Natural Resource Technology, Inc.
N R T

March 6, 1997
(1135)

Mr. James R. Reyburn
Wisconsin Department of Natural Resources
Lake Michigan District Headquarters
Post Office Box 10448
1125 North Military Avenue
Green Bay, Wisconsin 54307-0448

Replacement Pages added To Main Report. These Are the Draft pages. MJN

RE: Site Investigation Report, Former American Graphics, Inc. Site, 610 Main Street, Village of Goodman, Wisconsin

Dear Mr. Reyburn:

Replacement pages for the previously submitted draft copy of the Site Investigation Report (January 10, 1997) for the above referenced site are enclosed. The replacement pages include an entire revised text, all new figures and tables, an addition to Appendix A, and replacement figures for Appendix L. Replacement pages were also forwarded to Ms. Maries Stewart with WDNR Central District Office, Mr. Henry Nehls-Lowe with the State of Wisconsin Bureau of Public Health, and Mr. Don Hawley with the Village of Goodman.

Thank you for your continued confidence with Natural Resource Technology, Inc. Please call us should you have any questions regarding the enclosed report or project.

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

T Mueller

Tim Mueller, P.G.
Hydrogeologist

Enclosure: Replacement Pages for Site Investigation Report, March 6, 1997

cc: Ms. Marie Stewart, WDNR Central District Office
Mr. Henry Nehls-Lowe, State of Wisconsin Bureau of Public Health
Mr. Don Hawley, Village of Goodman.

[1135\SI Report\SI Report Letter - Final]

Natural Resource Technology, Inc.
N R T

DRAFT

SITE INVESTIGATION REPORT

FORMER AMERICAN GRAPHICS, INC. FACILITY
VILLAGE OF GOODMAN, WISCONSIN

Project No. 1135

Prepared For:

Wisconsin Department of Natural Resources
101 South Webster Street
Madison, WI 53707

Prepared By:

Natural Resource Technology, Inc.
23713 West Paul Road, Suite D
Pewaukee, WI 53072

January 10, 1997

Rebecca J. Koepke
Hydrogeologist

"I, Rebecca J. Koepke, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

Tim Mueller, P.G. (WI #286)
Hydrogeologist

"I, Timothy E. Mueller, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

Robert J. Karnauskas, P.G., P.HG.
President/Principal Hydrogeologist

"I, Robert J. Karnauskas, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

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EXECUTIVE SUMMARY

Natural Resource Technology, Inc. (NRT) was retained by the Wisconsin Department of Natural Resources (WDNR) to conduct a site investigation of the former American Graphics, Inc. (AGI) facility located at 610 Main Street in the Village of Goodman, Marinette County, Wisconsin. The investigation was conducted to assess the magnitude and extent of impacts in relation to a reported release of ethyl acetate on the former AGI facility. The investigation focused on the AGI site and downgradient areas, but did not include the area surrounding the two Village of Goodman municipal wells. The investigation was performed in accordance with the NRT's *Site Investigation Work Plan, American Graphics, Inc. Facility and Village of Goodman*, submitted to the WDNR on May 16, 1996 and Change Order Number 3 submitted to the WDNR on September 19, 1996.

AGI occupied the subject property from 1979 to 1993 and was engaged in the business of printing labels for food, household, and beverage items. A release of ethyl acetate associated with a 3,000-gallon underground storage tank (UST) and associated above grade storage drums at the AGI facility was reported to the WDNR in 1991.

In December 1992, Remedial Engineering, Inc. (REI) detected 1,1,1 trichloroethane (1,1,1-TCA) in two shallow-depth soil samples in the vicinity of the UST and storage drums. REI identified four on-site USTs: one 6,000-gallon solvent blend ("Trichlor Toluol") tank, one 3,000-gallon ethyl acetate tank, one 3,000-gallon tank of unknown contents, and one 1,200-gallon heating oil tank.

In November 1993, REI installed and sampled soil and groundwater from four on-site soil borings/monitoring wells located to the northeast of the USTs. Several volatile organic compounds (VOCs) were detected in soil and groundwater samples. Elevated concentrations of toluene, 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), and 1,1,1-TCA were detected above the NR 140 Groundwater Quality Enforcement Standards.

NRT performed a site investigation in August through October 1996 to evaluate the potential for the releases at the former AGI facility to impact groundwater quality at the Village of Goodman Municipal wells #1 and #2. The objectives of this investigation included the following:

- A historical survey of past site operations pertinent to the reported and potential releases at the site;
- A review of regulatory databases to identify other sites and facilities having the potential to impact the municipal wells;
- An investigation of the horizontal and vertical extent of soil and groundwater impacts at the AGI site and the potential for impacts to migrate to the two municipal wells;

- Characterization of the hydrogeologic and stratigraphic conditions and flow of groundwater beneath the former AGI site;

- Conducting a preliminary analysis of remedial alternatives.

NRT's investigation focused on identifying on-site source areas and determining extents of on-site and off-site soil and groundwater impacts identified by the REI investigation. Telephone interviews were conducted of several former AGI employees and state regulatory databases were reviewed to evaluate past operations and identify potential on-site source areas. NRT's on-site investigation included performance of a soil vapor survey, analysis of surface and shallow-depth soil, and groundwater sampling. The off-site investigation was designed to delineate the horizontal and vertical extent of the groundwater plume through soil and groundwater sampling form soil borings, water table wells, and piezometers.

A release of ethyl acetate on the AGI facility occurred in 1991 associated with surface water infiltration into a UST and related handling of the spill. The quantity of product released is unknown. Other known releases occurred at the northern loading dock area (north of the UST area) and suspected releases south of the main warehouse. However, soil gas surveys and surface soil sampling indicated no evidence of VOCs in the soil at these locations.

NRT's investigation concluded that on-site soils located in the vicinity of the solvent USTs and former drum storage area appear to be a minor source of impact to groundwater based on the limited on-site soil analytical data collected. Significant impacts were not detected in unsaturated soil samples (above the water table). The on-site groundwater plume consists predominantly of chlorinated hydrocarbons, several of which exceed NR 140 ES and is present on the east half of the site at a depth less than 80 feet below the land surface.

The plume was detected off-site approximately 1,020 feet to the northeast and downgradient of the AGI property. Benzene, toluene, chloroform, tetrachloroethene (PCE), trichloroethene (TCE), 1,1-DCE, 1,1,1-TCA, 1,1-DCA, and 1,2-dichloroethane (1,2,-DCA) are compounds which have exceeded PAL and/or ES standards on and off the former AGI site.

Vertical profiling samples taken during drilling of the piezometers and analyzed by field GC and subsequent laboratory analyses of groundwater samples from the piezometers indicates minimal vertical migration of impacts has occurred on and off the former AGI site.

Depth to water at the AGI site ranges between 27 to 41 feet bls. Shallow groundwater flow across the property is generally to the east. Depth to water in the off-site investigation area is generally depended on local topography and ranges from approximately 20 feet bls to less than one foot bls. Shallow groundwater flow, south of Chemical Creek, is generally to the northeast and to the southeast, north and in close proximity of Chemical Creek. This local flow direction indicates a groundwater discharge area.

The horizontal groundwater gradient at the water table and the piezometer depth is generally moderate to steep and toward the northeast. Vertical gradients are generally slight to moderate and predominately downward. The well nest adjacent to Chemical Creek had a slight downward gradient indicating the creek is not a significant area of groundwater discharge nor an effective barrier to plume migration.

Soil and groundwater impacts detected in samples collected from off-site soil borings located east of the groundwater plume (east of Maple Avenue) indicate that a separate unknown off-site source may be attributing to the detected impacts.

Two municipal wells, Municipal Wells #1 and #2, are present approximately 1,000 to 1,200 feet downgradient, respectively, of the former AGI facility to the northeast. Municipal well #1 is screened between 35 to 70 feet bls, and well #2 is screened 38 to 53 feet bls. Both wells pump water from the sand and gravel aquifer at the referenced screen depth. Groundwater samples collected from the wells in 1994 and 1995, indicate sporadic detections of low levels of VOCs in both well samples. Analytical data suggests detections may be the result of the municipal chlorination process.

Four private potable wells located east-southeast of the former AGI facility were sampled by the WDNR in 1996. VOCs were not detected in the samples collected from the potable wells. These potable wells are located up and side gradient of the plume defined by the monitoring well installations.

Based on the results of the investigation, a preliminary analysis of remedial alternatives was conducted by NRT. Specific objectives for developing a long term monitoring strategy were identified and practical remedial responses capable of achieving the objectives focus on source control, migration control, groundwater monitoring, and an alternate water supply. The remedial alternatives considered included (1) Groundwater migration control and limited source control, (2) source control and groundwater monitoring, and (3) groundwater monitoring.

Recommendations, based on the results of the investigation, are provided below.

- Remove the three solvent USTs and fuel oil UST and surrounding impacted soil as a source removal action. Sample excavated soil for hazardous waste characterization.

