SNS	Plot Date: 01–20–1995	Revision No:	Figure: 1

MARSH

PRIVATE ROAD

LAKE
GOODVIEW

FORMER BITUMINOUS
MIX PLANT

MINNESOTA
HIGHWAY
DEPARTMENT

WINONA
COUNTY
HIGHWAY
DEPARTMENT

GOODVIEW
SCHOOL

WEIGHT
STATION

T.H. NO. 61

54TH AVE

53RD AVE

52ND AVE

51ST AVE

49TH AVE

8TH ST

9TH ST

7TH ST

7TH PL

6TH ST

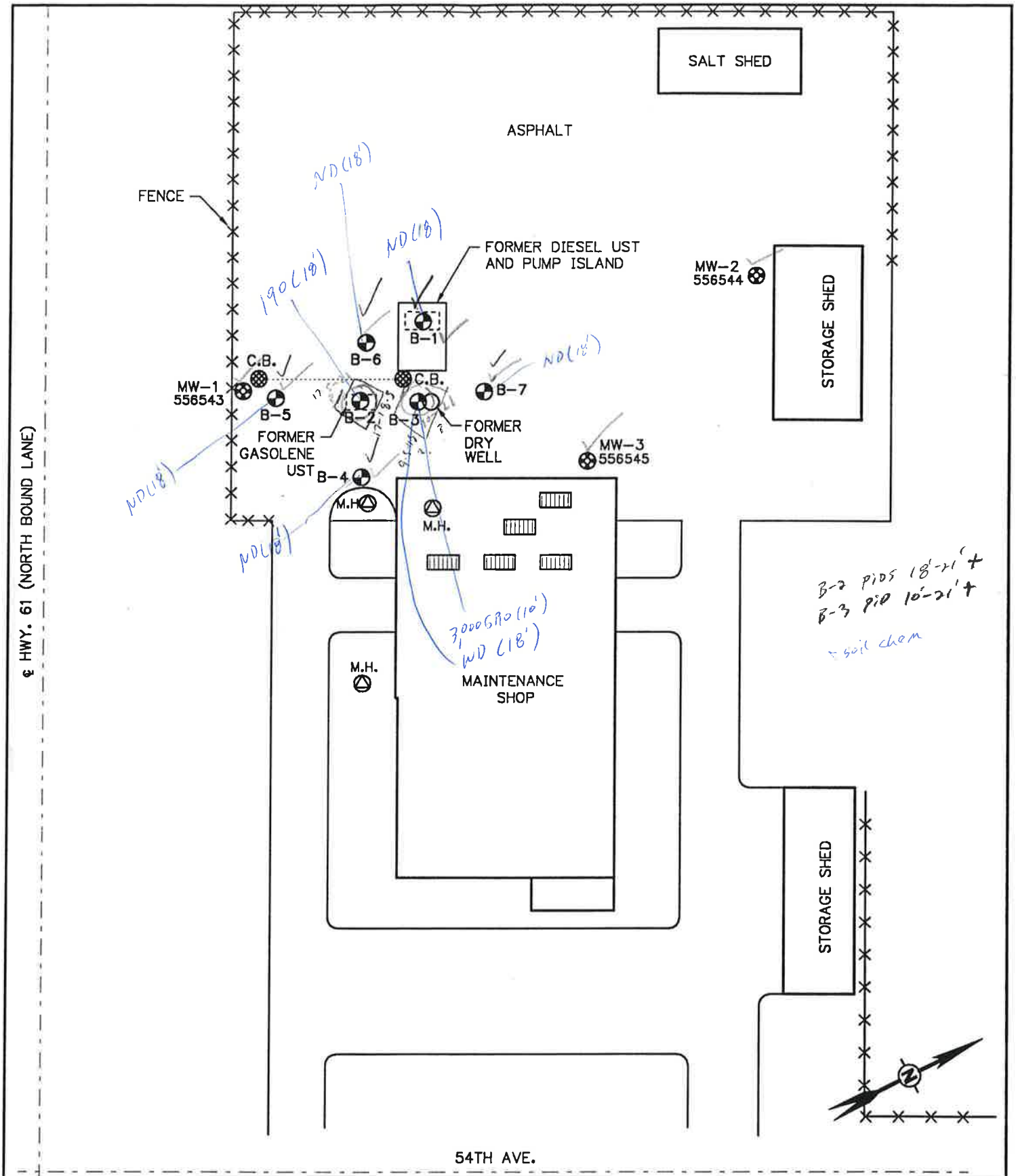
N

LEGEND

0' 100' 200'
SCALE: 1"=200'

