TSR040 Remarks Listing For Leaksite = 3388
Report Date: May 27, 1998

Leaksite ID# 3388	Tank Facility ID 14225
CINEMA PROFESSIONAL BUILDING	ROBIN VANVALKENBURG
Site Name	Responsible Party

LEAKSITE REMARKS

12/17/92:(JME)I spoke w/MJC about this site. He feels that site can be closed once we have rec'd information regarding the unused fuel oil UST. Find out if tank has been removed or properly abandoned (abandonment records) - if so, site can be closed.

2/9/93:(JME)Called Rob VanValkenberg (441-8260) to see if he'd rec'd 12/29 letter - Rob was out - left message for him to call me.

3/16/93:(JME)Called Rob V. again - out for the day - spoke to a woman who said that the UST was abandoned in place - filled w/foam. I said we need documentation/response to 12/29 letter. She said I should fax copy of the letter to Rob at the Cinema Professional Building.
7/3/96 JTC: I am goiing to send out first wakeup letter requesting any response and info they can offer.
7/17/96 JTC: Rob called (828-8400). Will look for tank closure info.
7/22/96 JTC: Recv'd fax of info I was looking for. Fax contained info on tank abandonment in place. Since all previous corresp. was looking for this and mentioned once this was recv'd the site could be closed, I am going to close this site. Therefore, this site is considered closed.

05/27/98 sent to archives kl

End of Remarks

TSR040 Remarks Listing For Leaksite = 3388
Report Date: July 22, 1996

Leaksite ID# 3388	Tank Facility ID 14225
CINEMA PROFESSIONAL BUILDING	ROBIN VANVALKENBURG
Site Name	Responsible Party

LEAKSITE REMARKS

12/17/92:(JME)I spoke w/MJC about this site. He feels that site can be closed once we have rec'd information regarding the unused fuel oil UST. Find out if tank has been removed or properly abandoned (abandonment records) - if so, site can be closed.

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End of Remarks

16-MAR-1993 13:00:32

LEAK REMARKS

Leak ID: 3388
Site Name: CINEMA PROFESSIONAL BUILDING
Site City: ELK RIVER

12/17/92:(JME)I spoke w/MJC about this site. He feels that site can be closed once we have rec'd information regarding the unused fuel oil UST. Find out if tank has been removed or properly abandoned (abandonment records) - if so, site can be closed.

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PROJECT LOG SHEET — PROJECT NAME: Cinema Profess. Bldg. — PROJECT NUMBER: 3388

DATE	STAFF MEMBER	WHO CONTACTED	ACTIVITY (phone number, letter, meeting, etc.)
11/8/90	DR	John Lichter 559-1423	John L. called to ask when report will be reviewed - they (city) want to sell the property. I told him I rec'd the report on 10/31 from Jane Doerboom, gave it to Mitch on 11/2, that he should contact Mitch re turn-around time.
11/21/90	DR	John Lichter	John L. - I called John abt. site, responding to 11/6 letter. I discussed our concerns (receiving RI/CAS report on 10/10, sending standard letter on 10/25, concerns regarding nature of RI activities, etc). John provided the following info: structural borings done by Braun revealed high headspace readings + soil contamination at Hardware store site. Tank was located. Based on these results, the city contracted w the rp to do the RI/CAS. The city wants to buy the old hardware store site. John did not know why the original borings by Braun were done.
5/29/91	DR	discussed w Bob Dullinger re: Petro Bd reimb.	
5/29/91	DR	Sue Bugh via mail	Sue Bugh - DR called Sue to outline reasons why we feel amended site report (see Ltr memo dated 5/8/91) is not necessary. Asked her to let me know if she needs our reasons in writing.
6/3/91	DR	Sue Bugh via mail	Sue Bugh - DR called again to ask if our verbal info was adequate - asked to let me know if she had questions or needed additional written info.

Minnesota Pollution Control Agency
520 Lafayette Road, Saint Paul, Minnesota 55155-3898
Telephone (612) 296-6300

Celebrate MINNESOTA 1990

December 14, 1990

441-4257

Ms. Robin VanValkenberg
12400 Ridgewood Drive Northwest
Elk River, Minnesota 55330

Dear Ms. VanValkenberg:

RE: Petroleum Tank Release Remedial Investigation
Site: Cinema Professional Building, 657 Main Street, Elk River
Site ID#: LEAK00003388

The Minnesota Pollution Control Agency (MPCA) staff has received the Bruce A. Liesch Associates (Liesch) report dated October 1990, documenting and summarizing the results of the soil boring investigation at the above-referenced site. An MPCA hydrologist has reviewed the report. The following comments are based on this review:

1. At this time, the source of the contamination does not appear to be emanating from the former hardware store site where most of the remedial investigation has been conducted.

2. The MPCA staff agrees with the Liesch recommendation to abandon the unused fuel oil tank in place if removal is not possible. This should take place as soon as possible.

3. The MPCA will require no additional investigation due to the limited extent of the area of contamination as well as the drilling constraints at the site. However, if additional investigation of off-site sources shows that a problem persists at this site, additional corrective action may be required in the future.

If you have any questions or require additional information, please contact MPCA hydrologist Mitch Chiodi at 612/643-3460 or me at 612/643-3589.

Sincerely,

Dagmar Romano

Dagmar Romano
Project Leader
Tanks and Spills Section
Hazardous Waste Division

DR:kra

cc: John Lichter, Bruce Al Liesch Associates, Inc., Plymouth

Site Review VAX FILE: cinema.txt

Date: 11/30/90 Hydrogeologist: M. Chiodi

Site Name: Cinema Professional Building

Address: 657 Main Street, Elk River, MN

Leak Number: 00003388

Name of Report: Remedial Investigation

The MPCA staff has reviewed the remedial investigation report by Bruce A. Liesch Associates, Inc. (Liesch) associated with the above referenced site. The source of the contamination does not appear to be emanating from the former hardware store site were most of the remedial investigation has been conducted. At this time, the MPCA agrees with the Liesch recommendation to abandon the unused fuel oil tank inplace if removal is not possible, and the MPCA will require no additional investigation due to the limited areal extent of contamination found and drilling constraints. However, if additional investigation of off site sources show that a problem persists at this site, additional corrective action may be required in the future.

BRUCE A. LIESCH ASSOCIATES, INC.
HYDROGEOLOGISTS • ENGINEERS • ENVIRONMENTAL SCIENTISTS

13400 15th Avenue No. • Plymouth, MN 55441 • 612-559-1423 • FAX No: 559-2202

November 16, 1990

Ms. Dagmar Romano, Project Manager
Tanks and Spills Unit
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

RE: LEAK #3388 - 657 Main Street, Elk River, Minnesota

Dear Ms. Romano:

I am writing on behalf of Mr. Robin VanValkenberg concerning the investigation of this petroleum release. We intend to conduct and complete necessary work on-site to comply with the MPCA request of October 25, 1990. The remedial investigation and proposed corrective action plan have been submitted to MPCA for this site. We appreciate MPCAs efforts to cooperate with the City and Mr. VanValkenberg and look forward to the completion of your review. Please contact me if you have any questions. Thank you.

Sincerely,

John C. Lichter, P.E.

cc: Mr. Robin VanValkenberg
Mr. Steve Rohlf

maw:erltr11-16

Dropped off.
5/30/90

C88-304 PRELIMINARY FOUNDATION INVESTIGATION
Jenne Square Shopping Mall
65 Main Street
Elk River, MN

WINKELMAN BUILDING CORPORATION

December 9, 1988

BRAUN™

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CONSULTING ENGINEERS/
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Reply to address/phone #:

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St. Cloud, MN 56302
(612) 253-9940

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David R. Hausler, P.E.
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James J. Craig, Jr., P.E.
Dale R. Allen, P.E.
Wm. M. Weyrauch, P.E.
Thomas R. Blumberg
Michael M. Heuer, P.E.
Kurt E. Dvorak
Norman E. Hall
Ray A. Huber, P.E.
William K. Cody, P.E.

AFFILIATED COMPANIES
Braun Environmental Laboratories, Inc.
Braun Pavement Technologies, Inc.

December 9, 1988

Winkelman Building Corporation
P.O. Box 1144
St. Cloud, MN 56302

Attn: Mr. Terry Duffy

RE: C88-304 PRELIMINARY FOUNDATION INVESTIGATION
Jenne Square Shopping Mall
65 Main Street
Elk River, Mn

Dear Mr. Duffy:

We recently completed the preliminary subsurface soils and groundwater investigation for the proposed Jenne Square Shopping Mall in Elk River, MN. This work was authorized by you on November 7, 1988. To date, our investigation has consisted of seven standard penetration test borings conducted in the proposed building area.

A concrete slab was encountered at the building site, varying in thickness from one to seven inches at the boring locations. Fill was encountered at three of the boring locations extending from two to possibly eight feet beneath the concrete surface. The fill soils were generally underlain by poorly graded sands which were generally in a very loose to medium dense condition.

Log of Boring sheets indicating the various soil strata encountered, penetration resistances and water level observations; along with our engineering recommendations, are also included in the attached report.

It is our pleasure to be of service to you in providing this preliminary subsurface soils and groundwater investigation. We have scheduled additional field tests to more fully evaluate the bearing capacity and settlement characteristics of the sands at this site. A more detailed report will be

issued when that work is completed. If you have questions regarding the services conducted to date, please contact Mr. Jeff Elliott at 253-9940.

Very truly yours,

BRAUN ENGINEERING TESTING, INC.

R. Jeff Elliott, P.E.
Project Engineer

George D. Kluempke, P.E.
Vice President

RJE/GDK/bjb

cc: Braun - Mpls.

BRAUN

RE: C88-304 PRELIMINARY FOUNDATION INVESTIGATION
Jenne Square Shopping Mall
65 Main Street
Elk River, Mn

A. INTRODUCTION:

A.1. Purpose: The purpose of our investigation was to assist in evaluating the current subsurface soils and groundwater conditions in the proposed building area.

A.2. Scope: The investigation consisted of seven standard penetration test borings which were taken to depths of 15 1/2 to 20 1/2 feet. With the results of these borings we have prepared this report addressing our engineering analysis and recommendations.

A.3. Bore Hole Locations and Surface Elevations: The borings were taken in the building area as requested by your firm. The boring locations are shown on the attached sketch.

The surface elevation at the bore holes were referenced to an assumed bench mark, the top of a sanitary sewer manhole located north of the project site, at the Main Street intersection. An elevation of 100.0 was assumed for this bench mark.

A.4. Field Investigation: The borings were conducted on November 10, 1988, with a truck-mounted core and auger drill. The sampling was in accordance with ASTM D1586 "Penetration Test and Split Barrel Sampling of Soils". Using this method, we

advanced the bore hole with the hollow-stem auger to the desired test depth. Then a 140-pound hammer falling 30 inches drove a standard, 2-inch OD, split barrel sampler a total penetration of 1½ feet below the top of the hollow-stem auger. The blows for the last foot of penetration were recorded and are an index of soil strength characteristics. Soil samples were generally taken at 2½-foot increments to the 10-foot depth and at 5-foot increments to the termination depth of each of the borings. Use of the hollow-stem auger eliminated the driving of casing and the need for jetting water.

A.5. Soil Classifications: Soils encountered in the borings were visually and manually classified in the field by the the crew chief in accordance with ASTM D2487 "Unified Soils Classification System" and ASTM D2488 "Recommended Practice for Visual and Manual Description of Soils." A copy of ASTM D2487 is attached. All samples were then returned to the laboratory for review of the field classifications by a soils engineer.

A.6. Water Level Measurements: Immediately after taking the final sample in the bottom of the borings, the bore holes were probed with the hollow-stem auger in the ground to check for groundwater. In addition, immediately after withdrawal of the auger, the bore holes were again probed and the depth to cave-in and the presence or absence of water was noted. The borings were then immediately backfilled.

B. RESULTS:

B.1. Logs: Log of Boring sheets indicating the depth and identification of the various soil strata, the penetration resistances and water level information are attached. It should

be noted that the depths shown as boundaries between the strata are only approximate. The actual change may be more of a transition and the depth of change likely varies horizontally.

B.2. Soils Encountered: The borings encountered a concrete slab at the surface and extending to depths ranging from 0.1 to 0.6 feet. Two borings, ST-1 and ST-4, encountered silty clayey sand fill and poorly graded sand with silt fill beneath the concrete extending to the two foot depth. Boring ST-5 encountered possible fill beneath the concrete extending to the eight foot depth. The possible fill was underlain by what may be the original topsoil layer which extended to the 8½ foot depth. Boring ST-7 encountered a void space beneath the concrete extending to the four foot depth. In all the borings beneath the fill, possible fill, void space and under the concrete; poorly graded sand was encountered extending to the 15½ to 20½ foot termination depth. At the 14 foot depth in boring ST-3 we observed a petroleum odor in the poorly graded sands.

B.3. Penetration Resistances: The penetration resistances recorded in the poorly graded sands ranged from weight of hammer (WH) to 36 blows per foot (BPF) indicating these cohesionless soils to be in a very loose to dense condition. The penetration resistances recorded in the possible fill ranged from two to eight BPF.

B.4. Water Level Observations: Groundwater was encountered at the 17-foot depth when probing the bore hole ST-6 through the hollow-stem auger. In the remaining bore holes groundwater was not encountered to cave-in depths ranging from five to ten feet when probing the bore holes immediately after removal of the auger. Based on the probings, the moisture content and

coloration of the various soils encountered, the current groundwater level is likely near elevation 67± at the boring locations.

Water level readings have been made in the borings at the times and under the conditions stated on the boring logs. This data has been reviewed and interpretations made in the text of this report. However, it must be noted that the period of observation was relatively short and that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors not evident at the time measurements were made and reported herein. Design drawings and specifications and construction planning should recognize the possibilities of variations

C. ANALYSIS AND RECOMMENDATIONS:

C.1. Available Design Criteria: The proposed building will be a four-story, pre-cast concrete structure. The structure will have outside nominal dimensions of 71 by 140 feet and will be supported primarily by interior columns and exterior footings. Column loadings are anticipated to be on the order of 92 to 435 kips per column. 9940

Ground floor grade is anticipated to be at elevation 80±. The interior column footings will be situated at approximate elevation 78±.

C.2. Suitability of Existing Soils: The borings encountered fill, possible fill, a void space and very loose native sands in the proposed building area. In addition, directly adjacent to the project site is an existing building and a primary street.

Our initial calculations indicate that a soil correction or soil stabilization program would be required to provide adequate support for the proposed structure. In order to provide soil capable of supporting column pads sized so as to exert a soil pressure of at least 4,000 pounds per square foot, subcutting of the existing soils to a depth of at least eight feet below footing grade would be required. Placement of compacted structural fill could result in adequate soil conditions capable of limiting total settlement to less than 2 inches.

This soil correction would require excavation below the existing building foundations which would require additional costs to either stabilize these soils or provide temporary sheeting and bracing of the excavation. You subsequently requested that we initiate discussions with firms providing soil stabilization services. The costs for those services appears to be high such that you are developing other construction alternatives. As an example, changing the structure from a precast concrete to a steel-frame structure would reduce the loads. In addition, you have requested that we conduct additional borings and perform pressuremeter tests to obtain more detailed information as to the bearing capacity and settlement characteristics of the natural soils. These tests will allow us to provide additional information regarding:

- the extent of soil correction required
- structural fill placement and compaction criteria
- the bearing capacity of the various soils
- the potential for settlement of the building foundation, slabs and surrounding structures.