- Install one water table well, following the removal of the USTs, on the former AGI site in the vicinity of the drum storage area and solvent USTs to monitor groundwater quality at the source area.

- Conduct additional assessment to identify potential additional sources associated with the groundwater impacts detected in on-site monitoring well MW-102.

- Install one water table well downgradient (east) of the eastern extent of the groundwater plume to verify the groundwater impacts detected by field GC analysis in samples SB-123 through SB-127 and to monitor plume migration.

- Install one water table well between the south-southeast extent of the groundwater plume and the four private potable wells located along Maple Avenue to monitor plume migration toward the private potable wells.

- Install one piezometer adjacent to water table well MW-109 (north of Chemical Creek) to monitor the groundwater quality and flow direction at depth between the identified northeast edge of the plume and the two municipal water supply wells.

- Continue groundwater sampling of all water table wells, piezometers, private potable wells, and municipal wells to monitor groundwater quality and plume migration. Sampling frequency should be at least on a semi-annual basis or at a greater frequency (quarterly) of key monitoring wells.

1 INTRODUCTION

1.1 Overview

This report was prepared by Natural Resource Technology, Inc. (NRT) on behalf of Wisconsin Department of Natural Resources (WDNR) to document the site investigation of the former American Graphics, Inc. (AGI) facility located at 610 Main Street in the Village of Goodman, Marinette County, Wisconsin. The investigation was conducted to assess the magnitude and extent of impacts in relation to a reported release of ethyl acetate on the former AGI facility. The site location is shown on Figure 1 and the area of investigation is shown on Figure 2.

The investigation focused on the AGI site and downgradient areas, but did not include the area surrounding the two Village of Goodman municipal wells. An investigation of the area surrounding the municipal wells was a contingency task which was determined not to be necessary based upon field investigation results presented herein.

The investigation was performed in accordance with the NRT's *Site Investigation Work Plan, American Graphics, Inc. Facility and Village of Goodman*, submitted to the WDNR on May 16, 1996 and Change Order Number 3 submitted to the WDNR on September 19, 1996.

1.2 General Project Information

General project information and project contacts include the following:

WDNR Contacts:

James R. Reyburn
Environmental Response & Repair Program
1125 North Military Avenue
P.O. Box 10448
Green Bay, WI 54307-0448
(414) 492-5916

	Marie Stewart Wisconsin Department of Natural Resources 101 South Webster Street P.O. Box 7921 Madison, WI 53707 (608) 267-2465
AGI Facility Address:	610 Main Street, Village of Goodman, Marinette County, Wisconsin
Geographic Location:	Southeast 1/4, Northwest 1/4 and Northeast 1/4, Southwest 1/4, Section 3, Township 36 North, Range 17 East, Village of Goodman, Marinette County (Figure 1).
Project Description:	Soil and groundwater investigation associated with solvent underground storage tanks (USTs) and solvent spills at the former AGI facility.
Past Property Tenants:	Vacant, 1994-Present FLS Graphics, Inc. 1993-1994 American Graphics, Inc. (AGI) 1979-1993 St. Joan of Arc Catholic School, 1950-1979
Environmental Consultant:	Natural Resource Technology, Inc. 23713 West Paul Road Pewaukee, WI 53072 Tim Mueller, P.G. (414) 523-9000
Project Subcontractors:	
Drilling Services:	Boart Longyear, Environmental Drilling Division 101 Alderson Street P.O. Box 109 Schofield, WI 54476-0109 Ron Thalacker (715) 359-7090
WDNR Certified Laboratory:	National Environmental Testing (NET) 602 Commerce Drive P.O. Box 288 Watertown, WI 53094 Warren Topel (414) 261-1660

Mobile Laboratory:	McCloskey Environmental Services, Inc. P.O. Box 141 Muskego, WI 53150 Matt McCloskey (414) 529-8935
	En Chem Corporation 1795 Industrial Drive Green Bay, WI 54302 Mary Christie (414) 469-2436
Survey:	Technical Engineering Support Services P.O. Box 11541 Green Bay, WI 54307-1541 Dennis J. Christie (414) 434-8377

1.3 Background and Previous Site Investigation

AGI occupied the subject property from 1979 to 1993 and was engaged in the business of printing labels for food, household, and beverage items. A release of ethyl acetate associated with a 3,000-gallon underground storage tank (UST) at the AGI facility was reported to the WDNR in 1991. Water had infiltrated the UST through an uncovered opening in the top of the UST. The liquid in the UST overflowed into the surrounding soil. In an effort to prevent further release of the ethyl acetate into the surrounding soil and groundwater, AGI employees pumped the ethyl acetate and infiltrated water from this UST into two above ground, open-top storage tanks stored between the Storage (Ink Room) and Press buildings (Figure 3). These open-top tanks were used to phase separate the ethyl acetate from the water over time. Subsequent precipitation events apparently caused the tanks to over fill resulting in additional spillage onto the surrounding soils.

In August 1992, the WDNR performed a Hazardous Waste Inspection of the AGI facility which revealed five hazardous waste violations. The WDNR also observed leakage from several corroded liquid-filled drums and soil staining surrounding the corroded drums and open-top storage tanks, all of which were located in the outside storage area between the Storage and Press buildings. The WDNR instructed AGI to transfer the remaining liquid in the corroded drums and open-top tanks into drums in good condition and properly dispose the drummed liquid waste. Approximately 800 gallons of an ethyl acetate and water mixture remained in the 3,000-gallon ethyl acetate UST.

In December 1992, Remedial Engineering, Inc. (REI) collected several shallow-depth soil samples (H-1, H-2, and H-3) in the drum and open-top tank storage area and at the ends of the ethyl acetate UST. The approximate sample locations are shown on Figure 3 and laboratory analytical data are summarized on Table 1.

REI conducted a Phase I assessment (records search) and Phase II subsurface investigation in November 1993. REI findings are presented in their document titled *Environmental Assessment Report January 7, 1994 American Graphics Facility, 610 Main Street, Goodman, Wisconsin.* Results of the Phase I assessment indicated that the site was occupied by St. Joan of Arc Catholic School from 1950 to approximately 5 to 10 years prior to AGI occupying the site from 1979 to 1993. FLS Graphics, Inc. (FLS) leased the facility from early 1993 to March 1994.

Four USTs are present on the site and include one 6,000-gallon solvent blend ("Trichlor Toluol") tank, one 3,000-gallon ethyl acetate tank, one 3,000-gallon tank of unknown contents, and one 1,200-gallon heating oil tank. REI identified four additional sites which have or potentially have impacts to the environment within a one mile radius of the site. All sites appear to be petroleum hydrocarbon releases located west of Main Street, down or side gradient of AGI and upgradient of the municipal wells.

In November 1993, REI conducted a Phase II investigation which consisted of advancing four on-site soil borings ranging in depths from 24 to 40 feet below land surface (bls). Water table monitoring wells (MW-1, MW-2, MW-3), were installed in three of the four borings, all of which were presumed to be hydraulically downgradient of the four USTs. Monitoring well and soil boring locations are shown on Figure 3. Soils encountered during drilling generally consisted of sand and gravel. Soil samples were collected from the three borings/wells and analyzed for volatile organic compounds (VOCs - U.S. EPA Method SW846) including methanol, 1,1,1-trichloroethane (1,1,1-TCA), acetone, toluene, and ethyl acetate. One soil sample collected from boring MW-3 was also analyzed for diesel range organics (DRO, Wisconsin Modified Method). Analytical data is summarized on Table 1.

Groundwater samples were collected from the groundwater monitoring wells on November 24, 1993 and were analyzed for VOCs (U.S. EPA Method 8021), and one sample collected from monitoring well MW-3 was analyzed for DRO (Wisconsin Modified Method). Analytical data are summarized on Table 2.

Results of this sampling indicated that NR 140 Groundwater Quality Preventive Action Limit (PAL) for trichloroethene (TCE) and the Enforcement Standard (ES) for 1,1-dichloroethene (1,1-DCE) and 1,1,1-TCA were exceeded in the groundwater samples collected from monitoring wells MW-1 and MW-2. The PALs for 1,1-dichloroethane (1,1-DCA) and TCE and the ESs for toluene, 1,2-DCA, 1,1-DCE, and 1,1,1-TCA were exceeded in the groundwater sample collected from MW-3.

1.4 Village of Goodman Municipal Wells and Private Wells

Two municipal wells, #1 and #2, are located approximately 1,650 to 1,400 feet, respectively, downgradient to the northeast of the AGI site. Municipal well #1 is screened between 35 to 70 feet bls, and well #2 is screened 38 to 53 feet bls. Both wells pump water from the sand and gravel aquifer at the referenced screen depth. The shallow depth of these wells make the Village of Goodman water supply highly vulnerable to surficial contaminant releases within their capture zones. Groundwater depth during pumping periods in Municipal Well #2 is reported at approximately 33 feet bls based on the well constructors report.