AREA LOCATION DIAGRAM

Project: MnDOT WP#8 Client: MnDOT Location: GOODVIEW, MN		AutoCAD File: 96194L01 STS Project No: 96194-XA Client Proj. No:	Checked by: GJR Approved by: RLD
CAD Operator: NTM	Plot Date: 06-13-1995	Revision No:	Figure: 2



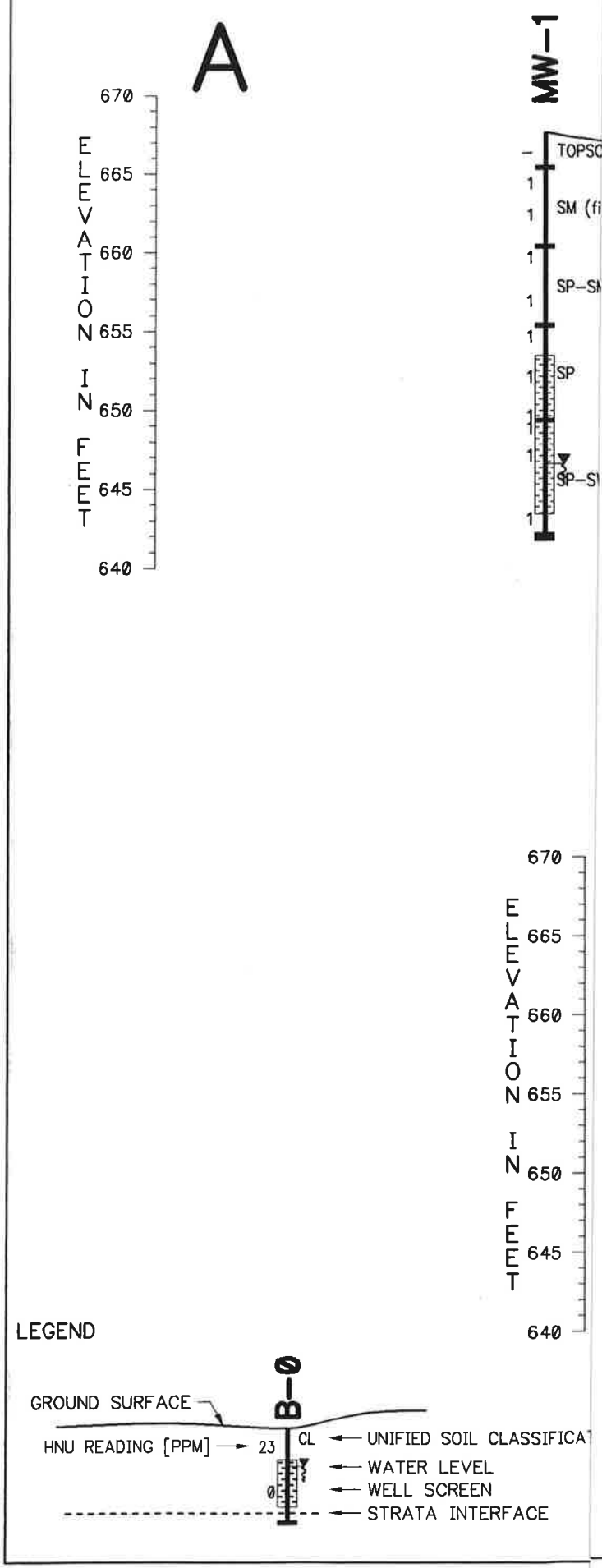
LEGEND
- MONITORING WELL UNIQUE WELL NO.
- CATCH BASIN
- SOIL BORING
- TRENCH GRATES
- MAN HOLE

BASE MAP: TWIN CITY TESTING DRAWING 93185-2 DATED 10/11/93.

0' 60'
SCALE: 1"=60'

SITE LAYOUT DIAGRAM

Project: MnDOT – WINONA TRUCK STATION		AutoCAD File: 96194MND	Checked by: GJR
Client: MnDOT		STS Project No: 96194-XA	Approved by: RLD
Location: GOODVIEW, MN		Client Proj. No:	
CAD Operator: SNS	Plot Date: 04-12-1995	Revision No:	Figure: 3



PROFILE A–A' AND B–B'