A more detailed evaluation of the foundation criteria for this structure will then be provided. This additional testing is scheduled for Wednesday, December 14, 1988.

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C.3. Groundwater Conditions: As previously indicated, water was encountered in one boring location at elevation 67±. Any groundwater which may be encountered during foundation construction could likely be controlled utilizing sump pumps.

C.4. Contaminated Soils: During the boring of ST-3 on November 10, 1988, strong petroleum odors and visible dark staining were noted at the 14 to 15 1/2 foot depth. Although characterization by chemical analysis is outside the present scope of work, these odors appear to be those of petroleum. All split spoon samples were transported to our chemical laboratory and examined with an H-Nu photoionization detector on November 11, 1988. With the exception of the sample mentioned above, all H-Nu readings of the soil samples were at normal background levels. The 14 to 15 1/2 foot sample interval in boring ST-3 yielded readings of approximately 200 parts per million.

The property owner, Ms. Erma Jenne, was asked by Mr. Terry Duffy whether there had been any above ground or underground gasoline storage tanks on the premises. She stated that she has owned the property for 40 years, and during that time there had been no such tanks. This, coupled with the depth and restricted area at which the contamination was noted, indicates that in our opinion, that the contamination is likely coming from an off-site source. The occurrence of the contamination at the water table is also consistent with the concept of migration of the contaminants along the surface of the water table from an off-site source.

State law requires notification of the Minnesota Pollution Control Agency (MPCA) when contamination is encountered. After a discussion between Terry Duffy, Doug Bergstrom (BRAUN), and Al Palmer (BRAUN) on November 11, 1988, Mr. Duffy instructed BRAUN

643.3455 - JANE BOGRHOOM (Prof. - ... SITES)
520 LAFAYETTE
643.3460 ANN BIDWELL
643.3461 SANDY ...
TANKS: SPILLS - 643.3464

to notify the MPCA. On November 14, 1988, Ms. Pat Chabot (TRANSFERRED) of the Minnesota Pollution Control Agency was notified of the contamination that was observed by Mr. Bergstrom, and also of our opinion that it was likely coming from an off-site source. We recommend that you forward a copy of this report to her at 250 Lafayette Road, St. Paul, MN 55155.

D. GENERAL REMARKS:

D.1. Basis of Recommendation: The analysis and recommendations submitted in this report are based upon the data obtained from the seven soil borings performed at the locations indicated on the attached sketch. Variations may occur between these borings, the nature and extent of which may not become evident until construction. If variations are encountered, it will be necessary to make a re-evaluation of the recommendations of this report after performing on-site observations during the construction and noting the characteristics of any variations. Such variations may result in additional foundation costs and it is suggested that a contingency be provided for this purpose.

To permit correlation of the soil data obtained to date with the actual soil conditions encountered during construction and to provide continuing professional responsibility for the conformance of the construction to the concepts originally contemplated in this report and to the plans and specifications, it is recommended that we be retained to develop and perform the necessary observation and testing program for the excavation and foundation phases of the project.

If others perform the recommended observations and/or testing of construction, professional responsibility becomes divided since

in doing so, they assume responsibility for evaluating that the soil conditions throughout the construction areas are similar to those encountered in the borings or recognizing variations which would require a change in recommendations.

D.2. Plan Review: This report is based on the design of the proposed structure as submitted to us for preparation of this report. It is recommended that we be retained to briefly review the final design and specifications to determine whether any changes in design may have had any effect on the validity of the recommendations contained in this report, and whether those recommendations have been correctly communicated to you so that their intent has been implemented in the design and specifications. If we are not permitted to make this recommended review, we will not be liable for losses arising out of such design changes, or misinterpretation or misapplication of our recommendations.

D.3. Level of Care: Services performed by the geotechnical and material engineers for this project have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in this area under similar budget and time restraints. No warranty, expressed or implied, is made.

D.4. Professional Certification: I hereby certify that this report was prepared by me or under direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

R. Jeff Elliott (WAP)

R. Jeff Elliott, P.E.
Registration Number: 19174
Date: December 9, 1988

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Billings & Bozeman, MT
Chicago, IL

Reply to:
P.O. Box 189
St. Cloud, MN 56302

LABORATORY TEST OF AGGREGATES

Date: December 1, 1988

Project: C88-304 FOUNDATION INVESTIGATION
Jenne Square Shopping Mall
65 Main Street
Elk River, MN

Reported To: Winkelman Building Corporation
P.O. Box 1144
St. Cloud, MN 56302
Attn: Mr. Terry Duffy

Copies To:

FIELD DATA

Sample #:	A
Date Sampled:	11-10-88
Date Received:	11-10-88
Date Tested:	11-30-88
Classification:	SP - POORLY GRADED SAND, fine to medium grained, with a trace of GRAVEL, brown.
Sample Location:	Composite from boring ST-1, ST-6, & ST-7, at the 0 to 10 foot depth

LABORATORY DATA GRADATION

Sieve Size	% Passing	Specifications
#4	100	
#10	97	
#40	60	
#100	10	
#200	3.8	

REMARKS:

BRAUN ENGINEERING TESTING, INC.

R. Jeff Elliott

R. Jeff Elliott, P.E.
Project Engineer

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Date: December 1, 1988

Project: C88-304 FOUNDATION INVESTIGATION
Jenne Square Shopping Mall
65 Main Street
Elk River, MN

Reported To: Winkelman Building Corporation
P.O. Box 1144
St. Cloud, MN 56302
Attn: Mr. Terry Duffy

Copies To:

FIELD DATA

Sample #:	B
Date Sampled:	11-10-88
Date Received:	11-10-88
Date Tested:	11-29-88
Classification:	SP - POORLY GRADED SAND, fine to medium grained, with a trace of GRAVEL, brown.
Sample Location:	Composite from boring ST-2, ST-4, & ST-5, at the 0 to 10 foot depth

LABORATORY DATA GRADATION

Sieve Size	% Passing	Specifications
#4	100	
#10	95	
#40	49	
#100	5	
#200	2.4	

REMARKS:

BRAUN ENGINEERING TESTING, INC.

R. Jeff Elliott

R. Jeff Elliott, P.E.
Project Engineer

BRAUN ENGINEERING TESTING Incorporated

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eply to:
P.O. Box 189
St. Cloud, MN 56302

LABORATORY TEST OF AGGREGATES

Date: December 1, 1988

Project: C88-304 FOUNDATION INVESTIGATION
Jenne Square Shopping Mall
65 Main Street
Elk River, MN

Reported To: Winkelman Building Corporation
P.O. Box 1144
St. Cloud, MN 56302
Attn: Mr. Terry Duffy

Copies To:

FIELD DATA

Sample #:	C
Date Sampled:	11-10-88
Date Received:	11-10-88
Date Tested:	11-30-88
Classification:	SP - POORLY GRADED SAND, medium to coarse sand, with GRAVEL, brown.
Sample Location:	Boring ST-3, at the 0 to 10 foot depth

LABORATORY DATA GRADATION

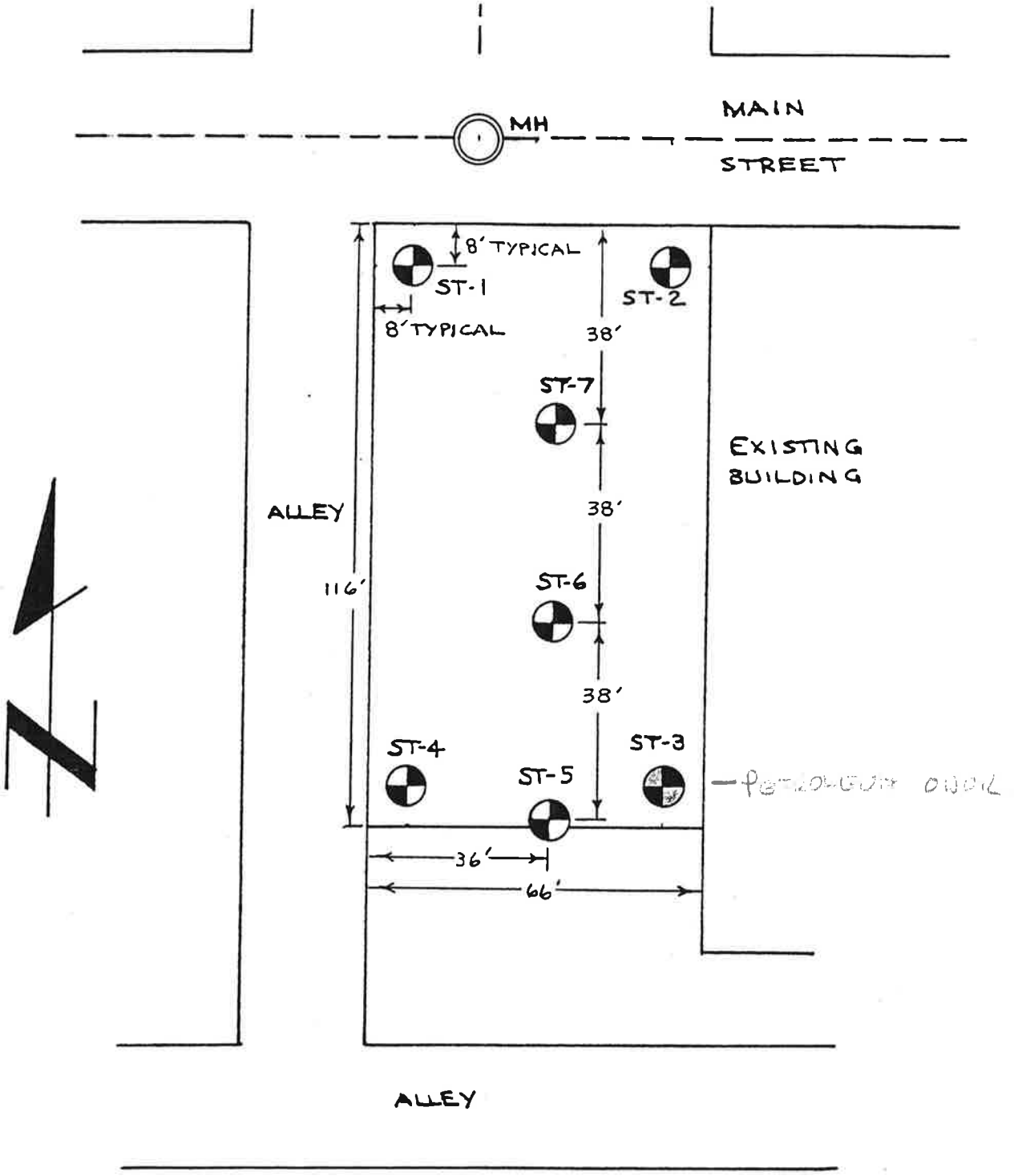
Sieve Size	% Passing	Specifications
1 1/2"	100	
1"	95	
3/4"	91	
3/8"	82	
#4	70	
#10	57	
#40	14	
#100	6	
#200	4.4	

REMARKS:

BRAUN ENGINEERING TESTING, INC.

R. Jeff Elliott

R. Jeff Elliott, P.E.
Project Engineer



denotes location of standard penetration test boring.

BRAUN

C88-304 FOUNDATION INVESTIGATION
Jenne Square Shopping Mall
65 Main Street
Elk River, MN.

Date: 11/29/88	Revised:	Drawn: RJE	Scale: 1" = 30'

LOG OF BORING

BRAUN ENGINEERING TESTING

PROJECT: C88-304 FOUNDATION INVESTIGATION Jenne Square Shopping Mall 665 Main Street Elk River, MN	BORING: ST-1 LOCATION: See Attached Sketch DATE: 11-10-88 SCALE: 1"=4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
80.2	0.0					
79.7	0.5		Concrete.			[1]dark brown, moist.
78.2	2.0		FILL: consisting primarily of SILTY CLAYEY SAND (SC-SM), mostly fine to medium grained,[1]			Surface elevation at the bore holes were referenced to the top of a sanitary sewer manhole located North of the project site, at the Main Street intersection. An elevation of 100.0 was assumed for this bench mark.
		SP	POORLY GRADED SAND, mostly fine to medium grained, with a trace of GRAVEL, brown, moist to waterbearing, very loose to loose. (Outwash)	4		
				6		
				8		
				7		
				6		
64.7	15.5			4		
			END OF BORING. Water level not encountered to cave-in depth of 10' immediately after withdrawal of auger. Boring immediately backfilled.			

(See Report and Standard Plates for evaluation and descriptive terminology.)

LOG OF BORING

BRAUN ENGINEERING TESTING

PROJECT:	BORING: ST-2
C88-304 FOUNDATION INVESTIGATION Jenne Square Shopping Mall 665 Main Street Elk River, MN	LOCATION: See Attached Sketch
	DATE: 11-10-88 SCALE: 1"=4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
80.2	0.0					
79.6	0.6		Concrete.			
		SP	POORLY GRADED SAND, mostly fine to medium grained, light brown to brown, moist to waterbearing, very loose to loose. (Coarse Alluvium)	8		
				8		
				6		
				5		
				5		
64.7	15.5			4		
			END OF BORING. Water level not encountered to cave-in depth of 10' immediately after withdrawal of auger. Boring immediately backfilled.			

(See Report and Standard Plates for evaluation and descriptive terminology.)

LOG OF BORING

BRAUN ENGINEERING TESTING

PROJECT:	BORING: ST-3
C88-304 FOUNDATION INVESTIGATION Jenne Square Shopping Mall 665 Main Street Elk River, MN	LOCATION: See Attached Sketch
	DATE: 11-10-88 SCALE: 1"=4'

(See Report and Standard Plates for evaluation and descriptive terminology.)

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
79.7	0.0					
79.6	0.1		Concrete.			
		SP	POORLY GRADED SAND, mostly fine to medium grained, with GRAVEL, dark brown to brown, moist, loose to medium dense. (Outwash)	6		
				7		
				11		
				7		
				7		
65.7	14.0					
		SP	POORLY GRADED SAND, mostly fine to medium grained, gray, with heavy petroleum odor,[1]	6		[1]waterbearing, loose. (Coarse Alluvium)
64.2	15.5					
			END OF BORING. Water level not encountered to cave-in depth of 5' immediately after withdrawal of auger. Boring immediately backfilled.			

LOG OF BORING

BRAUN ENGINEERING TESTING

PROJECT:
C88-304 FOUNDATION INVESTIGATION
Jenne Square Shopping Mall
665 Main Street
Elk River, MN

BORING: ST-4

LOCATION:
See Attached Sketch

DATE: 11-10-88

SCALE: 1"=4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
79.8	0.0					
79.7	0.1		Concrete.			
77.8	2.0		FILL: consisting primarily of POORLY GRADED SAND with SILT (SP-SM), mostly fine to medium[1]			[1]grained, with GRAVEL, dark brown, moist.
		SP	POORLY GRADED SAND, mostly fine to medium grained, with a trace of GRAVEL, dark brown to light brown, moist, very loose to loose. (Outwash)	4 6 7		
71.8	8.0	SP	POORLY GRADED SAND, mostly fine to medium grained, wtih a little GRAVEL, dark brown, moist to waterbearing, loose to dense. (Outwash)	8 36 15		
64.3	15.5		END OF BORING. Water level not encountered to cave-in depth of 7' immediately after withdrawal of auger. Boring immediately backfilled.			

(See Report and Standard Plates for evaluation and descriptive terminology.)