Groundwater samples collected from the wells by the Village of Goodman in December 1994 and April, May, June, September, and November 1995, indicated low levels of VOCs in both wells. Analytical data is summarized on Table 3. 2,2,-Dichloropropane, chloromethane, and dibromochloromethane were detected in groundwater samples collected from Municipal Well #1 at concentrations below WDNR groundwater quality standards. Total xylenes, isopropylbenzene, n-propylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, chloromethane, bromomethane, and ethylbenzene were detected in (below WDNR groundwater quality standards) samples collected from Municipal Well #2. Chloroform and bromodichloromethane were detected in groundwater samples collected from both municipal wells at concentrations which exceed the WDNR groundwater quality Enforcement Standards (ESs) of 6 micrograms per liter (µg/L) and of 0.6 µg/L, respectively. Chloroform concentrations ranged from no detection to 100 µg/L in Municipal Well #1 and from no detection to 60 µg/L in Municipal Well #2. Bromodichloromethane concentrations ranged from 0.61 µg/L to 5.2 µg/L in Municipal Well #1 and from no detection to 2.4 µg/L in Municipal Well #2.

Four private potable wells were identified within the investigation area by the WDNR and these wells were sampled by the WDNR in July and August 1996. The potable wells have been identified as Wetland (804 Maple Avenue), Kalkfen #1 (710 Maple Avenue), Kalkfen #2 (706 Maple Avenue), and Swanson (803 Maple Avenue). The samples were analyzed for VOCs but no VOCs were detected in the private potable well samples. The laboratory analytical reports are included in Appendix A and summarized on Table 3.

1.5 Objectives

The objective of this investigation is to evaluate the potential for the releases at the AGI facility to impact groundwater quality at Municipal wells #1 and #2. Consistent with achieving this objective, the scope of investigation included the following:

- A historical survey of past site operations pertinent to the reported and potential releases at the site;
- A review of regulatory databases to identify other sites and facilities having the potential to impact the municipal wells;

- An investigation of the horizontal and vertical extent of soil and groundwater impacts at the AGI site and the potential for impacts to migrate to the two municipal wells;
- Characterization of the hydrogeologic and stratigraphic conditions and flow of groundwater beneath the AGI site;
- Conducting a preliminary analysis of remedial alternatives.

The scope of investigation is described in more detail in the following section.

2 SCOPE OF INVESTIGATION

2.1 Historical Survey

2.1.1 Aerial Photographs

NRT obtained and reviewed copies of historical aerial photographs of the site and vicinity for possible contaminant sources at the AGI site and the two municipal wells. Aerial photographs dated 1979, 1989, and 1992 were obtained from National Aerial Resources (Troy, New York). These photographs were obtained to study structures and activities on the former AGI facility and surrounding area of investigation.

2.1.2 Telephone Interviews

NRT interviewed several former AGI employees and Village of Goodman residents regarding past activities at the AGI facility. Additional employees and/or neighbors were identified for interview based on interviews conducted. Interview questionnaires were completed and are included in Appendix B.

2.2 Regulatory Database Review

Environmental Data Resources, Inc. (EDR) was contracted to search federal and state databases which report locations where the handling, production, or release of substances may impact the environment. The EDR report is included in Appendix C. NRT also reviewed the Wisconsin databases to assist in identifying such facilities where address information was lacking or ambiguous. Sites identified by NRT from Wisconsin lists are also included in Appendix C.

2.3 Soil Vapor Survey

A soil vapor survey was conducted on July 13, 1996 to evaluate locations of possible on-site soil impacts. The on-site soil gas survey consisted of installing and sampling 43 soil vapor points in accessible outside areas on the former AGI facility. Locations of the soil vapor points are shown on Figure 4.

The soil vapor probes were installed to a maximum depth of two to three feet bls. NRT's KVA™ vapor probe system was used to install the soil vapor probes. Soil vapor probes are constructed with an aluminum probe (approximately three-quarters of an inch in diameter and three inches in length) driven into the ground surface with a electric rotary hammer to a depth of approximately two to three feet bls. Slits on the side of the aluminum probe allow soil gas to migrate into the probe. A one-quarter inch flexible Teflon™ tubing extends from the probe to the ground surface. The annular space around the probe is backfilled with sand to facilitate the migration of soil gas to the probe. The annular space above the probe to ground surface was filled with bentonite and hydrated to prevent surface air from entering the probe during extraction of soil gases.

After allowing the soil gas and the probes to equilibrate for several hours, the Teflon™ tubing was connected to an empty sample bag located in a vacuum box. A sampling pump was used to withdraw air from the vacuum box. As air was removed from the box, the vacuum created allowed soil gas within the soil probe to enter the empty sampling bag in the vacuum box. This method of sample collection prevents drawing water into screening equipment and the soil gas does not pass through a sampling pump. The soil gas in the sampling bag was then immediately connected to PIDs equipped with a 10.6 and 11.8 eV lamps to screen for VOCs. The PID readings provided an indication of the presence and magnitude of soil impacts in the immediate area of the probe.

Photoionization detectors (PID) equipped with 10.6 eV and 11.8 eV lamps were used to screen potential VOC vapors in the soil vapor points. The 10.6 eV PID was used to field screen for VOCs having lower ionization potentials such as toluene and ethyl acetate. The 11.8 eV PID was used to field screen VOCs having higher ionization potentials such as 1,1,1-TCA and some compounds associated with heating oil. PID readings were recorded on a Field PID Screening Log form included in Appendix D. PID readings are also summarized on Table 4.

After completion of screening, the probes were left in-place and the Teflon ™ tubing was cut at ground level. Since only the flexible Teflon tubing will be exposed at the surface, leaving the probes in place should not present a physical hazard or obstruction at the surface.

2.4 Soil Probe Survey

Twenty five (25) soil probes (soil borings) were installed in July and October 1996 for collection of groundwater samples to assess the lateral extent of groundwater impacts at the water table downgradient and off-site of the former AGI facility (Figure 5). The results of the soil probe groundwater sampling and field GC analysis were utilized to optimize locations for installation of water table wells to confirm the lateral extent of the plume and for the performance of vertical groundwater profiling to establish the depth of contamination within the aquifer. Field GC analytical data are summarized on Figure 5.

Nineteen (19) soil borings (SB-103 through SB-121) were performed in July 1996 and six soil borings (SB-122 through SB-127) were performed in October 1996 (Figure 5) to assess the magnitude and extent of groundwater impacts at the water table off-site of the former AGI facility. Soil boring sampling was performed utilizing a Dietrich Environmental Soil Probe. Soil samples were collected continuously with a one and three quarters inch outside diameter, two foot long, split spoon sampler with a truck mounted hydraulic hammer. Soil samples are described on WDNR Soil Boring Log Information forms included in Appendix E. Groundwater sampling was performed through the sampling rod with a disposable bailer.

Soil samples were field screened for the presence of VOCs with two PIDs; one equipped with a 10.6 eV lamp and the other with an 11.8 eV lamp. PID readings are recorded on a field screening PID logs (Appendix D) and on WDNR soil boring logs (Appendix E). PID readings are summarized on Table 5.

The groundwater samples collected using soil probes in July 1996 were analyzed by a field GC primarily for 1,1,1-TCA, 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), toluene, diesel range organics (DRO), acetone, methanol, and ethyl acetate. Samples were also screened for trans-1,2-dichloroethene (trans-1,2-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), tetrachloroethene (PCE), benzene, ethylbenzene, and total xylenes. Groundwater samples collected from soil borings advanced in October 1996 were analyzed for 1,2-DCE, TCE, PCE, 1,2-DCA, methyl tert-butyl ether (MTBE), benzene, toluene, ethylbenzene, total xylenes, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene. Analytical data are summarized on Table 6. Summaries of field analytical data are included in Appendix F.

Upon completion of groundwater sampling, the soil probes were abandoned in accordance with NR 141 borehole abandonment requirements. Soil probe abandonment is documented on WDNR borehole abandonment forms included in Appendix E.

2.5 Soil Borings and Sampling

Two soil borings (SB-101 and SB-102) were drilled and sampled on the AGI site following the completion of the soil vapor survey to assess soil impacts in the UST area. Soil boring locations were limited to accessible areas on the former AGI facility property. The soil borings were advanced with conventional hollow-stem auger drilling techniques. Soil samples were collected continuously to the total depth of 14 feet at boring SB-101 and to 20 feet at boring SB-102 using a two-foot long, two-inch inside diameter spilt-spoon sampler. Soil sampling in both soil borings was stopped because of auger refusal due to large boulders. Three attempts were made to advance soil boring SB-101 with a 4.25-inch hollow-stem augers. SB-102 was drilled by mud-rotary method. Soil samples were described on WDNR soil boring logs included in Appendix E.

Upon completion of soil sampling, the soil borings were abandoned in accordance with NR 141 requirements. Borehole abandonment forms are included in Appendix E.