Project: MnDOT – WINONA TRUCK STATION
Client: MnDOT
Location: GOODVIEW, MN

CAD OPERATOR SNS	CHECKED BY GJR	APPROVED BY RLD
DATE 04-14-1995	DATE	DATE
AUTOCAD FILE 96194PRA		

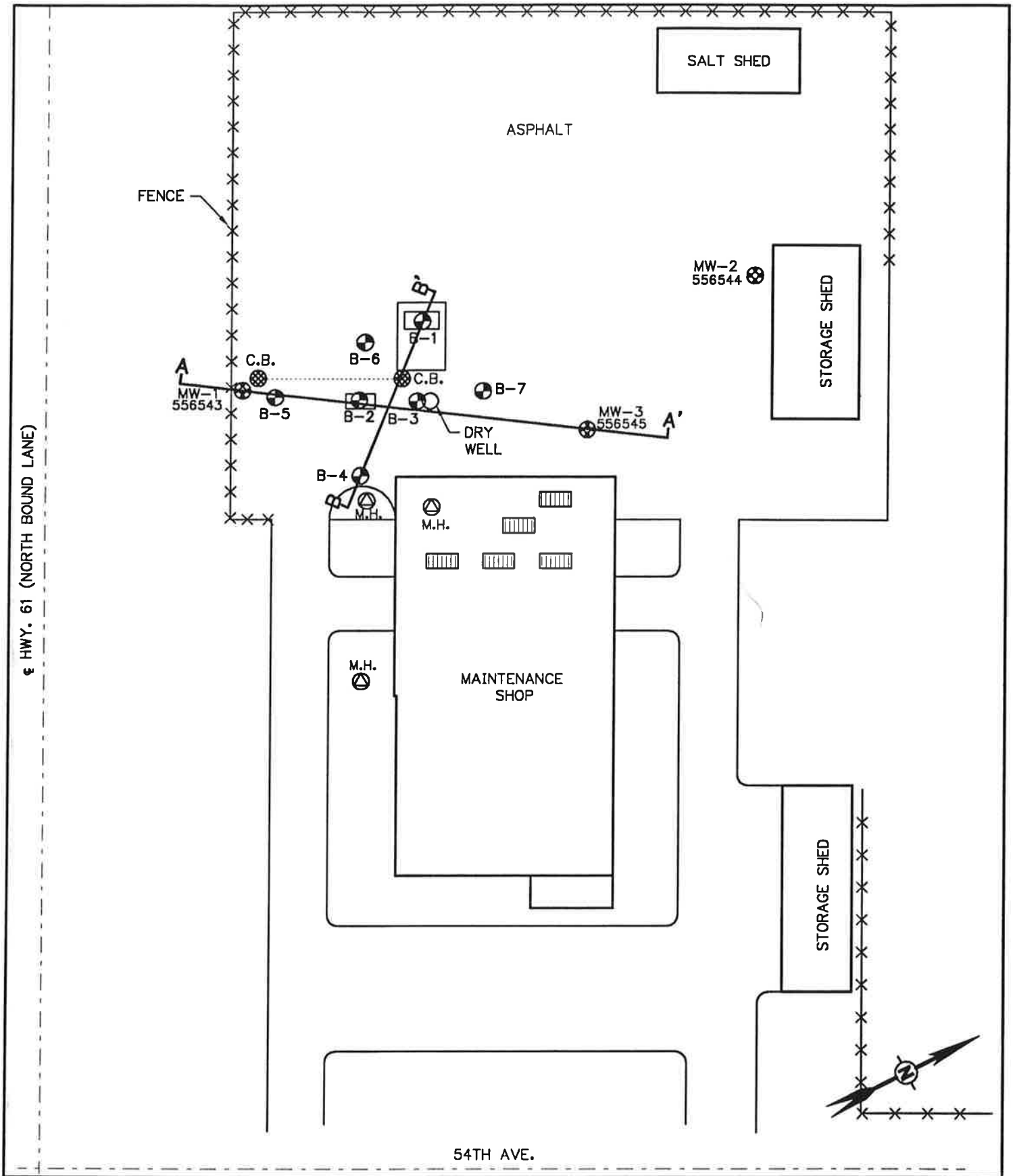
STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO.
96194-XA