LOG OF BORING

BRAUN ENGINEERING TESTING

PROJECT:	BORING: ST-5
C88-304 FOUNDATION INVESTIGATION Jenne Square Shopping Mall 665 Main Street Elk River, MN	LOCATION: See Attached Sketch
	DATE: 11-10-88 SCALE: 1"=4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
79.7	0.0					
79.2	0.5		Concrete.			
			POSSIBLE FILL: consisting primarily of POORLY GRADED SAND with SILT (SP-SM) and POORLY GRADED SAND (SP), mostly fine to medium grained, dark brown to brown, moist.	8		
				6		
				2		
71.7	8.0					
71.2	8.5	SP	POORLY GRADED SAND, mostly fine[1]			[1]to medium grained, black, moist, very loose. (Possible Topsoil)
		SP	POORLY GRADED SAND, mostly fine to medium grained, brown, moist, loose to medium dense.. (Coarse Alluvium)	9		
67.7	12.0					
		SP	POORLY GRADED SAND, mostly fine to medium grained, with GRAVEL, brown, wet to waterbearing, medium dense. (Outwash)	19		
64.2	15.5			11		
			END OF BORING. Water level not encountered to cave-in depth of 9' immediately after withdrawal of auger. Boring immediately backfilled.			

(See Report and Standard Plates for evaluation and descriptive terminology.)

LOG OF BORING

BRAUN ENGINEERING TESTING

PROJECT:
C88-304 FOUNDATION INVESTIGATION
Jenne Square Shopping Mall
665 Main Street
Elk River, MN

BORING: ST-6

LOCATION:
See Attached Sketch

DATE: 11-10-88

SCALE: 1"=4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
80.0	0.0					
79.5	0.5		Concrete.			
		SP	POORLY GRADED SAND, mostly fine grained, brown, moist, loose. (Coarse Alluvium)	8		
				5		
73.5	6.5					
		SP	POORLY GRADED SAND, mostly fine to medium grained, brown, moist to waterbearing, loose. (Coarse Alluvium)	5		
				5		
				7		
				8		
62.5	17.5					
		SP	POORLY GRADED SAND, mostly fine to medium grained, with a trace of GRAVEL, brown, waterbearing, medium dense. (Outwash)	18		
59.5	20.5					
			END OF BORING. Water level down 17' with 20' of hollow-stem auger in the ground. Water level not encountered to cave-in depth of 10' immediately after withdrawal of auger. Boring immediately backfilled.			

(See Report and Standard Plates for evaluation and descriptive terminology.)

LOG OF BORING

BRAUN ENGINEERING TESTING

PROJECT:
C88-304 FOUNDATION INVESTIGATION
Jenne Square Shopping Mall
665 Main Street
Elk River, MN

BORING: ST-7

LOCATION:
See Attached Sketch

DATE: 11-10-88

SCALE: 1"=4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
80.1	0.0					
79.6	0.5		Concrete.			
			VOID Space Under Concrete.			
76.1	4.0					
		SP	POORLY GRADED SAND, mostly fine grained, brown, moist, very loose. (Coarse Alluvium)	W.H.		
				1		
				1		
68.1	12.0					
		SP	POORLY GRADED SAND, mostly fine to medium grained, brown, wet to waterbearing, loose. (Coarse Alluvium)	10		
64.6	15.5			7		
			END OF BORING. Water level not encountered to cave-in depth of 10' immediately after withdrawal of auger. Boring immediately backfilled.			

(See Report and Standard Plates for evaluation and descriptive terminology.)

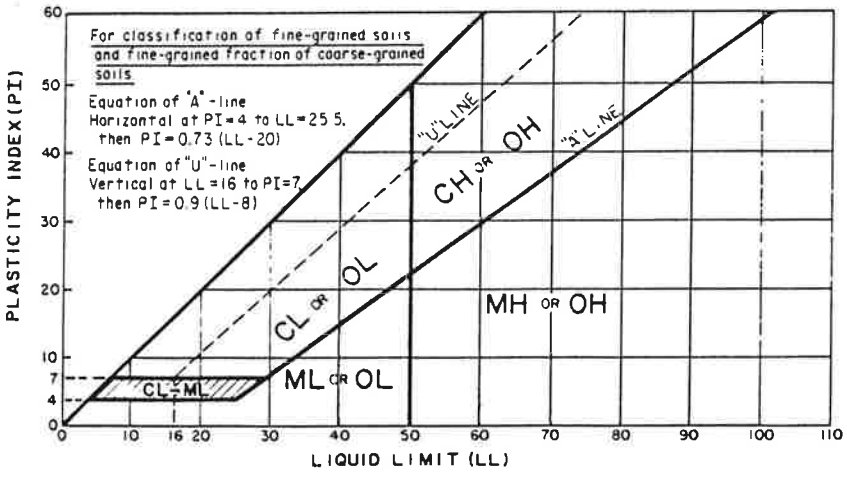
Descriptive Terminology

Designation D 2487 — 83

Standard Test Method for CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

CRITERIA FOR ASSIGNING GROUP SYMBOLS AND GROUP NAMES USING LABORATORY TESTS [a]				SOIL CLASSIFICATION	
				GROUP SYMBOL	GROUP NAME [b]
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVELS More than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS Less than 5% fines [c]	$C_u \geq 4$ and $1 \leq C_c \leq 3$ [e]	GW	Well-graded gravel [f]
			$C_u < 4$ and/or $1 > C_c > 3$ [e]	GP	Poorly graded gravel [f]
		GRAVELS WITH FINES More than 12% fines [c]	Fines classify as ML or MH	GM	Silty gravel [f,g,h]
			Fines classify as CL or CH	GC	Clayey gravel [f,g,h]
	SANDS 50% or more of coarse fraction passes No. 4 sieve	CLEAN SANDS Less than 5% fines [d]	$C_u \geq 6$ and $1 \leq C_c \leq 3$ [e]	SW	Well-graded sand [i]
			$C_u < 6$ and/or $1 > C_c > 3$ [e]	SP	Poorly graded sand [i]
		SANDS WITH FINES More than 12% fines [d]	Fines classify as ML or MH	SM	Silty sand [g,h,i]
			Fines classify as CL or CH	SC	Clayey sand [g,h,i]
FINE-GRAINED SOILS 50% or more passed the No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50%	inorganic	PI > 7 and plots on or above "A" line [j]	CL	Lean clay [k,l,m]
			PI < 4 or plots below "A" line [j]	ML	Silt [k,l,m]
		organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic clay [k,l,m,n] Organic silt [k,l,m,o]
	SILTS AND CLAYS Liquid limit 50% or more	inorganic	PI plots on or above "A" line	CH	Fat clay [k,l,m]
			PI plots below "A" line	MH	Elastic silt [k,l,m]
		organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic clay [k,l,m,p] Organic silt [k,l,m,q]
Highly organic soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

a. Based on the material passing the 3-in (75-mm) sieve.
b. If field sample contained cobbles and/or boulders, add "with cobbles and/or boulders" to group name.
c. Gravels with 5 to 12% fines require dual symbols
   GW-GM well graded gravel with silt
   GW-GC well graded gravel with clay
   GP-GM poorly graded gravel with silt
   GP-GC poorly graded gravel with clay
d. Sands with 5 to 12% fines require dual symbols
   SW-SM well graded sand with silt
   SW-SC well graded sand with clay
   SP-SM poorly graded sand with silt
   SP-SC poorly graded sand with clay
e. $C_u = D_{60}/D_{10}$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
f. If soil contains ≥ 15% sand, add "with sand" to group name.
g. If fines classify as CL-ML, use dual symbol GC-GM, SC-SM.
h. If fines are organic, add "with organic fines" to group name.
i. If soil contains ≥ 15% gravel, add "with gravel" to group name.
j. If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
k. If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant.
l. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
m. If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
n. PI ≥ 4 and plots on or above "A" line.
o. PI < 4 or plots below "A" line.
p. PI plots on or above "A" line.
q. PI plots below "A" line.



LABORATORY TESTS

DD	Dry Density, pcf	OC	Organic Content, %
WD	Wet Density, pcf	S	Percent of Saturation, %
MC	Natural Moisture Content, %	SG	Specific Gravity
LL	Liquid Limit, %	C	Cohesion
PL	Plastic Limit, %	Ø	Angle of Internal Friction
PI	Plasticity Index, %	qu	Unconfined Compressive Strength

PARTICLE SIZE IDENTIFICATION

Boulders	over 12"
Cobbles	3" to 12"
Gravel	
Coarse	¾" — 3"
Fine	No. 4 — ¾"
Sand	
Coarse	No. 4 — No. 10
Medium	No. 10 — No. 40
Fine	No. 40 — No. 200
Silt	No. 200 — .005 mm
Clay	less than .005 mm

RELATIVE DENSITY OF COHESIONLESS SOILS

very loose	0 — 4 B
loose	5 — 10 B
medium dense	11 — 30 B
dense	31 — 50 B
very dense	50+ B

CONSISTENCY OF COHESIVE SOILS

very soft	0 — 1 B
soft	2 — 3 B
rather soft	4 — 5 B
medium	6 — 8 B
rather stiff	9 — 12 B
stiff	13 — 16 B
very stiff	17 — 30 B
hard	30+ B

DRILLING NOTES

Standard penetration test borings were advanced by 3¼" or 6 I.D. hollow-stem augers unless noted otherwise. Jetting water w used to clean out auger prior to sampling only where indicated logs. Standard penetration test borings are designated by t prefix "ST" (Split Tube).

Power auger borings were advanced by 4" or 6" diamet continuous-flite, solid stem augers. Soil classification and str depths are inferred from disturbed samples augered to the surfa and are therefore somewhat approximate. Power auger borin are designated by the prefix "B".

Hand probings were advanced manually with a 1½" diame probe and are limited to the depth from which the probe can manually withdrawn. Hand probings are indicated by the pre "H".

SAMPLING — All samples are taken with the standard 2" O split tube sampler, except where noted. TW indicates thin-w (undisturbed) sample.

BPF — Numbers indicate blows per foot recorded in standa penetration test, also known as "N" value. The sampler is set into undisturbed soil below the hollow-stem auger. Drivi resistances are then counted for second and third 6" incremer and added to get BPF. Where they differ significantly, they a reported in the following form — 2/12 for the second and third increments respectively.

WH — WH indicates that sampler penetrated soil under weight hammer and rods alone, driving not required.

NOTE — All tests run in accordance with applicable AST standards.

BRAUN

REMEDIAL

INVESTIGATION AT

65 MAIN STREET

ELK RIVER, MINNESOTA

PREPARED FOR:

CITY OF ELK RIVER

7420 DODGE AVENUE NW

ELK RIVER, MINNESOTA

OCTOBER 8, 1990

PREPARED BY:

BRUCE A. LIESCH ASSOCIATES, INC.

13400 15TH AVENUE NORTH

PLYMOUTH, MINNESOTA 55441

(612) 559-1423

This report was prepared by
me or under my direct supervision.

James E. Graham

James E. Graham
Hydrogeologist

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APPENDICES (Following Tables)

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Appendix B	Soil Boring Logs
Appendix C	MPCA Jar Headspace Analytical Screening Procedures
Appendix D	Laboratory Test Results
Appendix E	MPCA UST Notification Form

1.0 INTRODUCTION

The City of Elk River retained Bruce A. Liesch Associates, Inc. (Liesch) to conduct a remedial investigation at 65 Main Street in Elk River, Minnesota. Figure 1 illustrates the general site location.

2.0 SCOPE OF INVESTIGATION

This remedial investigation included: the observation of soil boring installations; collection of soil and groundwater samples for laboratory analyses; monitoring of breathing zone conditions during drilling operations using an organic vapor monitor (OVM); and headspace analyses of collected soil samples utilizing the OVM. The purpose of this report is to document and summarize the results of the soil boring investigation.

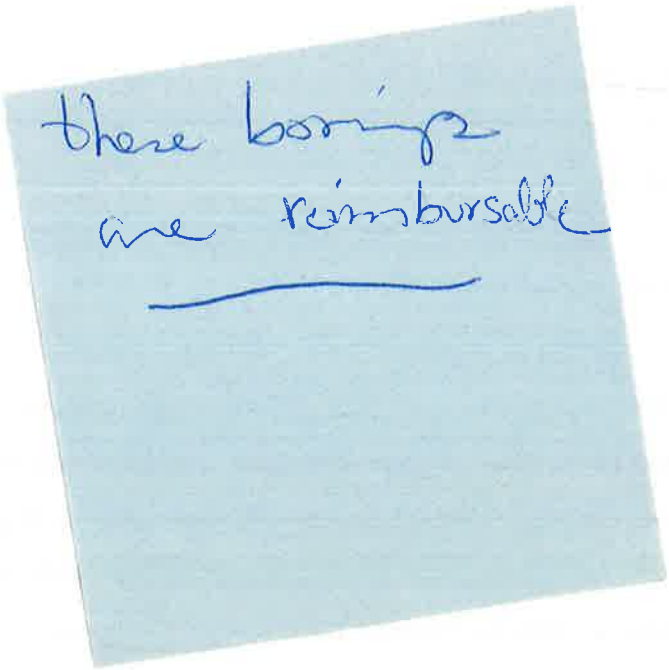
3.0 SITE HISTORY

This site currently consists of a concrete building foundation and retaining walls on three sides. The site was previously the location of a hardware store which was destroyed by fire in June, 1987. In response to proposed new construction at the site, Braun Engineering Testing, Inc. (Braun) located in St. Cloud, Minnesota conducted a preliminary foundation investigation at the site which consisted of seven standard penetration test borings. During the installation of these soil borings on November 10, 1988, Braun identified "strong petroleum odors and visible dark staining at the 14 to 15 1/2 foot depth" in soil boring ST-3 (see Figure 2). On November 14, 1988, Ms. Pat Chabot of the Minnesota Pollution Control Agency (MPCA) was notified of the petroleum impacted soil at the site. In addition, the "Preliminary Foundation Investigation" report prepared by Braun, dated December 9, 1988, was submitted to the MPCA for review and comment.

No known source

Did NOT want to pay for review at that time.

Ms. Jane Boerboom of the MPCA acknowledged receipt of the Braun report in a letter dated June 14, 1990 and indicated that MPCA would require reimbursement for technical


these bonus
are reimbursable

review of the report. A copy of the MPCA letter to Mr. James Trucker, a consultant for the project is contained in Appendix A.

On July 13, 1990, Liesch representative Mr. John Lichter conducted a site visit of the property at the request of Mr. Pat Klaers, City Administrator, to investigate a potential petroleum release in the vicinity of soil boring ST-3 which is located at the southeast portion of the site (see Figure 2). During a walk-over survey of an existing three story apartment building which included an attached garage in the rear of the building, an underground storage tank (UST) was discovered in the garage. The tank appeared to be approximately eight feet in length and three to four feet in diameter. The garage is located adjacent to and east of soil boring ST-3. An apparent fill and vent pipe were located adjacent to the western edge of the garage, near soil boring ST-3. Figure 3 illustrates the location of the tank and associated structures. The tank reportedly has not been used since 1976 and no product could be recovered from the tank when an attempt was made to pump the tank approximately ten years ago.

The City of Elk River subsequently retained Liesch to conduct a soil boring investigation at the site to: characterize the apparent extent of petroleum impacted soil and ground water; determine the levels of benzene, toluene, ethyl benzene, xylene (BTEX) in the soil and ground water; confirm groundwater flow direction; and to further investigate the geology and stratigraphy of the site.

4.0 SOIL BORING INVESTIGATION

Twin City Testing Corporation, Inc. (TCT) located in St. Paul, Minnesota was retained to install the soil borings. The installation of soil borings began on September 17, 1990 and were completed on September 19, 1990. Soil boring locations are shown on Figure 3 and logs of borings are contained in Appendix B.