Soil samples were field screened for the presence of VOCs using the headspace method with two PIDs, one equipped with a 10.6 eV lamp and one with an 11.7 eV lamp. PID readings were recorded on a Field PID Screening Log form and on WDNR soil boring logs (included in Appendix D and E, respectively). PID readings are also summarized on Table 5.

Two hand auger samples (HA-01 and HA-02) were collected on October 4, 1996 adjacent to soil vapor probe locations which indicated the possible presence of VOCs. The soil samples were collected from approximately three feet bls and analyzed at a laboratory for petroleum volatile organic compounds (PVOCs). Analytical data is summarized on Table 1 and the laboratory analytical report is included in Appendix G.

2.6 Surface Soil Samples

Five surface soil samples (SS-101 through SS-105) were collected from approximately four to six inches bls for VOC analysis by field GC in July 1996. These surface soil samples were collected from areas on-site where stressed vegetation was observed by NRT and the WDNR during a 1995 site inspection as shown on Figure 4. Surface soil samples were not part of the original scope of investigation. However, stressed vegetation was noted during NRT's 1995 initial reconnaissance of the facility in the southwest portion of the site. The field GC was on-site and available for use with no additional project cost. Therefore, a limited number of soil samples were collected to assess potential impacts in the area of stressed vegetation and in the southern loading dock area. Analytical data is summarized on Table 6 and is presented in Appendix F.

2.7 Monitoring Well Installations

Thirteen monitoring wells were installed during this investigation. Nine of the thirteen wells were constructed as water table monitoring wells (MW-101 to MW-109) and four piezometers (PZ-101 to PZ-104) were constructed and sampled for evaluation of the horizontal and vertical extent and magnitude of impacts on and migrating from the AGI site. Two water table wells and one piezometer were constructed on the AGI site. The remaining wells and piezometers were constructed off-site. Locations of monitoring well installations are shown on Figure 2. Water table monitoring wells MW-101 through MW-106 and piezometers PZ-101 through PZ-103 were constructed in July 1996, following the completion of the soil probe survey which assessed the extent of the groundwater plume at the water table. Following evaluation of the first two rounds of groundwater analyses and assessment of groundwater flow direction, monitoring wells MW-107, MW-108, MW-109, MW-110, and PZ-104 were constructed in September 1996 to further evaluate the plume extent and magnitude.

2.7.1 Water Table Observation Wells

Monitoring well MW-101 was installed upgradient of the former AGI facility. Monitoring well MW-102 was installed side gradient of the AGI facility. The remaining water table monitoring wells were constructed downgradient of the facility at locations indicated by the soil probe sampling to represent the lateral and downgradient extent of plume migration.

Difficult drilling conditions were anticipated (due to large boulders) based on previous experience by REI in 1993. Therefore, monitoring well MW-101, MW-102, MW-105 through MW-109 and PZ-101 through PZ-104 were constructed with a sonic drilling techniques which involves advancing a six or eight inch hollow steel pipe with sonic vibration. Soil samples are collected continuously with an inner steel rod lined with a plastic sampling bag. Drill cutting are not produced with this drilling technique, all soil removed during drilling is removed as soil samples. Monitoring well MW-103 and MW-104 were drilled with hollow stem augers. MW-103 was drilled with hollow stem augers because of the shallow depth (less than 20 feet below land surface). Monitoring well MW-104 was drilled with hollow stem augers because the area was inaccessible for a sonic drill.

The monitoring wells were constructed in accordance with NR 141 requirements with 10 or 15 foot screens and a minimum of five feet of the well screen placed below the estimated water table interface. Soil boring logs were prepared for each of the drilling locations on WDNR boring log forms. Soil descriptions were performed in accordance with ASTM Standard Practice D2488 which utilizes the Unified Soil Classification System. WDNR Monitoring Well Construction, and Groundwater Monitoring Well Information forms were completed for each well and are included in Appendix E.

2.7.2 Piezometers

The vertical extent of impacts was evaluated through the performance of vertical groundwater profiling during the drilling and sampling at three piezometer locations on-site (PZ-101) and downgradient of the former AGI facility (PZ-102 and PZ-103). The vertical groundwater profile sampling was accomplished using sonic drilling methods. The borehole was extended and cased to the desired sampling depth and a disposable bailer was lowered into the borehole for collection of a groundwater sample. The samples were collected for field GC VOC analysis (as described in Section 2.4). Analytical data is included in Appendix F.

Vertical groundwater sampling depths in PZ-101 were taken from approximately 25, 50, and 75 feet below the estimated water table interface (55, 80, and 105 feet bls) and from 35 and 65 feet bls in piezometers PZ-102 and PZ-103. These intervals were chosen to assess groundwater quality with aquifer depth and enable placement of piezometer screen intervals at optimal locations. The vertical groundwater profiling samples were analyzed using a field GC for major plume parameters as identified by the soil probe groundwater sampling analysis (Section 2.4). Soil samples were also collected from piezometers PZ-101 and PZ-102 to supplement the groundwater vertical profiling. These samples were not included in the original scope of investigation, but were analyzed at no additional cost to the investigation. Soil field GC analytical data is summarized on Table 6 and the field analytical report is included in Appendix F.

Following the completion of the field GC analyses, a depth interval was selected for the installation of a piezometer at each location to assess the vertical extent of impacts. The piezometers were constructed in accordance with NR 141 requirements with 5 foot screens. Soil samples were screened with PIDs as described in Section 2.4 and readings were recorded on Field PID Screening forms included in Appendix D. Soil boring logs were completed as described in Section 2.4 and are included in Appendix E. Monitoring well construction are included in Appendix E.

2.7.3 Monitoring Well Development

All monitoring wells and piezometers were developed following construction in accordance with NR 141 requirements. Purged water from monitoring wells MW-101 through MW-106 and PZ-101 through PZ-103 was temporarily stored in 55-gallon drums on the former AGI facility property pending authorization to dispose the water in the Village of Goodman sanitary sewer system. Permission to dispose purged water in the sanitary sewer was received from Mr. Bill Draeger, Village of Goodman Sanitary Sewer District Manager, prior to completion of the second phase of drilling. Stored water from monitoring wells MW-101 through MW-106 and piezometer PZ-101 thorough PZ-103 was disposed in the sanitary sewer with purged water from monitoring wells MW-107 through MW-109 and piezometer PZ-104. Monitoring well development forms are included in Appendix E.

2.8 Groundwater Sampling/Monitoring

2.8.1 Groundwater Sampling

Approximately one week after construction and development of monitoring wells MW-101 through MW-106 and piezometers PZ-101 through PZ-103, the existing wells constructed by

REI in 1993 (MW-1, MW-2, and MW-3) and new wells constructed by NRT were sampled on August 6, 1996. A second round of groundwater samples were collected from the same monitoring wells on September 5, 1996. The groundwater samples were submitted for laboratory analyses of VOCs using U.S. EPA Method 8260.

Following construction of MW-107, MW-108, MW-109 and PZ-104 in August 1996, a third round of groundwater samples were collected and analyzed for VOCs (U.S. EPA Method 8260) from all groundwater monitoring wells except MW-1, MW-2 and MW-3. Groundwater quality samples were not collected from MW-1, MW-2, and MW-3 due to the historical database for these wells and to reduce the analysis budget.

Mr. Bill Draeger, the Village of Goodman Sanitary Sewer District manager, informed NRT during the second phase of drilling operations (August 1996) that three monitoring wells existed in the vicinity of the former seepage cells for the Village of Goodman treatment facility which was closed in the 1980's (Figure 2). Information regarding the construction on these monitoring wells was not readily available for incorporation to this report. NRT identified these monitoring wells as OW-1, OW-2, OW-3 (Figure 2). These monitoring wells were sampled during the third sampling round as directed by the WDNR.

Groundwater analytical data is summarized on Table 2 and on Figure 6. Analytical laboratory reports are included in Appendix H.

2.8.2 Groundwater Elevation Measurements

Measurements of the water table, piezometric surface, and surface water (Chemical Creek, Maple Avenue culvert, SW-101) elevations were collected prior to well development and prior to each groundwater sampling event. Measurements of depth to groundwater were collected using an electronic water level indicator and measurements were read to ± 0.01 feet. Groundwater monitoring field forms are included in Appendix D. The water table well and piezometer head measurements were used to establish the direction of groundwater flow laterally and vertically.

Monitoring well and water level elevations are summarized on Table 7. Groundwater monitoring information field forms are included in Appendix D. Water table elevations for August 5, September 4, and October 10, 1996 have been contoured on Figures 7, 8, and 9, respectively. The piezometric surface contours for October 10, 1996 have been contoured on Figure 10. Groundwater gradients (vertical and horizontal) and average linear velocities were also calculated. Calculation sheets are included in Appendix I.