STS PROJECT FILE

SCALE
AS NOTED

SHEET NUMBER
4



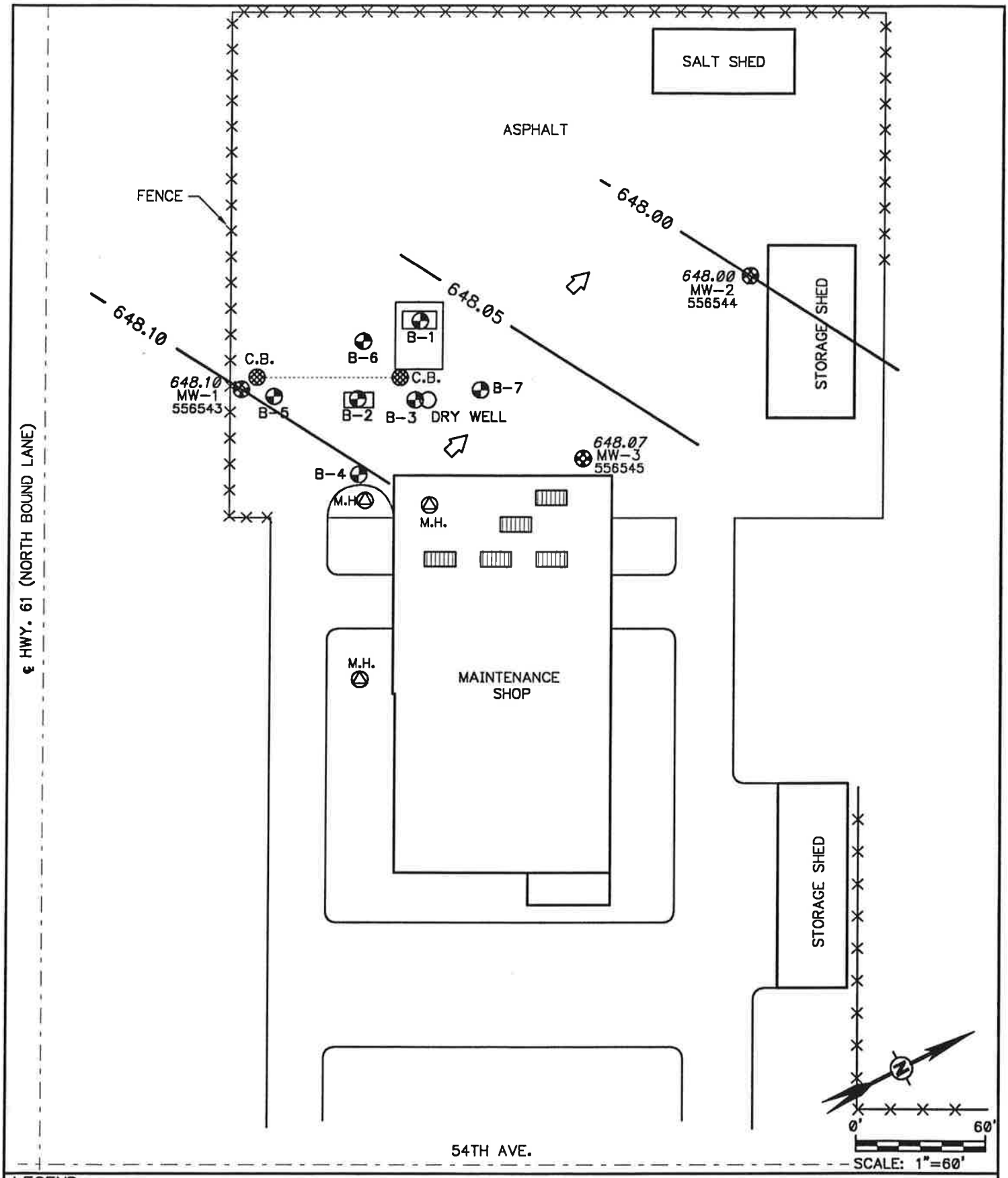
LEGEND
- MONITORING WELL UNIQUE WELL NO.
- CATCH BASIN
- SOIL BORING
- TRENCH GRATES
- MAN HOLE

BASE MAP: TWIN CITY TESTING
DRAWING 93185-2
DATED 10/11/93.

0' 60'
SCALE: 1"=60'

PROFILE ALIGNMENT DIAGRAM

Project: MnDOT – WINONA TRUCK STATION Client: MnDOT Location: GOODVIEW, MN		AutoCAD File: 96194L03 STS Project No: 96194-XA Client Proj. No:	Checked by: GJR Approved by: RLD
CAD Operator: SNS	Plot Date: 04-11-1995	Revision No:	Figure: 5