A total of ten soil borings were installed at the site. The site is located in the northeast quarter of the northeast quarter of the southwest quarter of the southwest quarter of Section 34, Township 33 North, Range 26 West. The approximate longitude and latitude of the site is 93 degrees, 34 minutes, 1 second and 45 degrees, 18 minutes, 9 seconds, respectively. Soil borings were installed by a CME 55 drill rig using 4 1/4-inch inside diameter (I.D.) hollow stem augers (HSA). Soil samples were obtained in each borehole by the split barrel method in accordance with American Society for Testing Materials (ASTM) D1586. Soil samples were classified in the field following the Unified Soil Classification System (USCS) using visual-manual procedures. Soil samples were collected at five foot intervals and at major changes in lithology.

Liesch conducted headspace analyses on collected soil samples in the field using a Thermo Environmental Instruments OVM (10.0 e.V. Photoionization Detector) to identify the presence of organic vapors down to 0.1 parts per million (ppm). The potentially detectable compounds include volatile organic compounds and constituents associated with gasoline, diesel fuel and fuel oil. Headspace analyses were conducted following MPCA Jar Headspace Analytical Screening Procedures (see Appendix C). Air quality was periodically monitored using the OVM both in the breathing zone and at the top of the auger during drilling operations. Background OVM readings during drilling were less than 1.0 ppm.

All boreholes were advanced to a point approximately three feet below the apparent groundwater level. Water samples were collected from the boreholes utilizing a temporarily installed flush threaded PVC well screen and riser. After collecting the water samples with a Voss disposable teflon bailer, the PVC casing and well screen were removed and the borehole abandoned with neat cement grout. Water samples were submitted for laboratory analyses. The PVC casing, well screen and HSA were steam cleaned prior to arriving at the site and between boreholes. During sampling procedures at each borehole, the split spoon sampler was rinsed with clean water prior to collection of the next sample. A separate disposable bailer was utilized at each borehole to collect water samples.

4.1 Geology

The site stratigraphy consists primarily of fine to coarse grained sands as illustrated by cross-sections A-A' and B-B' (Figures 5 and 6). Headspace analyses conducted in the field on collected soil samples from B-3, B-4, B-8, B-9 and B-10 did not indicate the presence of detectable organic vapors. In addition, stained soils and odors were not encountered during the advancement of HSA at these locations. Table 1 presents the results of headspace analyses conducted on collected soil samples.

Headspace analyses did indicate the presence of organic vapors in soil samples from B-1, B-2, B-5, B-6 and B-7 (see Table 1). Headspace analyses indicated the highest concentration of organic vapors in soil samples collected near the groundwater level at B-2 and B-5. In addition, stained soils and odors were observed in the soil samples from B-1 (12.0 to 14.0 feet), B-2 (13.0 to 15.0 feet), B-5 (13.0 to 15.0 feet) and B-7 (13.0 to 15.0 feet).

4.2 Hydrogeology

The boreholes were left open below grade and covered at the ground surface to allow ground water to recharge the boreholes prior to abandonment. After allowing groundwater recharge, Liesch personnel measured and recorded the depths to ground water (see Logs of Borings, Appendix B). Water samples were subsequently collected from each borehole for laboratory analyses. Although petroleum sheens or product were not observed on the water samples collected from the boreholes, slight odors were apparent in the samples collected from B-1, B-2, B-5, B-6 and B-7.

After completion of the borings, elevations of the ground surface adjacent to each borehole were determined by survey assuming a temporary benchmark elevation of 100.00 feet on top of the fire hydrant located northeast of the site (see Figure 4). These ground elevations were then used to determine groundwater elevations for the soil borings as

shown in Table 2. Based on these groundwater elevations, groundwater flow at the site was interpreted to be southeast towards the Mississippi River as illustrated by the groundwater contour map (see Figure 7).

5.0 ANALYTICAL TEST RESULTS

A total of ten soil and ten water samples were submitted to Minnesota Valley Testing Laboratories, Inc. (MVTL) located in New Ulm, Minnesota for laboratory analyses. The soil samples were analyzed for BTEX and total petroleum hydrocarbons (TPH). The water samples were analyzed for volatile organic hydrocarbons (465C List). Appendix D contains copies of analytical test results and chain of custody forms.

5.1 Soil Test Results

BTEX and TPH were not detected above laboratory method detection limits (MDL) in soil samples collected from B-1, B-3, B-4, B-6, B-8, B-9 and B-10. Ethyl benzene was detected at 1200 parts per billion (ppb), benzene at 1100 ppb, toluene at 2300 ppb, xylene at 3700 ppb and TPH at 330 ppm as gas or 600 ppm as fuel oil in the soil sample collected from B-2 (13.0 to 15.0 feet). Although benzene was not detected in the sample from B-5 (3.0 to 15.0 feet), ethyl benzene, toluene, xylene, and TPH were detected at 38.7 ppb, 56.0 ppb, 110 ppb and 12 ppm as gas or 24 ppm as fuel oil, respectively. Although ethyl benzene and xylene were detected at low levels in the sample from B-7 (13.0 to 15.0 feet), benzene, toluene and TPH were not detected above laboratory MDL. Table 3 presents analytical test results for collected soil samples.

5.2 Water Quality

Table 4 presents analytical test results for collected water samples. Benzene was detected at 4.4 ppb, ethyl benzene at 13.9 ppb and xylene at 12 ppb in the water sample collected from B-1. BTEX were also detected in the sample from B-2 at 600 ppb, 34.0

ppb, 470 ppb and 448 ppb, respectively. Laboratory test results also indicated the presence of benzene at 110 ppb, toluene at 4.7 ppb, ethyl benzene at 39.6 ppb, xylene at 59.1 ppb, cumene at 2.5 ppb and ethyl ether at 1.9 ppb in the water sample from B-5. Benzene was detected at 29.1 ppb, ethyl benzene at 16.9 ppb, xylene at 3.6 ppb and cumene at 2.0 ppb in the sample from B-6. Benzene, ethyl benzene and xylene were also detected in the sample from B-7 at 43.6 ppb, 12.6 ppb and 27.6 ppb, respectively.

Volatile organic hydrocarbons (465C List) were not detected above laboratory MDL in the water samples from B-3, B-4, B-8, B-9 and B-10 with the exception of methylene chloride which was detected near the laboratory MDL at 3.1 ppb in the sample from B-10.

The Minnesota Department of Health (MDH) recommended allowable limit (RAL) for benzene in drinking water was exceeded in the water samples from B-2, B-5, B-6 and B-7. The MDH RAL for xylene was also exceeded in the sample from B-2. The concentrations of the other compounds detected in the water samples did not exceed MDH RALs.

Although the source of the cumene, ethyl ether and methylene chloride is unknown, the concentration of these compounds was low (at the laboratory MDL). Cumene and ethyl ether are likely associated with the petroleum product release.

6.0 SUMMARY

During the installation of soil borings, headspace analyses on collected soil samples indicated the presence of detectable organic vapors. Subsequent laboratory analyses on soil and water samples collected from B-1, B-2, B-5, B-6 and B-7 confirmed the above observations with BTEX and TPH being detected above laboratory MDL. The MDH RAL for benzene was exceeded in several of the water samples. Xylene also exceeded the

MDH RAL in the water sample collected from B-2. Other compounds detected in the collected water samples did not exceed MDH RALs. Petroleum sheens or free product were not observed on the water samples collected from the boreholes.

Based on field observations, headspace analyses and laboratory test results, it appears groundwater quality has been impacted by a petroleum release. The primary downgradient potential target receptor is apparently the Mississippi River due to its close proximal distance to the site. The north bank of the Mississippi River is located approximately 40 feet south of the site. Other potential target receptors in the immediate vicinity include the underground gas, electric and sanitary sewer utilities which are located in the bituminous area (see Figure 3) south of the site. In addition, a flowing well of unknown depth and construction is located in the wooded area south of the apartment building which supplies water to a fountain (located in the grassy area south of the site) that discharges to the Mississippi River. Should be sampled.

The extent of petroleum impacted soil appears to be limited to the eastern edge of the former hardware store along the existing apartment building footing. In addition, the highest levels of BTEX in the ground water were detected in the sample from B-2 (located adjacent to the former boiler location in the apartment building) with lower levels of BTEX being detected in the samples from B-1 and B-6 (downgradient of B-2). The BTEX levels observed in the water samples from B-5 and B-7 (upgradient of B-2) may be a result of migration along the building footing since the BTEX levels decrease from B-2 towards B-7.

Based on field observations and laboratory test results, the most likely source of the petroleum impacts appears to be the fuel oil tank or associated piping to the former boiler located in the garage and apartment building adjacent to the site (see Figure 3).

7.0 RECOMMENDATIONS

This site presently consists of a concrete foundation surrounded on three sides by a concrete retaining wall (remnants of the former hardware store). The site is bounded on the north by Main Street, the east by an existing three story apartment building and the south and west by an alley. The only area identified where appreciable petroleum impacts to the soil are present is in the area along the east side of the site (adjacent to the apartment building). This area is presently covered by concrete. In addition, the impacted soils at B-2, B-5, B-6 and B-7 are apparently at a depth of approximately 13 feet, are overlain by unimpacted soil (no apparent petroleum impacts) and may be associated with fluctuating water table and/or capillary fringe effects since the soil impacts were observed directly above the water table.

Owing to the depth of the impacted soil, the fact that the area is covered with concrete and the fact that the apartment building footing is exposed in this area, we do not recommend excavation or remediation of on-site soils. Although the soil is sandy and would be amenable to soil venting, the type of anticipated release (fuel oil) is not ideally treated through soil venting.

Since groundwater flow is apparently to the southeast towards the Mississippi River, the overriding concern for potential off-site impacts would be the River due to its close proximal distance to the site. The sanitary sewer located south of the site trends east-west, flows to the east and is at a depth of approximately three to four feet according to City of Elk River personnel. Due to the depth of ground water, it is not anticipated that the sanitary sewer would be impacted by the apparent release.

The fuel oil tank located in the garage behind the apartment building was registered with the MPCA (see Appendix E). Since the tank is located in the garage and adjacent to the apartment building footing (see Figure 3), it is recommended that the state fire marshall be contacted and approval obtained to close the tank in place.

Additional investigation at the site is not recommended for the following reasons:

1. The petroleum impacted soil is apparently at a depth of approximately 13 feet, is overlain by apparently unimpacted soil and may be associated with fluctuating water table and/or capillary fringe effects. Excavation of these soils would endanger existing structures on and adjacent to the site.

2. The most likely source of the apparent release will be remediated by closing the fuel oil tank and associated piping in place, if approved by the fire marshall.

3. Groundwater flow is to the southeast based on groundwater flow direction and space and access limitations at the site including existing structures, woods and steep slopes towards the Mississippi River (see Figure 7), downgradient groundwater monitoring wells are not feasible at the site.

4. Due to the close proximal distance of the Mississippi River, the most likely downgradient target receptor of petroleum impacts would apparently be the River. The utilities located south of the site would most likely not be impacted by off-site migration due to the shallow depth of the utilities and the deeper depth to ground water.

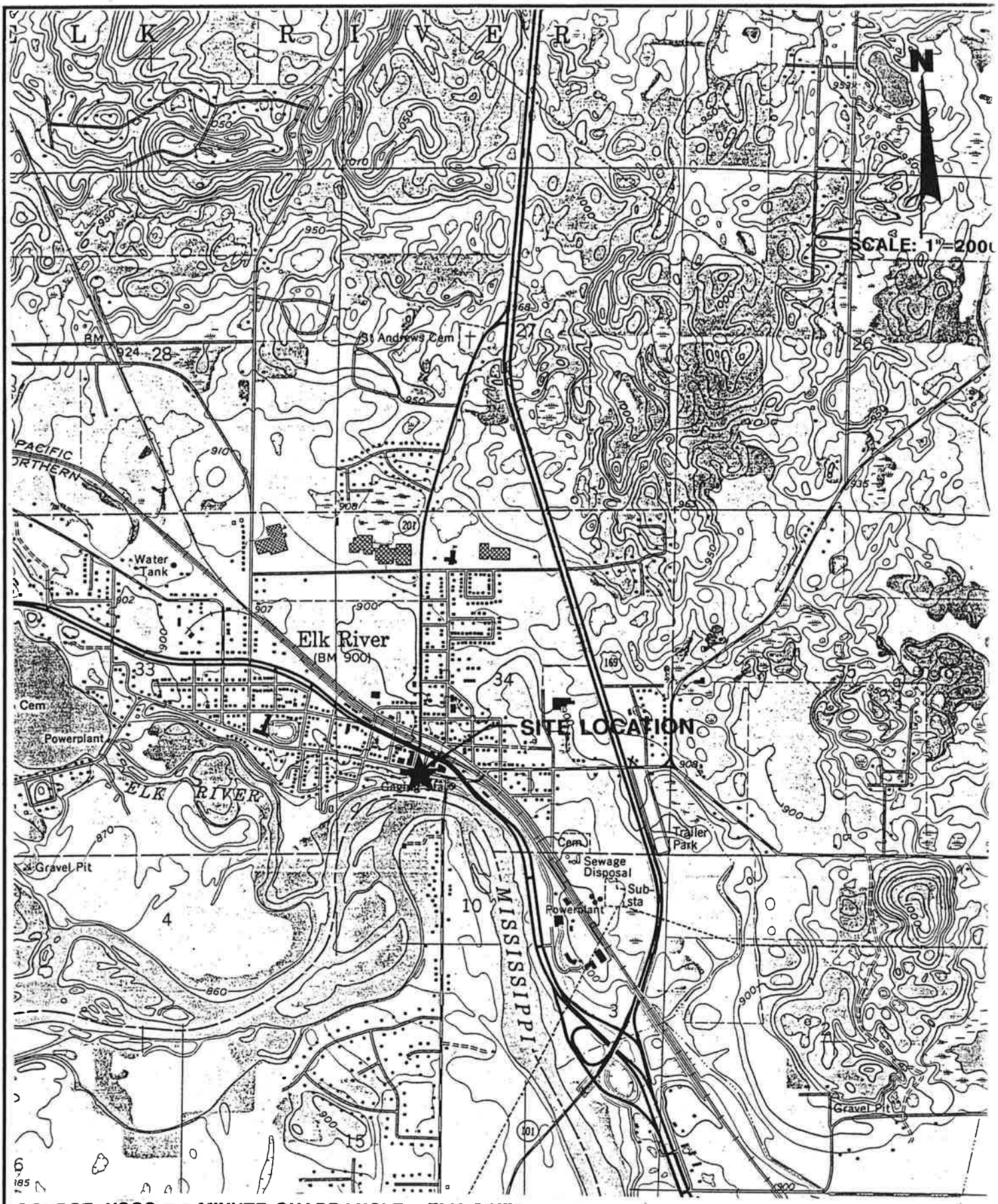
5. The businesses and residences adjacent to the site are located in downtown Elk River (see Figure 8) which is supplied by municipal water, therefore it is not anticipated that drinking water will be affected by the release.