2.8.3 Field Hydraulic Tests

In August 1996, twelve wells (MW-1, MW-2, MW-3, MW-101, MW-102, MW-103, MW-104, MW-105, MW-106, PZ-101, PZ-102, and PZ-103) and in October 1996, one piezometer (PZ-104) were hydraulically tested by baildown recovery to characterize the hydraulic properties of the unconsolidated deposits. The tests were performed using baildown recovery methods. Before starting the tests, the water level elevation in each well was measured. A pressure transducer, connected to a data logger, and the dedicated bailer were inserted into the well. The water level was then allowed to return to within 0.02 feet of the original water level. Following stabilization of the water level within the well the bailer was quickly removed. The rate of the water level recovery was measured and recorded by the pressure transducer and data logger. Field measurement data and analysis sheets are included in Appendix J.

The data collected by the data logger was used in the characterization of the aquifer properties and may be used to evaluate remedial action alternatives for groundwater. The baildown recovery data was analyzed using the Bouwer-Rice (Bouwer and Rice, 1976) method. Estimated hydraulic conductivity data is summarized on Table 8.

2.9 Elevation Survey of Investigation Area

Site elevation surveys were performed on August 5 and October 3, 1996. The initial survey performed in August 1996 was performed following the construction of monitoring wells MW-101 through MW-106 and PZ-101 through PZ-103. An additional survey was performed in

October to include the new monitoring wells into the original survey. Horizontal locations were surveyed on a local grid system and elevations were surveyed relative to mean sea level (MSL). Locations surveyed included existing monitoring wells, new monitoring wells and piezometers, soil borings, soil probes, soil vapor probes, surface soil samples, roads, municipal utilities, and AGI site buildings. Survey data is included in Appendix K.

2.10 Underground Storage Tank Observations

The three solvent USTs on the former AGI facility were observed to evaluate remaining contents and volumes on September 25, 1996 (Figure 3). The fill pipes for each tank were removed to measure the depth of remaining liquid in the USTs using a product stick gauge. If product remained in the tanks, the product was to be sampled and analyzed to determine chemical composition.

2.11 Quality Assurance/Quality Control

2.11.1 Equipment Decontamination

The drilling subcontractor provided a steam cleaner, and a decontamination area was established on-site for decontamination of the soil probe, drill rig, auger casing, and drill stem used in extending the borings. Oils, greases or petroleum based products were not permitted on downhole equipment. Sampling equipment, such as split spoons and sampling spatulas, were cleaned by thoroughly washing in Alconox ™ detergent followed by triple rinses with distilled water prior to the collection of each sample.

2.11.2 Cross-Contamination

Groundwater sampling procedures were used which minimize the potential for cross-contamination. Sampling personnel wore new sampling gloves and utilized new bailer draw line at each well. Care was exercised to ensure that bailer, draw line, and sampling containers did not come in contact with possible contamination sources. New PVC bailers were be dedicated to each well to prevent cross-contamination between wells.

2.11.3 Laboratory Quality Assurance

Analysis of environmental media samples was performed by a laboratory certified by WDNR under NR 149. A trip blank was analyzed for VOCs with each round of groundwater samples. For every set of ten or less groundwater samples, one field duplicate sample was collected and tested for the same analysis as the monitoring well samples.

All samples were analyzed within method hold times. The analytical laboratory did not report any analyses out of control limits.

2.11.4 Field GC Laboratory Quality Assurance

Field duplicates and field blanks analyzed for VOCs by field GC analyses were within quality assurance (QA) limits as report in the field GC analytical reports included in Appendix F. The field laboratories did not report any analyses out of control limits.

3 INVESTIGATIVE RESULTS

3.1 Aerial Photograph Review

NRT obtained and reviewed copies of historical aerial photographs for possible contaminant sources at the AGI site and/or other sources in the vicinity of the two municipal wells. Aerial photographs dated 1979, 1989, and 1992 were obtained from National Aerial Resources (Troy, New York). The sections of the AGI building currently identified as the Main Office and Press Room are evident in the 1979 photograph. A small structure is evident in the location of the three solvent USTs adjacent to the Press Room. All structures currently identified on the AGI property are evident in the 1989 and 1992 aerial photographs. Unidentified structures or objects were not noted in these aerial photographs. No other suspect features (such as above ground tanks, disposal ponds, or accumulations of drums) were observed on the photographs in the area of investigation.

3.2 Federal and State Database Review

The results of the federal and state database review conducted by EDR and NRT are summarized below. The database search results reported herein included sites in the Village of Goodman zip code (54125).

- Resource Conservation and Recovery Information System (RCRIS-Updated 10/31/95);
  Five sites were identified:
  1. WDNR Goodman Ranger Station, Hwy 8
  2. Goodman Forest Industries Ltd, 200 C Avenue
  3. American Graphics Inc., 610 Main Street
  4. Louisiana Pacific Corp., Mill Street
  5. Goodman Armstrong Creek School, One Falcon Crest

- National Priority List (NPL-Updated 09/01/95);
  No sites identified

- Federal Emergency Response Notification System List (ERNS-Updated 11/30/95);
  No sites identified

- Comprehensive Environmental Response Compensation, and Liability Information System (CERCLIS-Updated 11/30/95);
  No sites identified

- Corrective Action Report (CORRACTS-Updated 04/10/95);
  No sites identified

- Facility Index System (FINDS-Updated 09/30/95);
  Five sites were identified:
  1. WDNR Goodman Ranger Station, Hwy 8
  2. Goodman Forest Industries Ltd, 200 C Avenue
  3. American Graphics Inc., 610 Main Street
  4. Louisiana Pacific Corp., Mill Street
  5. Goodman Armstrong Creek School, One Falcon Crest

- Hazardous Materials Information Reporting System (HMIRS-Updated 12/31/95);
  No sites identified

- Material Licensing Tracking System (MLTS-Updated 08/01/95);
  No sites identified

- Federal Superfund Liens (NPL Liens-Updated 10/15/91);
  No sites identified

- PCB Activity Database System (PADS-Updated 10/14/984);
  No sites identified

- RCRA Administrative Action Tracking System (RAATS-Updated 04/17/95);
  No sites identified

- Records of Decision (ROD-Updated 03/31/95);
  No sites identified

- Toxic Chemical Release Inventory System (TRIS-Updated 12/31/92);
  No sites identified

- Toxic Substances Control Act (TSCA-Updated 01/31/95);
  No sites identified

- Wisconsin Department of Natural Resources Spills List (Updated 01/01/96);
  Four sites were identified:
  1. Goodman Forest Ind., Ltd.; 200 gallons Hydraulic Fluid, 1995
  2. 502 and 504 Mill Street, Section 3, Township 36 North, Range 17 East; Spilled substance not listed
  3. American Graphics Inc., Ethyl Acetate
  4. Box 451, Ray Millette Residence, Southeast ¼, Southwest ¼, Section 34, Township 37 North, Range 17 East; Gasoline

- Wisconsin Remedial Response Site Evaluation Report (WRRSER-Updated 10/01/95);
  One site was identified:
  1. 200 "C" Avenue; Northeast ¼, Northwest ¼, Section 3, Township 36 North, Range 17 east; High Priority LUST

- Wisconsin List of Hazardous & Solid Waste Disposal Sites (Updated-01/10/95);
  Three sites were identified:
  1. Goodman Forest Industry Landfill; Southwest ¼, Northwest ¼, Section 3, Township 36 North, Range 17 East; 200 C Avenue
  2. Town of Goodman, Southeast ¼, Southwest ¼, Section 34, Township 37 North, Range 17 East
  3. Universal Oil Products Company, No Listing

- Wisconsin Lists of Leaking Underground Storage Tank Sites (LUST-Updated 01/10/96);
  Seven sites were identified:
  1. Goodman Forest Industries, Ltd.; 200C Avenue
  2. Goodman Public Works, Alley-200 block between $4^{Th.}/5^{Th.}$; low priority
  3. Goodman Elementary School, Corner $4^{Th.}$ and Main; low priority
  4. Goodman-Armstrong Creek High School, #1 Falcon Crest; low priority
  5. Rocque's Eight High Club, W14681 Highway 8
  6. Stoney Ridge Inn, W15224 Hwy 8
  7. Trail's End Tavern, Hwy 8 and Twin Lake Road; Low Priority

- Department of Industry, Labor and Human Relations (DILHR) database for the registration of USTs, (Updated 02/20/96);
  33 registered USTs were identified within the Village of Goodman. Specific UST locations are listed in the EDR Report included in Appendix A.

- State or federally threatened species located within a one mile radius of the study area:
  Jim Raber,
  WDNR Wildlife Specialist, was telephone interviewed for information on threatened and endangered species within a one mile radius of the Village of Goodman. Mr. Raber stated he does not have records of endangered or threatened species in the study area. A copy of the phone conversation record is included in Appendix A

- Hazard Ranking System/WI Remedial Site Evaluation Report (SHWS -Updated 11/30/94)
  No Sites Identified

All sites listed above are located down gradient or more than one mile from the former AGI facility except the Goodman-Armstrong Creek High School which is the property located directly south of AGI and is located up-gradient. However, this site is listed as a low priority LUST site and is not believed to have a high potential of impacting the AGI facility. This finding is supported by the site investigation results described below.