LEGEND

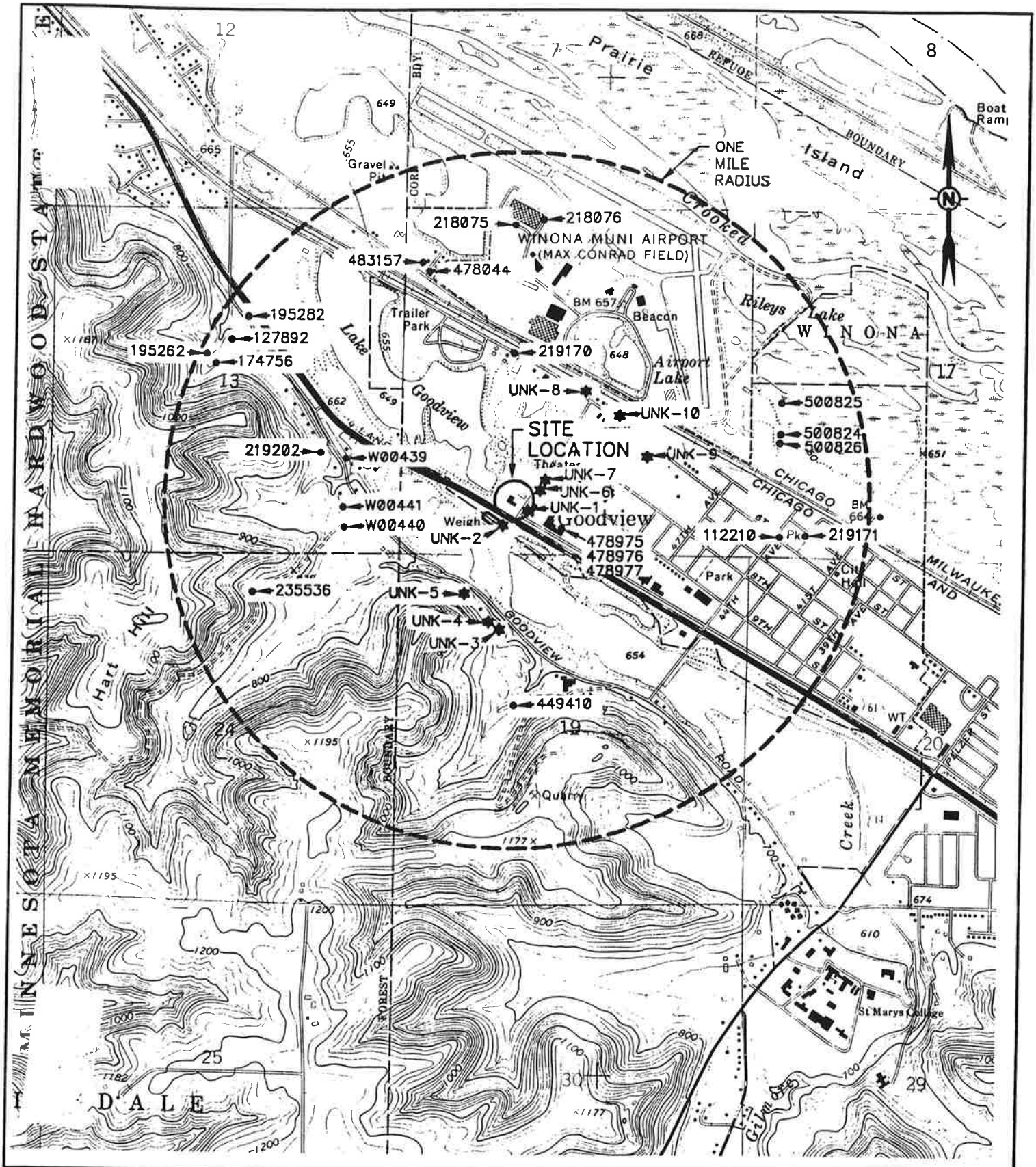
CATCH BASIN | TRENCH GRATES | GROUNDWATER ELEVATION MONITORING WELL UNIQUE WELL NO. | FLOW DIRECTION

SOIL BORING | MAN HOLE

BASE MAP: TWIN CITY TESTING DRAWING 93185-2 DATED 10/11/93.

GROUNDWATER CONTOUR DIAGRAM — ON 2/16/95

Project: MnDOT — WINONA TRUCK STATION Client: MnDOT Location: GOODVIEW, MN		AutoCAD File: 96194L02 STS Project No: 96194-XA Client Proj. No:	Checked by: GJR Approved by: RLD
CAD Operator: SNS	Plot Date: 04-11-1995	Revision No:	Figure: 6



LEGEND

UNK-3 ✱ UNREGISTERED PRIVATE WELL (LOCATIONS PROVIDED BY CITY OF GOODVIEW)

BASE MAP: U.S.G.S. WINONA WEST QUADRANGLE, 7.5 MINUTE SERIES 1972

0' 2000'

SCALE: 1"=2000'

WELL LOCATION DIAGRAM

Project: WELL RECEPTOR SURVEY		AutoCAD File: 96194LOC	Checked by: GJR
Client: MnDOT – WINONA TRUCK STATION		STS Project No: 96194–XA	Approved by: RLD
Location: WINONA, MN		Client Proj. No:	
CAD Operator: SNS	Plot Date: 06–16–1995	Revision No:	Figure: 7