It is recommended that a copy of this remedial investigation report be submitted to MPCA for review. Following MPCA review of the report, a meeting with MPCA should be scheduled to discuss whether additional corrective actions, if any, are necessary at the

site and to determine if site closure is considered complete for subsequent PetroBoard reimbursement.

mas:elkhardware

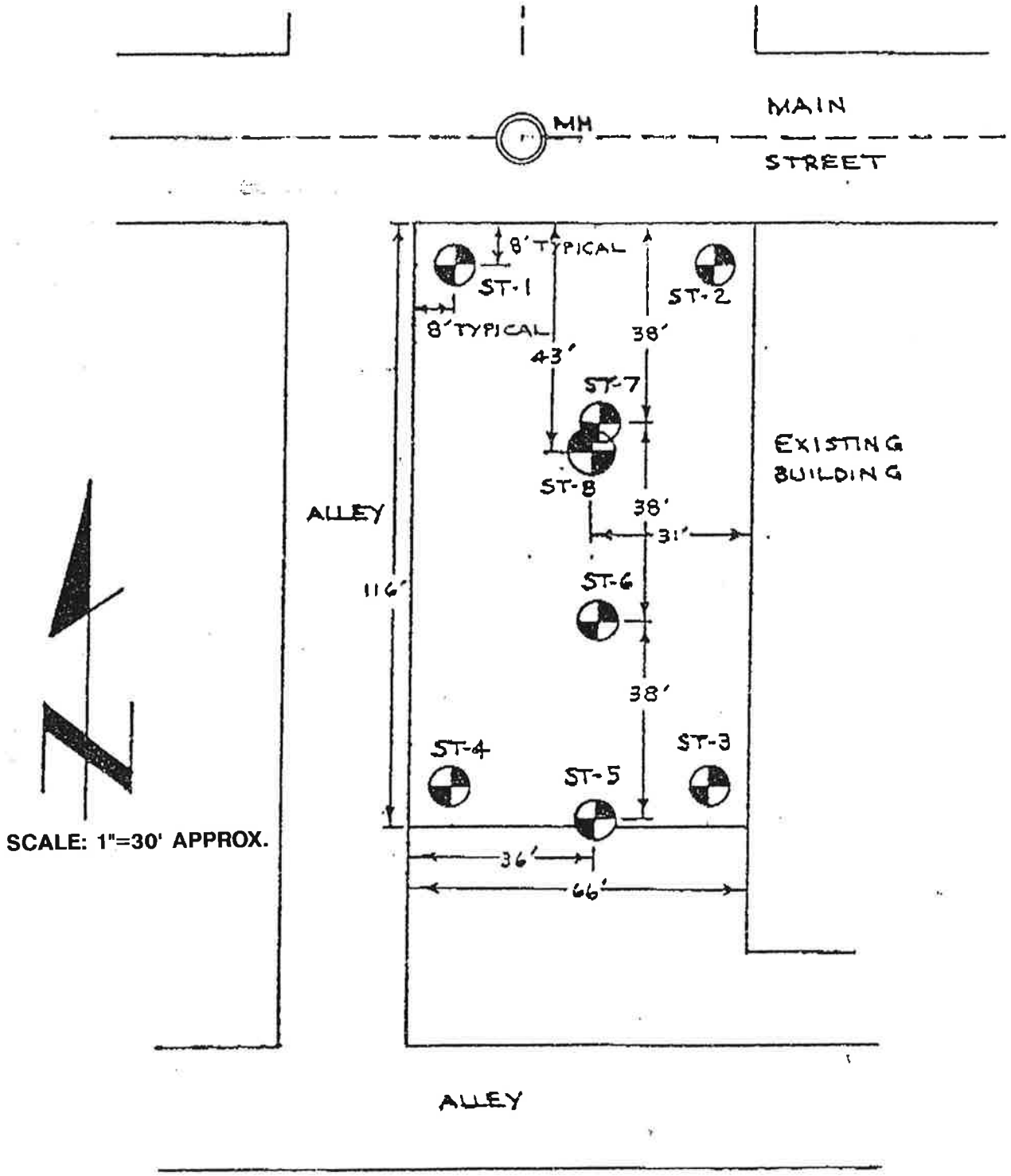
FIGURES



SOURCE: USGS 7.5 MINUTE QUADRANGLE - ELK RIVER, MINNESOTA

BRUCE A. LIESCH ASSOCIATES, INC. HYDROLOGISTS • GEOLOGISTS • ENVIRONMENTAL SCIENTISTS 13400 15th Avenue North • Plymouth, MN 55441 • 612-559-1423	**ELK RIVER/HARDWARE STORE**	**OCT 90**
	SITE LOCATION MAP	**FIG. 1**

538816



SCALE: 1"=30' APPROX.

denotes location of standard penetration test borings drilled 11-10-88 borings ST-1 thru ST-7

denotes location of standard penetration test borings drilled 12-14-88 boring ST-8

SOURCE: BRAUN PRELIMINARY FOUNDATION INVESTIGATION REPORT DATED DECEMBER 9, 1988.

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	BRAUN SOIL BORING LOCATIONS	FIG. 2

538816

16094

N

TEMPORARY BENCHMARK
(ELEV. 100.00)
LOCATED ON TOP OF
FIRE HYDRANT

SCALE: 1"=20'

MAIN SREET

EXISTING BUILDING FOUNDATION
AND RETAINING WALL

EXISTING
BUILDING

FORMER
HARDWARE STORE

B-9

B-7

B-10

EXISTING
APARTMENT BUILDING
(3-STORY BUILDING)

ALLEY

CONCRETE

B-5

B-8

FORMER
LOCATION OF BOILER

B-2

PARKING LOT

GRAVEL

B-1

EXISTING FUEL
OIL TANK

FLOWING WELL

BITUMINOUS AREA

B-4

B-6

B-3

WOODS

GRASS AREA

AREA OF STEEP SLOPES

ALLEY

RIVER BANK

MISSISSIPPI RIVER

NOTE: (1) ALL DIMENSIONS AND LOCATIONS AS SHOWN WERE DETERMINED BY TAPED MEASUREMENT AND ARE APPOXIMATE.

(2) UTILITIES LOCATED BENEATH THE BITUMINOUS AREA LOCATED SOUTH OF THE FORMER HARDWARE STORE INCLUDE GAS, ELECTRIC AND SANITARY SEWER. THE SEWER TRENDS EAST-WEST, FLOWS TO THE EAST AND IS AT A DEPTH OF APPROXIMATELY 3 TO 4 FEET BELOW GRADE.

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ELK RIVER / HARDWARE STORE	OCT 90
SOIL BORING/TANK LOCATIONS	FIG. 3

N

SCALE: 1"=20'

TEMPORARY BENCHMARK
(ELEV. 100.00)
LOCATED ON TOP OF
FIRE HYDRANT

MAIN SREET

B-9

EXISTING BUILDING FOUNDATION
AND RETAINING WALL

A'

B-9

FORMER
HARDWARE STORE

EXISTING
BUILDING

B'

B-7

B-10

EXISTING
APARTMENT BUILDING
(3-STORY BUILDING)

ALLEY

CONCRETE

B-5

B-8

FORMER
LOCATION OF BOILER

B-2

PARKING LOT

GRAVEL

B-1

EXISTING FUEL
OIL TANK

BITUMINOUS AREA

B-4

B-6

ALLEY

B-3

A

B

WOODS

GRASS AREA

AREA OF STEEP SLOPES

RIVER BANK

MISSISSIPPI RIVER

NOTE: (1) ALL DIMENSIONS AND LOCATIONS AS SHOWN WERE DETERMINED BY TAPED MEASUREMENT AND ARE APPOXIMATE.

(2) UTILITIES LOCATED BENEATH THE BITUMINOUS AREA LOCATED SOUTH OF THE FORMER HARDWARE STORE INCLUDE GAS, ELECTRIC AND SANITARY SEWER. THE SEWER TRENDS EAST-WEST, FLOWS TO THE EAST AND IS AT A DEPTH OF APPROXIMATELY 3 TO 4 FEET BELOW GRADE.

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ELK RIVER / HARDWARE STORE

OCT 90

GEOLOGIC CROSS SECTION LOCATIONS

FIG. 4

N

SCALE: 1"=20'

TEMPORARY BENCHMARK
(ELEV. 100.00)
LOCATED ON TOP OF
FIRE HYDRANT

MAIN SREET

EXISTING BUILDING FOUNDATION
AND RETAINING WALL

EXISTING
BUILDING

FORMER
HARDWARE STORE

B-9
64.22

64.00

EXISTING
APARTMENT BUILDING
(3-STORY BUILDING)

B-7
63.90

B-10
63.84

ALLEY

CONCRETE

63.00

B-5
63.67

B-8
62.63

FORMER
LOCATION OF BOILER

B-2
63.22

PARKING LOT

GRAVEL

B-1
62.58

EXISTING FUEL
OIL TANK

62.79
B-4

BITUMINOUS AREA

62.00

B-6
59.17

B-3
60.63

61.00

ALLEY

WOODS

60.00

GRASS AREA

59.00

AREA OF STEEP SLOPES

58.00

W.L.
57.37

RIVER BANK

MISSISSIPPI RIVER

NOTE: (1) ALL DIMENSIONS AND LOCATIONS AS SHOWN WERE DETERMINED BY TAPED MEASUREMENT AND ARE APPOXIMATE.

(2) GROUNDWATER FLOW BASED ON SOIL BORING WATER LEVELS RECORDED SEPTEMBER 18 AND 19, 1990.

LEGEND

B-1
70.00 ● SOIL BORING AND GROUNDWATER ELEVATION

W.L. ● WATER LEVEL ELEVATION FOR MISSISSIPPI RIVER AS DETERMINED BY SURVEY ASSUMING A TEMPORARY BENCHMARK ELEVATION OF 100.00 FEET LOCATED ON TOP OF FIRE HYDRANT

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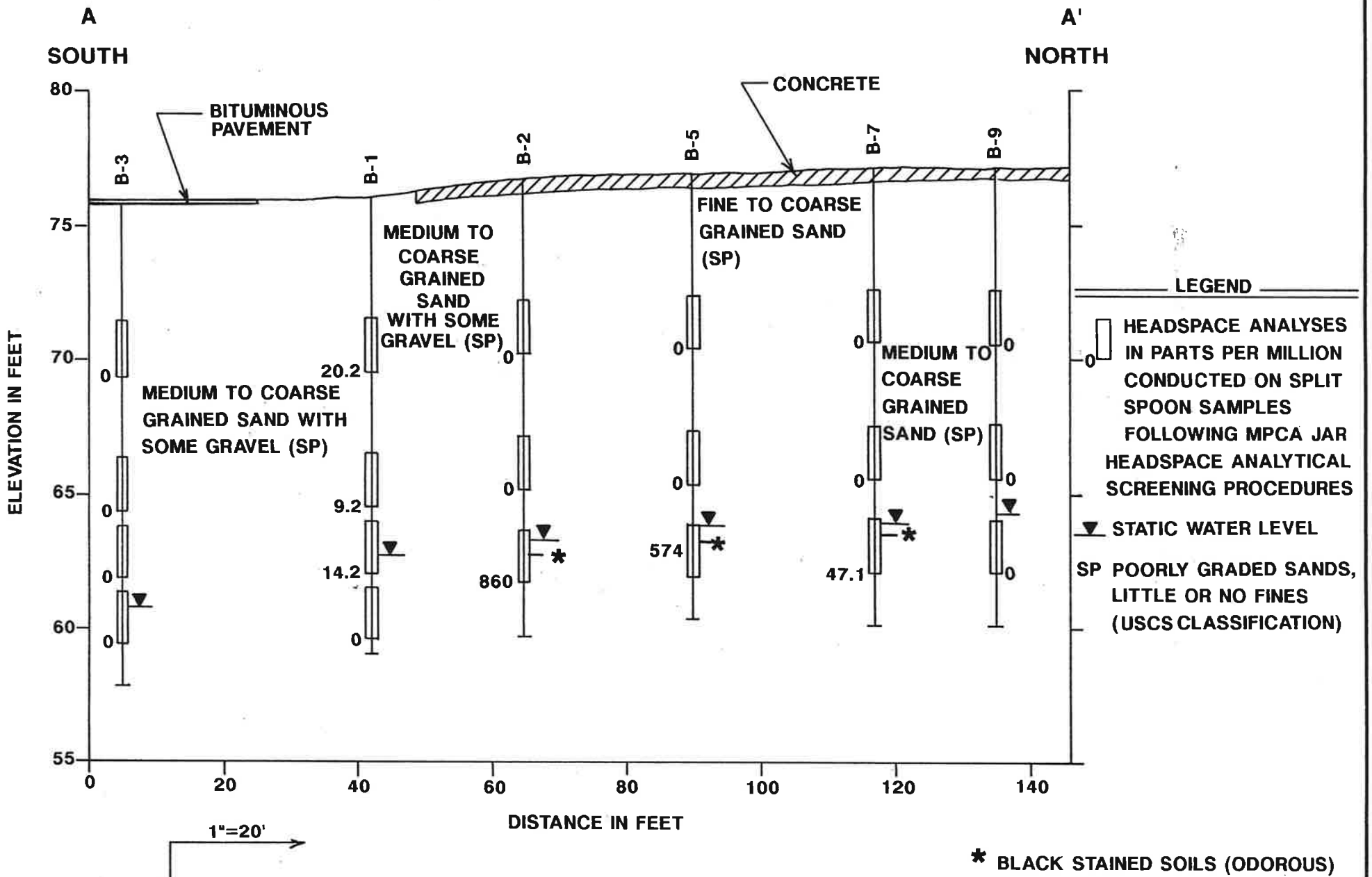
ELK RIVER / HARDWARE STORE	OCT 90
GROUNDWATER CONTOUR MAP	FIG. 7



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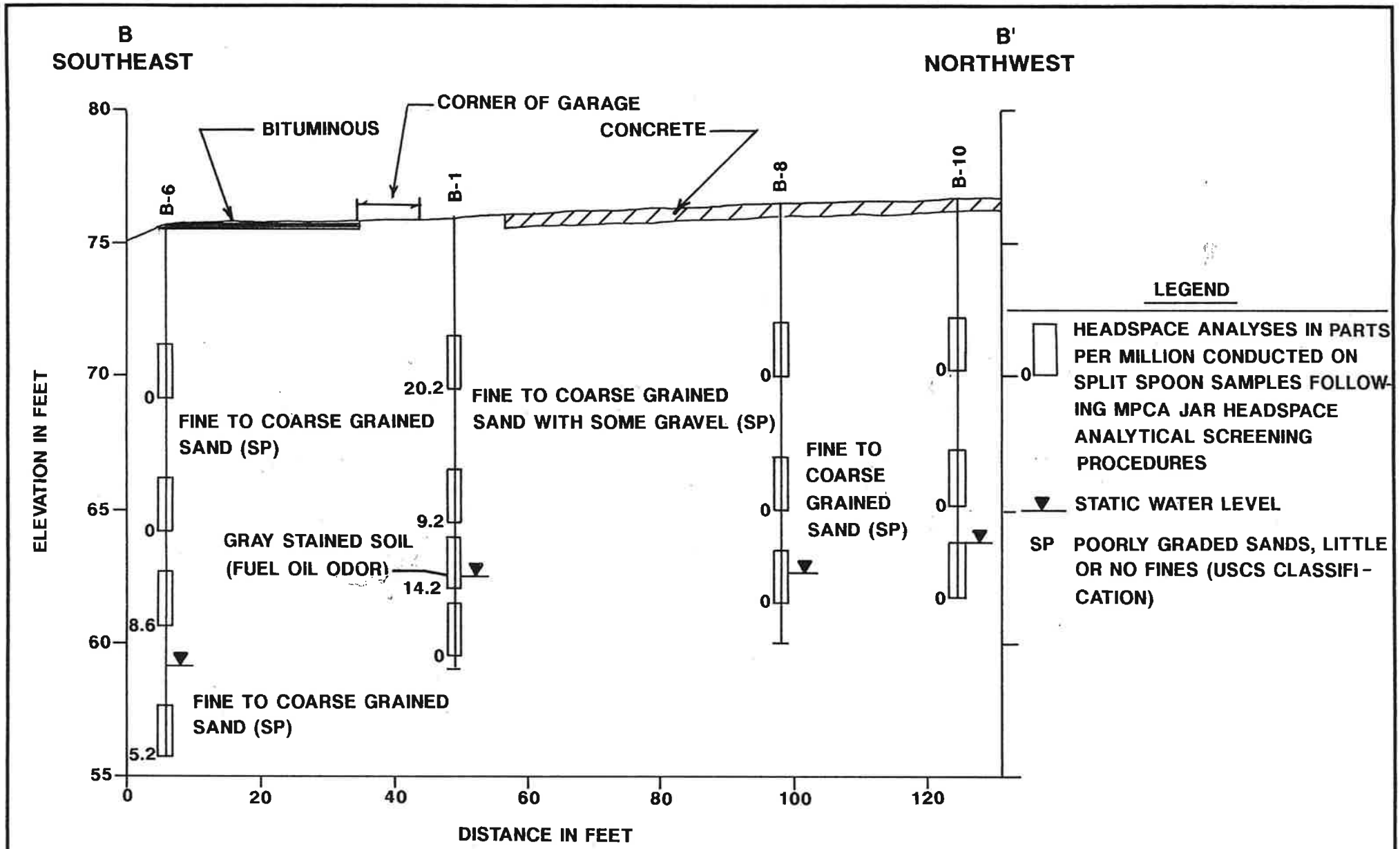
ELK RIVER/HARDWARE STORE	OCT 90
GEOLOGIC CROSS SECTION A-A'	FIG. 5