3.3 Telephone Interviews

NRT interviewed several former AGI employees and Village of Goodman residents regarding past activities at AGI facility. Additional employees and/or neighbors were identified for interview based on interviews conducted. Questionnaires were completed during each interview and are included in Appendix B. Interviews were attempted with the following people:

INTERVIEWEE	RELATION TO AGI FACILITY	INTERVIEW STATUS
Thomas P. Bojar	AGI Vice President	Could not be Reached-No listed number in Milwaukee (last known residence)
Dorothy Dorsch	AGI Director	Could not be Reached-No listed number in Milwaukee (last known residence)
Bill Ebart	AGI Employee	Could not be Reached
Donald Hawley	Village of Goodman Town Chairman	Interview Summary in Appendix B
Chuck Kalcow	AGI Employee	Could not be Reached
Mary Lotto	AGI Employee	Could not be Reached
Mike Menard	AGI Operation's Manager	Interview Summary in Appendix B
Matt Milan	AGI Employee	Interview Summary in Appendix B
Edward Nowakowski	Priest at Church on Adjoining Property	Interview Summary in Appendix B
Jeffrey L. Smith	AGI Plant Supervisor	Could not be Reached
Dick Stapleford	Goodman Resident	Interview Summary in Appendix B

Below is a summary of notable information from the interviews conducted with Mr. Mike Menard and Mr. Matt Milan concerning releases and migration pathways from the AGI facility. The remaining interviewees provided no additional facility information.

Mr. Mike Menard, AGI Operation's Manager, employed from 1979 to 1993, was interviewed on April 25, 1996. Mr. Menard indicated that a floor drain was located in the center of the Press Room (Figure 3). Mr. Menard believes the drain was connected to a "make-shift" dry well and is unsure of its location. Mr. Menard stated that the floor drain was filled with cement in 1980 or 1981.

Mr. Menard stated that he observed brown or dying vegetation in an area associated with a spill which occurred on the AGI property in the warehouse loading dock area (north of the UST area). Mr. Menard is unsure of the chemical spilled, the estimated volume, and the date (year) of the spill. He recalled a truck which transported solvent to the AGI facility spilled solvent in the warehouse loading dock area. The solvent flowed down the driveway toward the trees located near the property boundary between the AGI site and the church to the north. Mr. Menard believes the spill did not advance off of the AGI property boundary and does not know if this spill was reported to the WDNR.

Mr. Matt Milan, AGI Ink Technician, employed from 1980 to 1993, was interviewed on May 9, 1996. Mr. Milan remembers a floor drain located in the middle of the Press Room. Mr. Milan believes the drain piping ran beneath the building foundation towards the northeast corner of the Press Room and that the drain was filled with cement shortly after he was employed at AGI. Mr. Milan recalls digging outside of the Press Room and discovering several buried stacked concrete blocks approximately eight feet from the northeast corner of the Press Room. Mr. Milan does not recall when or exactly why he was digging in this area. However, it may have been for the construction of steps to the office building. He stated that the digging stopped after blocks were discovered.

Mr. Milan stated that Par-4 (a mixture of ethyl, toluol, and Jayosol received from Milwaukee Solvent) was stored in the largest UST. The contents of this UST were later switched to 1,1,1-TCA. The middle UST was used to store ethyl.

Mr. Milan spoke of an "ethyl" spill that was associated with water leaking into the ethyl UST. Mr. Milan stated that in March (he could not recall the year), the pump for the ethyl UST was not functioning properly and that the cover for the UST was removed and was left off. Water from melting snow infiltrated into the ethyl UST. The AGI maintenance department cut a 500 gallon tank in half and placed the tank outside between the Ink and Press Rooms. An attempt was made to pump the water and ethyl mixture out of the ethyl UST and into the cut 500 gallon tank. The cut 500 gallon tank was not covered and remained beneath the eves of both Ink and Press Room buildings. The cut tank remained uncovered and outside for two to three years and overflowed a few times due to precipitation. The remaining ethyl in the UST was pumped into 55-gallon drums which were also stored outside between the Ink and Press Room buildings for two to three years. Mr. Milan stated these drums corroded and cracked over the storage period due to freezing and believes the contents of the drums leaked onto the surrounding ground surface. Mr. Milan also stated that the liquid in the cut tank was eventually "pumped into the ground" using an air pump on a day he was not working. Mr. Milan was informed (he does not remember by whom), that the pumping was performed by AGI management. Mr. Milan does not know the area in which this liquid was pumped, but he was told a gas chromatography analysis was performed on the contents, and the "ethyl" or solvents were not detected in the remaining liquid.

Mr. Milan also stated that he witnessed a spill in association with filling of the largest UST in 1986 or 1987. During filling of the UST, product spilled in the driveway area (newly paved with asphalt). The solvent spill flowed to the east down the driveway and then flowed north down Main Street. Mr. Milan stated the driver of the tanker told him that 100 gallons of product was spilled. However, Mr. Milan believes the spill may have been larger based on his observation that the spilled liquid already covered an area of approximately five feet by 300 yards. Mr. Milan does not know if this spill was reported to the WDNR.

3.4 Site Reconnaissance

NRT and the WDNR conducted an initial site visit on September 8, 1995 to visually observe the AGI site and vicinity. Notable items observed included stressed vegetation located in the southwest portion of the site several feet from a south door of the Warehouse building; two concrete pads with polyvinyl chloride (PVC) casings extending downward to an undetermined depth located along the north property boundary; and two above ground tanks (presumed to be former heating oil tanks of approximately 250 gallon capacity) along the west building wall of the office building. In addition, one UST was observed located on the adjacent church property to the north. Figure 3 shows the approximate locations of the referenced items.

3.5 Regional Geology and Hydrogeology

Generally, the AGI facility is located along a topographic high approximately 20 to 30 feet above the surrounding properties to the north, east, and west (Figure 1). The high school located south of AGI is approximately five to ten feet higher in elevation.

Unconsolidated glacial material which underlies the Village of Goodman area consists of outwash and ice-contact deposits (Oakes and Hamilton, 1973). The deposits consist mainly of sand and sand and gravel. Small areas of ground moraine (till consisting of clay, silt, sand, gravel, and boulders) may be found in these areas. The glacial material is estimated to be 100 feet thick in the area and underlain by undifferentiated Precambrian crystalline bedrock (Oaks and Hamilton, 1973).

Regional groundwater flow reported to be generally to the east toward Lake Michigan (Oaks and Hamilton, 1973). Groundwater depth during pumping periods in Municipal Well No. 2 is reported at approximately 33 feet below land surface (bls) based on the well constructors report presented in the referenced REI report.

Lakes, ponds, and creeks located near the former AGI facility include Chemical Creek located approximately 450 feet northeast of the property, Clark Lake located approximately 2,000 feet north of the property, and Goodman Millpond located approximately 1,600 feet east of the property.

3.6 Investigation Area Geology

Approximately five to ten feet of fill (consisting of fine silty sand with gravel) is present on the former AGI property. Generally, 15 to 22 feet of sand and gravel till underlie the fill. This till material was encountered off-site in sampling locations PZ-102, SB-118, and SB-121. Soil sampling locations SB-118 and SB-121 are located in areas of higher topography (Figure 1) as the former AGI property. The area appears to contain gravel and sand till deposits in the higher topographic areas which are underlain by sand and silt alluvium. The underlying alluvium is predominately characterized by fine to medium sand to silty sand. Geologic cross sections have been drawn for representative borings and monitoring wells on Figures 11 and 12. Geologic cross -sections A-A' and B-B' were drawn approximately parallel to groundwater flow direction. Cross-sections C-C' and D-D' were drawn approximately perpendicular to groundwater flow direction.

3.7 Investigation Area Hydrogeology

A sand and gravel aquifer was encountered which extends from the water table interface to below the maximum depth of sampling during this investigation (approximately 105 feet bls on the former AGI facility). Groundwater elevations and monitoring well construction information are summarized on Table 7. Hydraulic conductivity and flow velocities are summarized on Table 8. Hydraulic gradient, conductivity, and flow velocity calculations are presented in Appendix I. Aquifer characteristics are discussed in detail below.

3.7.1 Depth to Groundwater and Groundwater Flow Direction

Groundwater elevations and flow direction for August 5, September 4, and October 10, 1996 are illustrated on Figures 7, 8, and 9, respectively. Depth to water at the AGI site ranges between approximately 27 feet bls in the northeastern portion (MW-3) of the property to 41 feet bls (MW-101) in the southwestern portion of the property. Shallow groundwater flow across the property is generally to the east. Depth to water in the off-site investigation area ranges from approximately 20 feet bls at MW-104 to less than one foot bls at MW-107, which is located adjacent to Chemical Creek. Shallow groundwater flow in the off-site investigation area and south of Chemical Creek, is generally to the northeast toward Chemical Creek. Shallow groundwater flow north and in close proximity of Chemical Creek appears to be to the southeast, toward the creek, indicating a groundwater discharge area.

Figure 10 illustrates piezometric surface elevations and flow direction for October 10, 1996. Depth to groundwater in the on-site piezometer (PZ-101) is approximately 27 feet bls. Depth to water in the off-site piezometers (PZ-102, PZ-103, and PZ-104) ranges from approximately 1 to 7.5 feet bls. Groundwater flow is generally to the northeast which is consistent with the water table.

3.7.2 Horizontal Groundwater Gradient

The horizontal groundwater gradient for the water table aquifer for October 10, 1996 is moderate calculated at 0.012 feet/foot to the northeast. The horizontal groundwater gradient as measured in the piezometers on October 10, 1996 is moderate to steep calculated at 0.08 feet/foot to the northeast. Calculations are presented in Appendix I.

3.7.3 Vertical Hydraulic Gradient

Vertical hydraulic gradients were calculated for the four well nests (MW-3/PZ-101, MW-105/PZ-102, MW-106/PZ-103, and MW-108/PZ-104) using monitoring data from August, September, and October 1996. The vertical hydraulic gradient calculation sheet is presented in Appendix I. Calculated vertical gradients are summarized below.

Well Nest	Monitoring Date	Vertical Hydraulic Gradient (unitless value)	Flow Direction (upward/downward)
MW-3 / PZ-101	August 6, 1996	1.9E-04	downward
	September 4, 1996	9.7E-04	downward
	October 10, 1996	9.7E-04	downward

MW-105 / PZ-102	August 6, 1996	1.1E-02	downward
	September 4, 1996	1.2E-02	downward
	October 10, 1996	8.9E-03	upward
MW-106 / PZ-103	August 6, 1996	1.2E-03	upward
	September 4, 1996	2.5E-04	downward
	October 10, 1996	7.5E-04	upward
MW-108 / PZ-104	October 10, 1996	8.0E-03	downward

Vertical gradients are slight to moderate at well nest MW-105/PZ-102. All other gradients are slight and predominately downward. The well nest adjacent to Chemical Creek (MW-108/PZ-104) had a slight downward gradient in October 1996 indicating the creek is not a significant area of groundwater discharge nor an effective barrier to plume migration.

3.7.4 Hydraulic Conductivity

Hydraulic conductivity (K) was calculated using baildown recovery test data analyzed following the Bouwer-Rice method for monitoring wells MW-1, MW-2, MW-3, MW-101 through MW-106, and all piezometers. Estimated K values are summarized on Table 8 and data and analysis graphs are presented in Appendix I. Estimated K values for the water table monitoring wells range from 4.0×10^{-3} to 5.1×10^{-2} feet/minute (2.0×10^{-3} to 2.6×10^{-2} centimeters/second). Estimated K values for the piezometers range from 5.0×10^{-3} to 8.0×10^{-3} feet/minute (2.5×10^{-3} to 4.1×10^{-3} centimeters/second). The estimated K values for the monitoring wells and piezometers are comparative to average values for middle to upper range values for silty and clean sands and lower range values for gravel. (Freeze and Cherry, 1979). Estimated K values are consistent for soils screened by the monitoring wells and piezometers.

3.7.5 Groundwater Flow Velocity

Estimated horizontal groundwater flow velocity at the water table observation wells ranges from 56 to 98 feet/year. A significantly higher velocity was calculated in water table observation well MW-101 (710 feet/year), due primarily to a higher hydraulic conductivity. Estimated horizontal groundwater flow velocity for deeper groundwater in the piezometers ranges from 470 to 750 feet/year. The average groundwater linear velocity calculated for the deeper aquifer in the study area is 585 feet/year. Groundwater velocity calculations are included in Appendix I.

3.8 Source Investigation Results

3.8.1 Field Observations

Stressed vegetation was observed by NRT and WDNR personnel during the September 1995 AGI site reconnaissance. The stressed vegetation was observed in the vicinity of the south door of the Warehouse building as indicated on Figure 3. Results of surficial soil sampling in this area are described in Section 3.8.4.

3.8.2 Underground Storage Tank Assessment

The assessment of remaining liquid in the three USTs indicated less than 1/8 of an inch of liquid remains in Tanks 1 and 3, and no measurable liquid remains in Tank 2 (Figure 3). The amount of liquid present in Tanks 1 and 3 was not enough to sample.

3.8.3 Soil Gas Survey Results

The soil gas survey indicated a limited area of surficial impacted soil near the surface on site (Figure 4). Positive PID readings were not detected in soil gas probes except in GP-104, GP-126, GP-127, GP-128, and GP-129. Gas probes GP-126 through GP-129 are located approximately 10 to 40 feet east of the three solvent USTs. Gas probe GP-104 is located at the northcentral property boundary approximately 50 feet north of the Storage Room (Figure 4). The 10.6 eV PID responses ranged from 21.1 to 176 parts per million (ppm) relative to isobutylene. PID responses with the 11.8 eV PID ranged from 2 to 100 ppm relative to isobutylene.

Hand auger soil samples HA-01 and HA-02 were collected from three feet bls and laboratory analyzed for PVOCs to verify positive PID readings in gas probe locations GP-126 and GP-129 (Figure 4). PVOCs were not detected in hand auger soil sample HA-02 above minimum detection limits as summarized on Table 1. PVOC concentrations detected in hand auger soil sample HA-01 included toluene at 58 micrograms per kilogram (µg/kg), ethylbenzene at 120 µg/kg, 1,2,4-trimethylbenzene at 1,500 µg/kg, 1,3,5-trimethylbenzene at 1,100 µg/kg, and total xylenes at 860 µg/kg. The concentrations of these compounds do not exceed the WDNR Residual Contaminant Levels (RCLs) established in NR 720 for toluene, ethylbenzene, and total xylenes (1,500 µg/kg, 2,900 µg/kg, and 4,100 µg/kg, respectively).

Results of the soil gas probe survey are summarized on Table 4 and Figure 4. Field screening data is presented in Appendix D.

3.8.4 Surface Soil Samples Field GC Results

Five surface soil samples were collected and analyzed for VOCs by field GC analysis in July 1996. These soil samples were collected from the area south of the Warehouse building in which NRT observed stressed vegetation in 1995 and in the southern loading dock area. Soil samples were collected from approximately four to six inches bls and sampling locations are shown on Figure 4. The analytical data is summarized on Table 6 and the field GC analytical report is included in Appendix F. VOCs were not detected in the surface soil samples.

3.8.5 Soil Screening Results

Soil samples collected during sampling of soil borings and installation of groundwater monitoring wells were field screened for the presence of VOCs with 10.6 eV and 11.8 eV PIDs. PID readings were recorded on Field PID Data Forms (Appendix D) and soil boring logs (Appendix E) and are summarized on Table 5.

Low level PID readings (from 0 to 21 ppm relative to isobutylene) were detected in soil samples collected from on-site soil borings SB-101 and SB-102. These readings may represent residual concentrations of VOCs in the soil samples.

In general, soil samples screened in borings off-site exhibited positive PID readings at, below, or within the water table fluctuation zone. These positive PID readings either represented positive responses to VOCs within the soil samples or false positive readings due to condensation of water from the soil on the detector lamps.

Elevated PID readings were detected in near surface soil samples collected from off-site soil borings SB-122 to SB-127 (located east of the groundwater plume). PIDs readings were not recorded in soil samples collected from the two soil borings (SB-119 and SB-120) located to the west of borings SB-22 through SB-127. These results indicate that a separate source in the vicinity of borings SB-122 through SB-127 may be attributing to the detected impacts based on the near surface PID readings detected in these soil samples.

3.9 Groundwater Investigation Results

3.9.1 Shallow Groundwater Plume Assessment

The field GC shallow groundwater screening results for VOCs are summarized on Table 6 and on Figure 5. Summaries of field GC screening results are presented in Appendix F.

The initial plume assessment evaluated the extent of groundwater impacts downgradient of the AGI facility to the north, south, and east with groundwater samples collected from soil borings SB-103 through SB-121. Compounds detected during this assessment which are likely present in association with impacts originating from AGI included toluene, 1,1-DCA, 1,1-DCE, 1,2-DCA, TCE, 1,1,1-TCA, cis-1,2-dichloroethene (cis-1,2-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE). Other VOC compounds detected included benzene, ethylbenzene, and total xylenes.

The northern and northeastern extent of the plume was assessed with soil borings exhibiting no VOC detections or VOC detections below PALs in collected groundwater samples. Soil borings which indicate the extent of the plume to the north and northeast include: SB-103 (located at the intersection of Main and Sixth streets), SB-108 through SB-110 (located adjacent and south of

Chemical Creek), SB-111 and SB-112 (located approximately 140 feet north of Chemical Creek), and SB-119 (located south of Chemical Creek).