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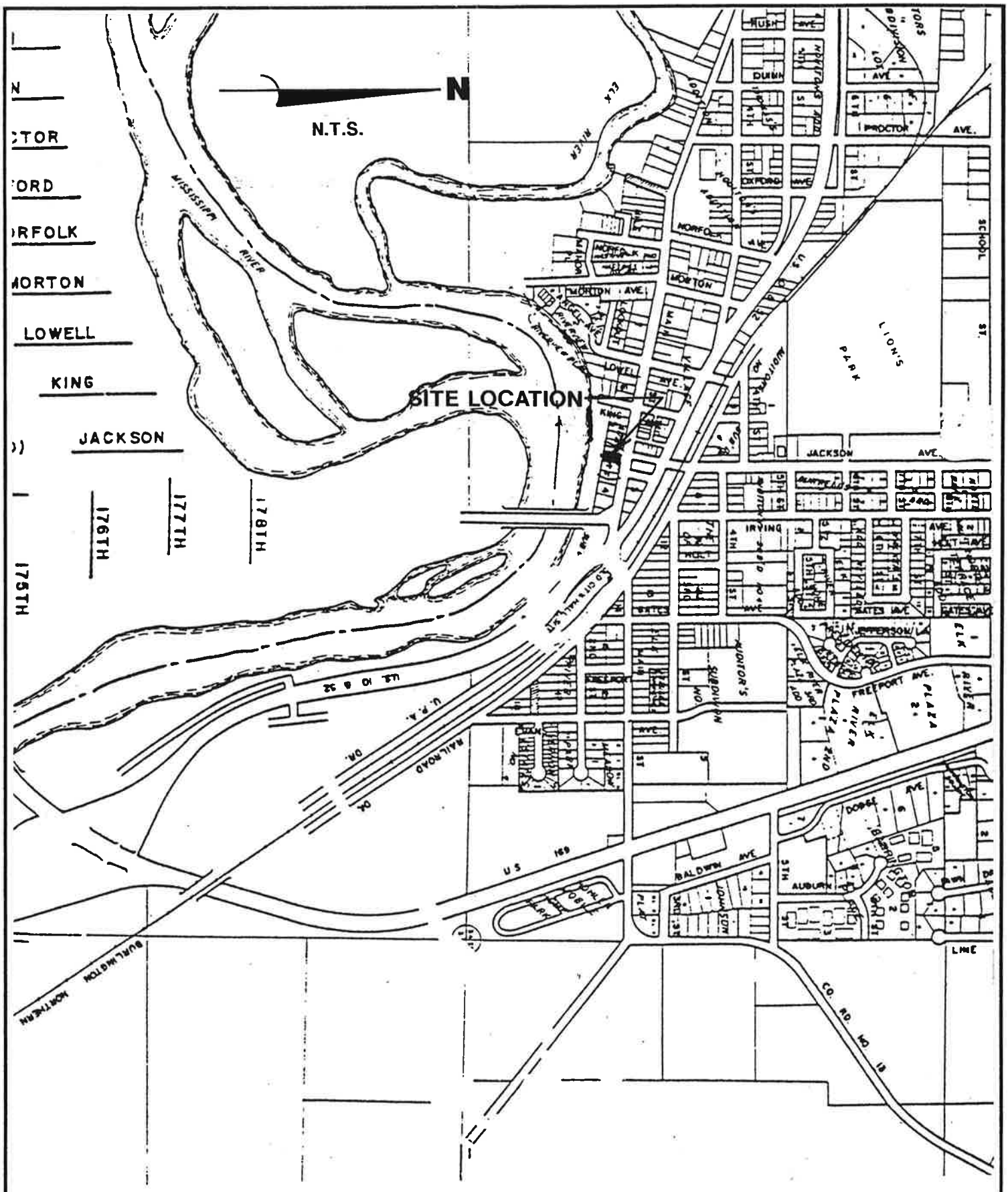
ELK RIVER/HARDWARE STORE	OCT 90
GEOLOGIC CROSS SECTION B-B'	FIG. 6



SOURCE: CITY OF ELK RIVER

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	CITY OF ELK RIVER MAP	**FIG. 8**

TABLES

TABLE 1
HEADSPACE ANALYSIS RESULTS FOR
COLLECTED SOIL SAMPLES

Soil Boring	Depth (feet)	OVM Results (ppm)
B-1	4.5 - 6.5	20.2
	9.5 - 11.5	9.2
	12.0 - 14.0	14.2
	14.5 - 16.5	0
B-2	4.5 - 6.5	0
	9.5 - 11.5	0
	13.0 - 15.0	860
B-3	4.5 - 6.5	0
	9.5 - 11.5	0
	12.0 - 14.0	0
	14.5 - 16.5	0
B-4	4.5 - 6.5	0
	9.5 - 11.5	0
	13.0 - 15.0	0
B-5	4.5 - 6.5	0
	9.5 - 11.5	0
	13.0 - 15.0	574
B-6	4.5 - 6.5	0
	9.5 - 11.5	0
	13.0 - 15.0	8.6
	18.0 - 20.0	5.2
B-7	4.5 - 6.5	0
	9.5 - 11.5	0
	13.0 - 15.0	47.1
B-8	4.5 - 6.5	0
	9.5 - 11.5	0
	13.0 - 15.0	0
B-9	4.5 - 6.5	0
	9.5 - 11.5	0
	13.0 - 15.0	0

TABLE 1 (Cont.)
HEADSPACE ANALYSIS RESULTS FOR COLLECTED SOIL SAMPLES

Soil Boring	Depth (feet)	OVM Results (ppm)
B-10	4.5 - 6.5	0
	9.5 - 11.5	0
	13.0 - 15.0	0

Notes:

1) Headspace analysis results were obtained at the time of sampling in the field from split spoon samples using an organic vapor monitor (OVM). Headspace analyses were conducted following MPCA procedures.

2) Background OVM readings during sampling were less than 1.0 parts per million (ppm).

ljs:elktbl104.wp

TABLE 2
GROUNDWATER ELEVATIONS

Soil Boring	Ground Elevation (ft)	T.O.C. Elevation (ft)	Depth to Ground Water (ft)	Date Measured	Groundwater Elevation (ft)
B-1	76.00	79.99	17.41 (T.O.C.)	9-18-90	62.58
B-2	76.65	79.61	16.39 (T.O.C.)	9-18-90	63.22
B-3	75.81	78.09	15.18 (Grnd)	9-18-90	60.63
B-4	76.53	79.74	13.74 (Grnd)	9-18-90	62.79
B-5	76.81	79.82	16.15 (T.O.C.)	9-18-90	63.67
B-6	75.67	80.17	21.00 (T.O.C.)	9-18-90	59.17
B-7	77.02	77.62	13.72 (T.O.C.)	9-18-90	63.90
B-8	76.53	77.33	14.70 (T.O.C.)	9-18-90	62.63
B-9	76.97	79.72	15.50 (T.O.C.)	9-19-90	64.22
B-10	76.78	79.73	15.89 (T.O.C.)	9-19-90	63.84
MISSISSIPPI RIVER					* 57.37

* Surface water elevation

Notes:

1) All elevations are based on an assumed temporary benchmark elevation of 100.00 feet located on top of the fire hydrant (see Figure 3).

2) Depths to ground water at the soil borings were determined by taped measurement and measured from either the ground surface (Grnd) or top of casing (T.O.C.) in the temporary PVC well casing.

ljs:elktbl2104.wp

TABLE 3
ANALYTICAL RESULTS FOR COLLECTED SOIL SAMPLES

Soil Boring	Depth (ft)	Ethyl Benzene /ppb	Benzene /ppb	Toluene /ppb	Xylene /ppb	Total Hydrocarbons /ppm
B-1	4.5 - 6.5	<15.0	<20.0	<20.0	<15.0	BDL
B-2	13.0 - 15.0	1200	1100	2300	3700	330 As Gas or 600 As Fuel Oil
B-3	12.0 - 14.0	<15.0	<20.0	<20.0	<15.0	BDL
B-4	9.5 - 11.5	<15.0	<20.0	<20.0	<15.0	BDL
B-5	13.0 - 15.0	38.7	<20.0	56.0	110	12 As Gas or 24 As Fuel Oil
B-6	13.0 - 15.0	<15.0	<20.0	<20.0	<15.0	BDL
B-7	13.0 - 15.0	24.4	<20.0	<20.0	40.0	BDL
B-8	13.0 - 15.0	<15.0	<20.0	<20.0	<15.0	BDL
B-9	13.0 - 15.0	<15.0	<20.0	<20.0	<15.0	BDL
B-10	13.0 - 15.0	<15.0	<20.0	<20.0	<15.0	BDL

Notes:
1) BDL = Below Detection Limits
2) Total Hydrocarbons Minimum Detection Limits:
   As Gasoline - 2.0 ppm
   As Fuel Oil/Diesel - 5.0 ppm
3) ppm - parts per million
   ppb - parts per billion
4) Soil samples were analyzed 9/27/90 by MVTL

ljs:elktbl3104.wp

TABLE 4
ANALYTICAL TEST RESULTS FOR COLLECTED
WATER SAMPLES

	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9	B-10	MDH RAL
Laboratory Name	MVTL	MVTL	MVTL	MVTL	MVTL	MVTL	MVTL	MVTL	MVTL	MVTL	
Sampling Date	9/17/90	9/17/90	9/17/90	9/17/90	9/18/90	9/18/90	9/18/90	9/18/90	9/19/90	9/19/90	
Date Analyzed	9/27/90	9/27/90	9/27/90	9/27/90	9/27/90	9/27/90	9/27/90	9/27/90	9/27/90	9/27/90	
Benzene (ppb)	4.4	600	BDL	BDL	110	29.1	43.6	BDL	BDL	BDL	7.0
Toluene (ppb)	BDL	34.0	BDL	BDL	4.7	BDL	BDL	BDL	BDL	BDL	2420.0
Ethyl Benzene (ppb)	13.9	470	BDL	BDL	39.6	16.9	12.6	BDL	BDL	BDL	680.0
Xylene (ppb)	12.0	448	BDL	BDL	59.1	3.6	27.6	BDL	BDL	BDL	400.0
Cumene (ppb)	BDL	BDL	BDL	BDL	2.5	2.0	BDL	BDL	BDL	BDL	--
Ethyl Ether (ppb)	BDL	BDL	BDL	BDL	1.9	BDL	BDL	BDL	BDL	BDL	--
Methylene Chloride (ppb)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3.1	48.0

MVTL - Minnesota Valley Testing Laboratories, Inc.
BDL - Below Detection Limits
ppb - parts per billion
MDL RAL - Minnesota Department of Health (MDH) Recommended Allowable Limit (RAL) for Drinking Water

maw:tbl4

MVTL LABORATORIES, Inc.
P.O BOX 249
NEW ULM, MN 56073-0249
PHONE (507) 354-8517 WATS (800) 782-3557 FAX (507) 359-2890

WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Report To: Bruce A. Liesch Associates
13400 15th Avenue North
Plymouth, MN 55441
Attn: John Lichter

Date: September 28, 1990
Work Order: 21-1500
Date Received: 9-21-90

Project Name: Elk River Hardware

Project No.: 61102

Date Analyzed = 9/27/90

ANALYZED FOR BENZENE, ETHYL BENZENE, TOLUENE, XYLENE & TOTAL HYDROCARBONS:

Sample I.D.	Lab #	Ethyl Benzene /ppb	Benzene /ppb	Toluene /ppb	Xylene /ppb	* Total Hydrocarbons /ppm
B-1, S1 4.5-6.5' (Soil)	5129	< 15.0	< 20.0	< 20.0	< 15.0	BDL
B-2, S3 (Soil)	5131	1200	1100	2300	3700	330 As Gas or 600 As Fuel Oil
B-3, S3 12-14' (Soil)	5133	< 15.0	< 20.0	< 20.0	< 15.0	BDL
B-4, S2 9.5-11.5' (Soil)	5135	< 15.0	< 20.0	< 20.0	< 15.0	BDL
B-5, S3 13-15' (Soil)	5137	38.7	< 20.0	56.0	110	12 As Gas or 24 As Fuel Oil

BDL = Below Detection Limits.

* SOIL - Total Hydrocarbons Minimum Detection Limits

As Gasoline - 2.0 ppm
As Fuel Oil/Diesel - 5.0 ppm

* WATER - Total Hydrocarbons Minimum Detection Limits

As Gasoline - 0.5 ppm
As Fuel Oil/Diesel - 1.0 ppm

Report approved by Wade Pullman,
Chemist
By and for Minnesota Valley Testing labs., Inc.
/SH

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P.O BOX 249
NEW ULM, MN 56073-0249
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ANALYZED FOR BENZENE, ETHYL BENZENE, TOLUENE, XYLENE & TOTAL HYDROCARBONS:

Sample I.D.	Lab #	Ethyl Benzene /ppb	Benzene /ppb	Toluene /ppb	Xylene /ppb	* Total Hydrocarbons /ppm
B-6, S3 13-15' (Soil)	5139	< 15.0	< 20.0	< 20.0	< 15.0	BDL
B-7, S3 13-15' (Soil)	5141	24.4	< 20.0	< 20.0	40.0	BDL
B-8, S3 13-15' (Soil)	5143	< 15.0	< 20.0	< 20.0	< 15.0	BDL
B-9 13-15' (Soil)	5145	< 15.0	< 20.0	< 20.0	< 15.0	BDL
B-10 13-15' (Soil)	5147	< 15.0	< 20.0	< 20.0	< 15.0	BDL
Trip Blank (Water)	5149	< 1.5	< 2.0	< 2.0	< 1.5	BDL

BDL = Below Detection Limits.

* SOIL - Total Hydrocarbons Minimum Detection Limits

As Gasoline - 2.0 ppm
As Fuel Oil/Diesel - 5.0 ppm

* WATER - Total Hydrocarbons Minimum Detection Limits

As Gasoline - 0.5 ppm
As Fuel Oil/Diesel - 1.0 ppm

Report approved by Wade Pullman,
Chemist
By and for Minnesota Valley Testing labs., Inc.
/SH

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WE ARE AN EQUAL OPPORTUNITY EMPLOYER

WATER ANALYZED FOR VOLATILE ORGANIC HYDROCARBONS

Report To: Bruce A. Liesch Associates
13400 15th Avenue North
Plymouth, MN 55441
Attn: John Lichter

Project Name: Elk River Hardware

Project Number: 61102

Submitted by: Minnesota Valley Testing Labs., Inc.
1126 N. Front Street
New Ulm, MN 56073

Kim D. Sjogren, Lab Manager

Wade E. Pullman, Chemist

Work Order #: 21-1500
Date Received: 9-21-90
Date Sampled: 9-18-90 & 9-19-90
Date Reported: 9-28-90

Jobs#: 5130, 5132, 5134, 5136, 5138, 5140, 5142, 5144, 5146, 5148, 5149

NQ = Not Present, qualitative only
PQ = Present, qualitative only
BDL = Below Detection Limits
MDL = Method Detection Limits
ND = Not Determined

Test methods: Purgeable Halocarbons - Method 601 and Purgeable Aromatics - Method 602. Method Detection Limits determined according to Appendix A, "Definition and Procedure for the Determination of the Method Detection Limit", EPA-600/4-82-057, July 1982.

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NEW ULM, MN 56073-0249
PHONE (507) 354-8517 WATS (800) 782-3557 FAX (507) 359-2890

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Sample Identification: B-1 Job #: 5130

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	2.0
	Chloromethane	BDL	2.0
	Bromomethane	BDL	2.0
	Dichlorodifluoromethane	BDL	2.0
	Vinyl Chloride	BDL	0.5
	Methylene Chloride	BDL	1.4
	Trichlorofluoromethane	BDL	0.9
	1,1-Dichloroethylene	BDL	1.3
	1,1-Dichloroethane	BDL	0.2
	Trans-1,2-Dichloroethylene	BDL	0.3
	Chloroform	BDL	1.0
	1,2-Dichloroethane	BDL	0.6
	1,1,1-Trichloroethane	BDL	1.1
	Carbon Tetrachloride	BDL	0.4
	Bromodichloromethane	BDL	0.7
	1,2-Dichloropropane	BDL	0.4
	Trans-1,3-Dichloropropene	BDL	0.2
	1,1,2-Trichloroethylene	BDL	0.4
	Chlorodibromomethane	BDL	0.4
	1,1,2-Trichloroethane	BDL	0.3
	Cis-1,3-Dichloropropene	BDL	0.5
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	0.5
	1,1,2,2-Tetrachloroethane	BDL	0.5
	1,1,2,2-Tetrachloroethylene	BDL	0.4
Purgeable Aromatics:	Chlorobenzene	BDL	0.3
	Benzene	4.4	2.0
	Toluene	BDL	2.0
	Ethyl Benzene	13.9	1.5
	1,2-Dichlorobenzene	BDL	0.6
	1,3-Dichlorobenzene	BDL	0.4
	1,4-Dichlorobenzene	BDL	0.2

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WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Sample Identification: B-1 Job #: 5130

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	0.8
	1,3-Dichloropropane.....	BDL	0.6
	1,2,3-Trichloropropane.....	BDL	0.7
	Allyl Chloride (3-Chloro-1-propene).....	BDL	0.5
	1,2-Dibromoethane (EDB).....	BDL	1.0
	Methyl Ethyl Ketone.....	BDL	3.5
	Methyl Isobutyl Ketone.....	BDL	1.5
	Tetrahydrofuran.....	BDL	6.0
	M-Xylene & P-Xylene.....	10.5	1.0
	O-Xylene.....	1.5	0.5
	Cumene.....	BDL	1.5
	1,1,1,2-Tetrachloroethane.....	BDL	0.5
	1,1-Dichloro-1-propene.....	BDL	1.0
	2,3-Dichloro-1-propene.....	BDL	0.8
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	0.9
	Ethyl Ether.....	BDL	1.6
	Acetone.....	BDL	10.4
	Dibromomethane.....	BDL	1.0

MVTL LABORATORIES, Inc.
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NEW ULM, MN 56073-0249
PHONE (507) 354-8517 WATS (800) 782-3557 FAX (507) 359-2890

WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Sample Identification: B-2 Job #: 5132

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	20.0
	Chloromethane	BDL	20.0
	Bromomethane	BDL	20.0
	Dichlorodifluoromethane	BDL	20.0
	Vinyl Chloride	BDL	5.0
	Methylene Chloride	BDL	14.0
	Trichlorofluoromethane	BDL	9.0
	1,1-Dichloroethylene	BDL	13.0
	1,1-Dichloroethane	BDL	2.0
	Trans-1,2-Dichloroethylene	BDL	3.0
	Chloroform	BDL	10.0
	1,2-Dichloroethane	BDL	6.0
	1,1,1-Trichloroethane	BDL	11.0
	Carbon Tetrachloride	BDL	4.0
	Bromodichloromethane	BDL	7.0
	1,2-Dichloropropane	BDL	4.0
	Trans-1,3-Dichloropropene	BDL	2.0
	1,1,2-Trichloroethylene	BDL	4.0
	Chlorodibromomethane	BDL	4.0
	1,1,2-Trichloroethane	BDL	3.0
	Cis-1,3-Dichloropropene	BDL	5.0
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	5.0
	1,1,2,2-Tetrachloroethane	BDL	5.0
	1,1,2,2-Tetrachloroethylene	BDL	4.0
Purgeable Aromatics:	Chlorobenzene	BDL	3.0
	Benzene	600	20.0
	Toluene	34.0	20.0
	Ethyl Benzene	470	15.0
	1,2-Dichlorobenzene	BDL	6.0
	1,3-Dichlorobenzene	BDL	4.0
	1,4-Dichlorobenzene	BDL	2.0

MDL - Adjusted due to sample matrix.

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Sample Identification: B-2 Job #: 5132

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	8.0
	1,3-Dichloropropane.....	BDL	6.0
	1,2,3-Trichloropropane.....	BDL	7.0
	Allyl Chloride (3-Chloro-1-propene).....	BDL	5.0
	1,2-Dibromoethane (EDB).....	BDL	10.0
	Methyl Ethyl Ketone.....	BDL	35.0
	Methyl Isobutyl Ketone.....	BDL	15.0
	Tetrahydrofuran.....	BDL	60.0
	M-Xylene & P-Xylene.....	440	10.0
	O-Xylene.....	8.0	5.0
	Cumene.....	BDL	15.0
	1,1,1,2-Tetrachloroethane.....	BDL	5.0
	1,1-Dichloro-1-propene.....	BDL	10.0
	2,3-Dichloro-1-propene.....	BDL	8.0
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	9.0
	Ethyl Ether.....	BDL	16.0
	Acetone.....	BDL	104.0
	Dibromomethane.....	BDL	10.0

MDL - Adjusted due to sample matrix.

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WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Sample Identification: B-3 Job #: 5134

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	2.0
	Chloromethane	BDL	2.0
	Bromomethane	BDL	2.0
	Dichlorodifluoromethane	BDL	2.0
	Vinyl Chloride	BDL	0.5
	Methylene Chloride	BDL	1.4
	Trichlorofluoromethane	BDL	0.9
	1,1-Dichloroethylene	BDL	1.3
	1,1-Dichloroethane	BDL	0.2
	Trans-1,2-Dichloroethylene	BDL	0.3
	Chloroform	BDL	1.0
	1,2-Dichloroethane	BDL	0.6
	1,1,1-Trichloroethane	BDL	1.1
	Carbon Tetrachloride	BDL	0.4
	Bromodichloromethane	BDL	0.7
	1,2-Dichloropropane	BDL	0.4
	Trans-1,3-Dichloropropene	BDL	0.2
	1,1,2-Trichloroethylene	BDL	0.4
	Chlorodibromomethane	BDL	0.4
	1,1,2-Trichloroethane	BDL	0.3
	Cis-1,3-Dichloropropene	BDL	0.5
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	0.5
	1,1,2,2-Tetrachloroethane	BDL	0.5
	1,1,2,2-Tetrachloroethylene	BDL	0.4
Purgeable Aromatics:	Chlorobenzene	BDL	0.3
	Benzene	BDL	2.0
	Toluene	BDL	2.0
	Ethyl Benzene	BDL	1.5
	1,2-Dichlorobenzene	BDL	0.6
	1,3-Dichlorobenzene	BDL	0.4
	1,4-Dichlorobenzene	BDL	0.2

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Sample Identification: B-3 Job #: 5134

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	0.8
	1,3-Dichloropropane.....	BDL	0.6
	1,2,3-Trichloropropane.....	BDL	0.7
	Allyl Chloride (3-Chloro-1-propene).....	BDL	0.5
	1,2-Dibromoethane (EDB).....	BDL	1.0
	Methyl Ethyl Ketone.....	BDL	3.5
	Methyl Isobutyl Ketone.....	BDL	1.5
	Tetrahydrofuran.....	BDL	6.0
	M-Xylene & P-Xylene.....	BDL	1.0
	O-Xylene.....	BDL	0.5
	Cumene.....	BDL	1.5
	1,1,1,2-Tetrachloroethane.....	BDL	0.5
	1,1-Dichloro-1-propene.....	BDL	1.0
	2,3-Dichloro-1-propene.....	BDL	0.8
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	0.9
	Ethyl Ether.....	BDL	1.6
	Acetone.....	BDL	10.4
	Dibromomethane.....	BDL	1.0

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Sample Identification: B-4 Job #: 5136

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	2.0
	Chloromethane	BDL	2.0
	Bromomethane	BDL	2.0
	Dichlorodifluoromethane	BDL	2.0
	Vinyl Chloride	BDL	0.5
	Methylene Chloride	BDL	1.4
	Trichlorofluoromethane	BDL	0.9
	1,1-Dichloroethylene	BDL	1.3
	1,1-Dichloroethane	BDL	0.2
	Trans-1,2-Dichloroethylene	BDL	0.3
	Chloroform	BDL	1.0
	1,2-Dichloroethane	BDL	0.6
	1,1,1-Trichloroethane	BDL	1.1
	Carbon Tetrachloride	BDL	0.4
	Bromodichloromethane	BDL	0.7
	1,2-Dichloropropane	BDL	0.4
	Trans-1,3-Dichloropropene	BDL	0.2
	1,1,2-Trichloroethylene	BDL	0.4
	Chlorodibromomethane	BDL	0.4
	1,1,2-Trichloroethane	BDL	0.3
	Cis-1,3-Dichloropropene	BDL	0.5
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	0.5
	1,1,2,2-Tetrachloroethane	BDL	0.5
	1,1,2,2-Tetrachloroethylene	BDL	0.4
Purgeable Aromatics:	Chlorobenzene	BDL	0.3
	Benzene	BDL	2.0
	Toluene	BDL	2.0
	Ethyl Benzene	BDL	1.5
	1,2-Dichlorobenzene	BDL	0.6
	1,3-Dichlorobenzene	BDL	0.4
	1,4-Dichlorobenzene	BDL	0.2

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Sample Identification: B-4 Job #: 5136

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	0.8
	1,3-Dichloropropane.....	BDL	0.6
	1,2,3-Trichloropropane.....	BDL	0.7
	Allyl Chloride (3-Chloro-1-propene).....	BDL	0.5
	1,2-Dibromoethane (EDB).....	BDL	1.0
	Methyl Ethyl Ketone.....	BDL	3.5
	Methyl Isobutyl Ketone.....	BDL	1.5
	Tetrahydrofuran.....	BDL	6.0
	M-Xylene & P-Xylene.....	BDL	1.0
	O-Xylene.....	BDL	0.5
	Cumene.....	BDL	1.5
	1,1,1,2-Tetrachloroethane.....	BDL	0.5
	1,1-Dichloro-1-propene.....	BDL	1.0
	2,3-Dichloro-1-propene.....	BDL	0.8
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	0.9
	Ethyl Ether.....	BDL	1.6
	Acetone.....	BDL	10.4
	Dibromomethane.....	BDL	1.0

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Sample Identification: B-5 Job #: 5138

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	2.0
	Chloromethane	BDL	2.0
	Bromomethane	BDL	2.0
	Dichlorodifluoromethane	BDL	2.0
	Vinyl Chloride	BDL	0.5
	Methylene Chloride	BDL	1.4
	Trichlorofluoromethane	BDL	0.9
	1,1-Dichloroethylene	BDL	1.3
	1,1-Dichloroethane	BDL	0.2
	Trans-1,2-Dichloroethylene	BDL	0.3
	Chloroform	BDL	1.0
	1,2-Dichloroethane	BDL	0.6
	1,1,1-Trichloroethane	BDL	1.1
	Carbon Tetrachloride	BDL	0.4
	Bromodichloromethane	BDL	0.7
	1,2-Dichloropropane	BDL	0.4
	Trans-1,3-Dichloropropene	BDL	0.2
	1,1,2-Trichloroethylene	BDL	0.4
	Chlorodibromomethane	BDL	0.4
	1,1,2-Trichloroethane	BDL	0.3
	Cis-1,3-Dichloropropene	BDL	0.5
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	0.5
	1,1,2,2-Tetrachloroethane	BDL	0.5
	1,1,2,2-Tetrachloroethylene	BDL	0.4
Purgeable Aromatics:	Chlorobenzene	BDL	0.3
	Benzene	110	2.0
	Toluene	4.7	2.0
	Ethyl Benzene	39.6	1.5
	1,2-Dichlorobenzene	BDL	0.6
	1,3-Dichlorobenzene	BDL	0.4
	1,4-Dichlorobenzene	BDL	0.2

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Sample Identification: B-5 Job #: 5138

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	0.8
	1,3-Dichloropropane.....	BDL	0.6
	1,2,3-Trichloropropane.....	BDL	0.7
	Allyl Chloride (3-Chloro-1-propene).....	BDL	0.5
	1,2-Dibromoethane (EDB).....	BDL	1.0
	Methyl Ethyl Ketone.....	BDL	3.5
	Methyl Isobutyl Ketone.....	BDL	1.5
	Tetrahydrofuran.....	BDL	6.0
	M-Xylene & P-Xylene.....	56.6	1.0
	O-Xylene.....	2.5	0.5
	Cumene.....	2.5	1.5
	1,1,1,2-Tetrachloroethane.....	BDL	0.5
	1,1-Dichloro-1-propene.....	BDL	1.0
	2,3-Dichloro-1-propene.....	BDL	0.8
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	0.9
	Ethyl Ether.....	1.9	1.6
	Acetone.....	BDL	10.4
	Dibromomethane.....	BDL	1.0

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Sample Identification: B-6 Job #: 5140

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	2.0
	Chloromethane	BDL	2.0
	Bromomethane	BDL	2.0
	Dichlorodifluoromethane	BDL	2.0
	Vinyl Chloride	BDL	0.5
	Methylene Chloride	BDL	1.4
	Trichlorofluoromethane	BDL	0.9
	1,1-Dichloroethylene	BDL	1.3
	1,1-Dichloroethane	BDL	0.2
	Trans-1,2-Dichloroethylene	BDL	0.3
	Chloroform	BDL	1.0
	1,2-Dichloroethane	BDL	0.6
	1,1,1-Trichloroethane	BDL	1.1
	Carbon Tetrachloride	BDL	0.4
	Bromodichloromethane	BDL	0.7
	1,2-Dichloropropane	BDL	0.4
	Trans-1,3-Dichloropropene	BDL	0.2
	1,1,2-Trichloroethylene	BDL	0.4
	Chlorodibromomethane	BDL	0.4
	1,1,2-Trichloroethane	BDL	0.3
	Cis-1,3-Dichloropropene	BDL	0.5
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	0.5
	1,1,2,2-Tetrachloroethane	BDL	0.5
	1,1,2,2-Tetrachloroethylene	BDL	0.4
Purgeable Aromatics:	Chlorobenzene	BDL	0.3
	Benzene	29.1	2.0
	Toluene	BDL	2.0
	Ethyl Benzene	16.9	1.5
	1,2-Dichlorobenzene	BDL	0.6
	1,3-Dichlorobenzene	BDL	0.4
	1,4-Dichlorobenzene	BDL	0.2

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WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Sample Identification: B-6 Job #: 5140

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	0.8
	1,3-Dichloropropane.....	BDL	0.6
	1,2,3-Trichloropropane.....	BDL	0.7
	Allyl Chloride (3-Chloro-1-propene).....	BDL	0.5
	1,2-Dibromoethane (EDB).....	BDL	1.0
	Methyl Ethyl Ketone.....	BDL	3.5
	Methyl Isobutyl Ketone.....	BDL	1.5
	Tetrahydrofuran.....	BDL	6.0
	M-Xylene & P-Xylene.....	3.6	1.0
	O-Xylene.....	BDL	0.5
	Cumene.....	2.0	1.5
	1,1,1,2-Tetrachloroethane.....	BDL	0.5
	1,1-Dichloro-1-propene.....	BDL	1.0
	2,3-Dichloro-1-propene.....	BDL	0.8
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	0.9
	Ethyl Ether.....	BDL	1.6
	Acetone.....	BDL	10.4
	Dibromomethane.....	BDL	1.0

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WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Sample Identification: B-7 Job #: 5142

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	2.0
	Chloromethane	BDL	2.0
	Bromomethane	BDL	2.0
	Dichlorodifluoromethane	BDL	2.0
	Vinyl Chloride	BDL	0.5
	Methylene Chloride	BDL	1.4
	Trichlorofluoromethane	BDL	0.9
	1,1-Dichloroethylene	BDL	1.3
	1,1-Dichloroethane	BDL	0.2
	Trans-1,2-Dichloroethylene	BDL	0.3
	Chloroform	BDL	1.0
	1,2-Dichloroethane	BDL	0.6
	1,1,1-Trichloroethane	BDL	1.1
	Carbon Tetrachloride	BDL	0.4
	Bromodichloromethane	BDL	0.7
	1,2-Dichloropropane	BDL	0.4
	Trans-1,3-Dichloropropene	BDL	0.2
	1,1,2-Trichloroethylene	BDL	0.4
	Chlorodibromomethane	BDL	0.4
	1,1,2-Trichloroethane	BDL	0.3
	Cis-1,3-Dichloropropene	BDL	0.5
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	0.5
	1,1,2,2-Tetrachloroethane	BDL	0.5
	1,1,2,2-Tetrachloroethylene	BDL	0.4
Purgeable Aromatics:	Chlorobenzene	BDL	0.3
	Benzene	43.6	2.0
	Toluene	BDL	2.0
	Ethyl Benzene	12.6	1.5
	1,2-Dichlorobenzene	BDL	0.6
	1,3-Dichlorobenzene	BDL	0.4
	1,4-Dichlorobenzene	BDL	0.2

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WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Sample Identification: B-7 Job #: 5142

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	0.8
	1,3-Dichloropropane.....	BDL	0.6
	1,2,3-Trichloropropane.....	BDL	0.7
	Allyl Chloride (3-Chloro-1-propene).....	BDL	0.5
	1,2-Dibromoethane (EDB).....	BDL	1.0
	Methyl Ethyl Ketone.....	BDL	3.5
	Methyl Isobutyl Ketone.....	BDL	1.5
	Tetrahydrofuran.....	BDL	6.0
	M-Xylene & P-Xylene.....	26.5	1.0
	O-Xylene.....	1.1	0.5
	Cumene.....	BDL	1.5
	1,1,1,2-Tetrachloroethane.....	BDL	0.5
	1,1-Dichloro-1-propene.....	BDL	1.0
	2,3-Dichloro-1-propene.....	BDL	0.8
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	0.9
	Ethyl Ether.....	BDL	1.6
	Acetone.....	BDL	10.4
	Dibromomethane.....	BDL	1.0

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Sample Identification: B-8 Job #: 5144

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	2.0
	Chloromethane	BDL	2.0
	Bromomethane	BDL	2.0
	Dichlorodifluoromethane	BDL	2.0
	Vinyl Chloride	BDL	0.5
	Methylene Chloride	BDL	1.4
	Trichlorofluoromethane	BDL	0.9
	1,1-Dichloroethylene	BDL	1.3
	1,1-Dichloroethane	BDL	0.2
	Trans-1,2-Dichloroethylene	BDL	0.3
	Chloroform	BDL	1.0
	1,2-Dichloroethane	BDL	0.6
	1,1,1-Trichloroethane	BDL	1.1
	Carbon Tetrachloride	BDL	0.4
	Bromodichloromethane	BDL	0.7
	1,2-Dichloropropane	BDL	0.4
	Trans-1,3-Dichloropropene	BDL	0.2
	1,1,2-Trichloroethylene	BDL	0.4
	Chlorodibromomethane	BDL	0.4
	1,1,2-Trichloroethane	BDL	0.3
	Cis-1,3-Dichloropropene	BDL	0.5
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	0.5
	1,1,2,2-Tetrachloroethane	BDL	0.5
	1,1,2,2-Tetrachloroethylene	BDL	0.4
Purgeable Aromatics:	Chlorobenzene	BDL	0.3
	Benzene	BDL	2.0
	Toluene	BDL	2.0
	Ethyl Benzene	BDL	1.5
	1,2-Dichlorobenzene	BDL	0.6
	1,3-Dichlorobenzene	BDL	0.4
	1,4-Dichlorobenzene	BDL	0.2

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Sample Identification: B-8 Job #: 5144

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	0.8
	1,3-Dichloropropane.....	BDL	0.6
	1,2,3-Trichloropropane.....	BDL	0.7
	Allyl Chloride (3-Chloro-1-propene).....	BDL	0.5
	1,2-Dibromoethane (EDB).....	BDL	1.0
	Methyl Ethyl Ketone.....	BDL	3.5
	Methyl Isobutyl Ketone.....	BDL	1.5
	Tetrahydrofuran.....	BDL	6.0
	M-Xylene & P-Xylene.....	BDL	1.0
	O-Xylene.....	BDL	0.5
	Cumene.....	BDL	1.5
	1,1,1,2-Tetrachloroethane.....	BDL	0.5
	1,1-Dichloro-1-propene.....	BDL	1.0
	2,3-Dichloro-1-propene.....	BDL	0.8
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	0.9
	Ethyl Ether.....	BDL	1.6
	Acetone.....	BDL	10.4
	Dibromomethane.....	BDL	1.0

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Sample Identification: B-9 Job #: 5146

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	2.0
	Chloromethane	BDL	2.0
	Bromomethane	BDL	2.0
	Dichlorodifluoromethane	BDL	2.0
	Vinyl Chloride	BDL	0.5
	Methylene Chloride	BDL	1.4
	Trichlorofluoromethane	BDL	0.9
	1,1-Dichloroethylene	BDL	1.3
	1,1-Dichloroethane	BDL	0.2
	Trans-1,2-Dichloroethylene	BDL	0.3
	Chloroform	BDL	1.0
	1,2-Dichloroethane	BDL	0.6
	1,1,1-Trichloroethane	BDL	1.1
	Carbon Tetrachloride	BDL	0.4
	Bromodichloromethane	BDL	0.7
	1,2-Dichloropropane	BDL	0.4
	Trans-1,3-Dichloropropene	BDL	0.2
	1,1,2-Trichloroethylene	BDL	0.4
	Chlorodibromomethane	BDL	0.4
	1,1,2-Trichloroethane	BDL	0.3
	Cis-1,3-Dichloropropene	BDL	0.5
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	0.5
	1,1,2,2-Tetrachloroethane	BDL	0.5
	1,1,2,2-Tetrachloroethylene	BDL	0.4
Purgeable Aromatics:	Chlorobenzene	BDL	0.3
	Benzene	BDL	2.0
	Toluene	BDL	2.0
	Ethyl Benzene	BDL	1.5
	1,2-Dichlorobenzene	BDL	0.6
	1,3-Dichlorobenzene	BDL	0.4
	1,4-Dichlorobenzene	BDL	0.2

MVTL LABORATORIES, Inc.
P.O BOX 249
NEW ULM, MN 56073-0249
PHONE (507) 354-8517 WATS (800) 782-3557 FAX (507) 359-2890

WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Sample Identification: B-9 Job #: 5146

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	0.8
	1,3-Dichloropropane.....	BDL	0.6
	1,2,3-Trichloropropane.....	BDL	0.7
	Allyl Chloride (3-Chloro-1-propene).....	BDL	0.5
	1,2-Dibromoethane (EDB).....	BDL	1.0
	Methyl Ethyl Ketone.....	BDL	3.5
	Methyl Isobutyl Ketone.....	BDL	1.5
	Tetrahydrofuran.....	BDL	6.0
	M-Xylene & P-Xylene.....	BDL	1.0
	O-Xylene.....	BDL	0.5
	Cumene.....	BDL	1.5
	1,1,1,2-Tetrachloroethane.....	BDL	0.5
	1,1-Dichloro-1-propene.....	BDL	1.0
	2,3-Dichloro-1-propene.....	BDL	0.8
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	0.9
	Ethyl Ether.....	BDL	1.6
	Acetone.....	BDL	10.4
	Dibromomethane.....	BDL	1.0

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WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Sample Identification: B-10 Job #: 5148

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	2.0
	Chloromethane	BDL	2.0
	Bromomethane	BDL	2.0
	Dichlorodifluoromethane	BDL	2.0
	Vinyl Chloride	BDL	0.5
	Methylene Chloride	3.1	1.4
	Trichlorofluoromethane	BDL	0.9
	1,1-Dichloroethylene	BDL	1.3
	1,1-Dichloroethane	BDL	0.2
	Trans-1,2-Dichloroethylene	BDL	0.3
	Chloroform	BDL	1.0
	1,2-Dichloroethane	BDL	0.6
	1,1,1-Trichloroethane	BDL	1.1
	Carbon Tetrachloride	BDL	0.4
	Bromodichloromethane	BDL	0.7
	1,2-Dichloropropane	BDL	0.4
	Trans-1,3-Dichloropropene	BDL	0.2
	1,1,2-Trichloroethylene	BDL	0.4
	Chlorodibromomethane	BDL	0.4
	1,1,2-Trichloroethane	BDL	0.3
	Cis-1,3-Dichloropropene	BDL	0.5
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	0.5
	1,1,2,2-Tetrachloroethane	BDL	0.5
	1,1,2,2-Tetrachloroethylene	BDL	0.4
Purgeable Aromatics:	Chlorobenzene	BDL	0.3
	Benzene	BDL	2.0
	Toluene	BDL	2.0
	Ethyl Benzene	BDL	1.5
	1,2-Dichlorobenzene	BDL	0.6
	1,3-Dichlorobenzene	BDL	0.4
	1,4-Dichlorobenzene	BDL	0.2

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Sample Identification: B-10 Job #: 5148

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	0.8
	1,3-Dichloropropane.....	BDL	0.6
	1,2,3-Trichloropropane.....	BDL	0.7
	Allyl Chloride (3-Chloro-1-propene).....	BDL	0.5
	1,2-Dibromoethane (EDB).....	BDL	1.0
	Methyl Ethyl Ketone.....	BDL	3.5
	Methyl Isobutyl Ketone.....	BDL	1.5
	Tetrahydrofuran.....	BDL	6.0
	M-Xylene & P-Xylene.....	BDL	1.0
	O-Xylene.....	BDL	0.5
	Cumene.....	BDL	1.5
	1,1,1,2-Tetrachloroethane.....	BDL	0.5
	1,1-Dichloro-1-propene.....	BDL	1.0
	2,3-Dichloro-1-propene.....	BDL	0.8
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	0.9
	Ethyl Ether.....	BDL	1.6
	Acetone.....	BDL	10.4
	Dibromomethane.....	BDL	1.0

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WE ARE AN EQUAL OPPORTUNITY EMPLOYER

Sample Identification: Trip Blank Job #: 5149

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Purgeable Halocarbons:	Chloroethane	BDL	2.0
	Chloromethane	BDL	2.0
	Bromomethane	BDL	2.0
	Dichlorodifluoromethane	BDL	2.0
	Vinyl Chloride	BDL	0.5
	Methylene Chloride	BDL	1.4
	Trichlorofluoromethane	4.8	0.9
	1,1-Dichloroethylene	BDL	1.3
	1,1-Dichloroethane	BDL	0.2
	Trans-1,2-Dichloroethylene	BDL	0.3
	Chloroform	BDL	1.0
	1,2-Dichloroethane	BDL	0.6
	1,1,1-Trichloroethane	BDL	1.1
	Carbon Tetrachloride	BDL	0.4
	Bromodichloromethane	BDL	0.7
	1,2-Dichloropropane	BDL	0.4
	Trans-1,3-Dichloropropene	BDL	0.2
	1,1,2-Trichloroethylene	BDL	0.4
	Chlorodibromomethane	BDL	0.4
	1,1,2-Trichloroethane	BDL	0.3
	Cis-1,3-Dichloropropene	BDL	0.5
	2-Chloroethylvinyl Ether	NQ	ND
	Bromoform	BDL	0.5
	1,1,2,2-Tetrachloroethane	BDL	0.5
	1,1,2,2-Tetrachloroethylene	BDL	0.4
Purgeable Aromatics:	Chlorobenzene	BDL	0.3
	Benzene	BDL	2.0
	Toluene	BDL	2.0
	Ethyl Benzene	BDL	1.5
	1,2-Dichlorobenzene	BDL	0.6
	1,3-Dichlorobenzene	BDL	0.4
	1,4-Dichlorobenzene	0.6	0.2

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Sample Identification: Trip Blank Job #: 5149

Date Analyzed: 9-27-90

		ug/L	MDL ug/L
Non-Priority Pollutants:	Cis-1,2-Dichloroethylene.....	BDL	0.8
	1,3-Dichloropropane.....	BDL	0.6
	1,2,3-Trichloropropane.....	BDL	0.7
	Allyl Chloride (3-Chloro-1-propene).....	BDL	0.5
	1,2-Dibromoethane (EDB).....	BDL	1.0
	Methyl Ethyl Ketone.....	4.7	3.5
	Methyl Isobutyl Ketone.....	BDL	1.5
	Tetrahydrofuran.....	15.7	6.0
	M-Xylene & P-Xylene.....	BDL	1.0
	O-Xylene.....	BDL	0.5
	Cumene.....	BDL	1.5
	1,1,1,2-Tetrachloroethane.....	BDL	0.5
	1,1-Dichloro-1-propene.....	BDL	1.0
	2,3-Dichloro-1-propene.....	BDL	0.8
	Dichlorofluoromethane.....	NQ	ND
	1,1,2-Trichlorotrifluoroethane.	BDL	0.9
	Ethyl Ether.....	BDL	1.6
	Acetone.....	BDL	10.4
	Dibromomethane.....	BDL	1.0