The southern extent of the impact plume was assessed with soil borings SB-115 through SB-118 and SB-121. Trans-1,2-TCE was the VOC of primary concern detected at concentrations which exceed a PAL or ES. Trans-1,2-TCE was detected only in soil borings SB-115 and SB-116 at concentrations above the PAL and below the ES. Trans-1,2-DCE was not detected in the sample collected from SB-117, which was drilled south of SB-115 and SB-116. VOCs were not detected in samples collected from SB-118 and SB-121. Benzene was detected in samples collected from SB-115, SB-116, and SB-117 (6, 8, 6 μg/L) above the ES of 5 μg/L. Benzene was not detected in a groundwater sample collected from the soil boring drilled for monitoring well MW-104 (constructed approximately 60 feet south of SB-117); therefore, the approximate southern extent of the impact plume was considered defined.

Soil boring SB-107 was performed within the estimated extent of the impact plume; however, VOCs were not detected in the groundwater sample collected from the soil boring.

Soil borings SB-104 through SB-106 (performed on sixth Street southeast of AGI), SB-113 (performed approximately 850 feet east-northeast of AGI between Chemical Creek and Sixth Street) and SB-120 (performed approximately 1,000 feet east of AGI on Maple Avenue) were sampled within the impact plume. All samples had concentrations of 1,1-DCE and/or 1,1,1-TCA which exceed the NR 140 PALs and/or ESs. The sample collected from SB-120 also contained concentrations of trans-1,2-DCE, cis-1,2-DCE, and benzene which exceeded NR 140 ESs. Analyses of samples from SB-113 and SB-120 indicated that the impact plume extended east of Maple Avenue and south of Sixth Street. This distance was farther than was initially anticipated due to the absence of VOC detections at sampling locations (SB-107, SB-108, and SB-118) closer to the former AGI site. Additional sampling was beyond the scope of investigation and the land east of Maple Avenue had not been cleared by local and regional utility companies for drilling. Therefore, the initial plume assessment was not continued and monitoring wells were constructed to assess the impact plume as approximated to this point.

As discussed in further detail in Section 3.9.3.1, monitoring wells MW-103 and MW-104 were constructed to confirm field GC analytical results and to evaluate the northwestern and southeastern extent of groundwater impacts. Monitoring wells MW-105 and MW-106 were constructed in areas where groundwater impacts were confirmed to assess the magnitude of the plume. Piezometers PZ-102 and PZ-103 were constructed adjacent to these monitoring wells to assess the vertical extent of groundwater impacts.

Following analyses (as discussed in Section 3.9.3.1) of groundwater samples collected from the existing on-site monitoring wells (MW-1, MW-2, and MW-3) and the new monitoring wells (MW-101 through MW-106 and PZ-101 through PZ-103) additional plume assessment at the water table was performed in October 1996 with field GC analyses of groundwater samples collected from soil borings SB-122 through SB-127. This sampling was performed to assess the eastern extent of groundwater impacts east of Maple Avenue.

The field GC analyses for the October 1996 plume assessment detected concentrations of toluene in samples collected from SB-124 and SB-127 at concentrations below the NR 140 PALs. 1,2-DCA was detected in samples collected from soil borings SB-123 through SB-127 at concentrations ranging from 8.4 ppb to 98.9 ppb, which exceed the ES of 5 µg/L. However, the field GC laboratory stated that "...under (the) current temperature program 1,1,1-trichloroethane elutes closely, but slightly after 1,2-dichloroethane. GC was not calibrated for 1,1,1-trichloroethane...". 1,2-DCA was not detected in the previous field GC analysis of the assessment samples collected in July 1996 (as discussed above) and has not been detected in off-site monitoring well samples collected in August, September, and October 1996 (as discussed in Section 3.9.3.1). Therefore, the concentrations reported for 1,2-DCA by the field GC may represent concentrations of 1,1,1-TCA.

During the performance of the additional plume assessment, Mr. William Draeger, Village of Goodman Sanitary Sewer District Manager, stated that the area east of Maple Avenue and monitoring well nest MW-106/PZ-103, was the location of the former Village of Goodman waste water treatment facility and seepage cells. The estimated location of two former seepage cells are shown on Figure 1. Due to the detection of 1,2-DCA (possibly 1,1,1-TCA) in groundwater samples collected from soil borings SB-123 through SB-127 and the location of the former seepage cells, the assessment to define to eastern extent of the impact plume was not continued and the remaining monitoring wells (MW-107, MW-108, MW-109, and PZ-104) were constructed.

Monitoring wells MW-107 and MW-108 were constructed to assess the northern extent of the impact plume immediately south of Chemical Creek. Piezometer PZ-104 was constructed adjacent to monitoring well MW-108 to assess the vertical extent of groundwater impacts. Monitoring well MW-109 was constructed north of Chemical Creek along Fifth Street to assess potential migration of groundwater impacts north of Chemical Creek. Analytical results are discussed in Section 3.9.3.1.

3.9.2 Piezometer Vertical Groundwater Profiling Assessment

VOCs were not detected with field GC analyses in groundwater samples collected at piezometer locations PZ-101, PZ-102, and PZ-103 during the vertical profiling assessment performed during drilling. Soil samples collected from PZ-101 and PZ-102 indicated low levels of VOCs to depths of 85 feet bls in PZ-101 and to 55 feet in PZ-102. VOCs detected in the soil samples included 1,1-DCE, 1,1,1-TCA, trans-1,2-DCE, ethylbenzene, toluene, and total xylenes. The concentrations of VOCs were not compared to NR 140 groundwater standards because they were detected in soil samples. The piezometer screens were constructed within five feet of the maximum depth at which VOCs were detected.

3.9.3 Laboratory Analytical Results

Soil and groundwater analytical results are summarized in the following sections. Soil data is summarized on Table 1 and the laboratory analytical reports are presented in Appendix G. Groundwater analytical data are summarized on Table 2 and Figure 6 and the laboratory analytical reports are included in Appendix H. Groundwater samples were collected and analyzed in August, September, and October 1996.

Chloroform was detected in monitoring wells MW-108 and MW-106 and piezometers PZ-101, PZ-102, PZ-103, and PZ-104 at concentrations ranging from 1.0 to 61 µg/L. The concentrations of chloroform has steadily decreased in samples collected from PZ-101, PZ-102, and PZ-103 in August, September, and October 1996. All of these wells were drilled with a sonic drill which was decontaminated between boreholes with Village of Goodman municipal water. As discussed in Section 1.4, Goodman municipal water contains concentrations of chloroform higher than those detected in the above reference wells. Therefore, municipal water may possibly be the source of chloroform.

3.9.3.1 Water Table Monitoring Wells

Monitoring well MW-101 was constructed at the southwestern corner of the AGI property and is located up-gradient of the facility buildings and USTs. VOCs were not detected in samples collected from this monitoring well except for a low level detection of toluene in the sample collected in October 1996.

Monitoring well MW-103 is located approximately 220 feet north and side-gradient of the AGI facility. Monitoring well MW-107 is located approximately 400 feet northeast and downgradient of the AGI facility. VOCs were not detected in samples collected from these monitoring wells except for a low level detection of toluene in the sample collected from MW-103 in October 1996. These wells are monitoring groundwater quality beyond the northern extent of the impact plume as illustrated on Figure 6.

Monitoring well MW-104 is located approximately 200 feet southeast and down and side-gradient of AGI. Toluene, at concentrations ranging from 1.1 to 2.7 µg/L, was the only VOC detected in samples collected from MW-104. This well defines the southern extent of the impact plume as illustrated on Figure 6.

Monitoring well MW-102 is located on the AGI facility, but is approximately 75 feet side-gradient of the USTs and spill areas. Concentrations of 1,1-DCE and 1,1,1-TCA were detected in samples collected above the NR 140 PALs and/or ESs as summarized on Table 2 and illustrated on Figure 6. 1,1-DCA was also detected in samples collected from this monitoring well, but at concentrations below the NR 140 PAL. Due to the distance of and position of this well from the USTs, the detected VOCs suggest the potential for other source areas, probably on-site.

Monitoring wells MW-1, MW-2, and MW-3 are located on the AGI property and 30 to 60 feet down gradient of the solvent USTs (Figure 6). These wells monitor the quality of groundwater which is migrating off of the AGI facility. Samples collected from MW-1 and MW-2 contained concentrations of 1,1-DCE and 1,1,1-TCA which exceed NR 140 ESs and TCE which exceeds the NR 140 PAL. TCE was detected in the groundwater samples collected in 1993 only. The TCE method detection limits (MDLs) for samples collected in 1996 ranged from 2.0 to 10 µg/L which were higher than the concentrations previously detected (0.6 and 2.4 µg/L). Therefore, it is uncertain if these compounds are still present in the groundwater at these sampling locations. Samples collected from MW-3 contained concentrations of toluene and 1,1,1-TCA which exceed NR 140 ESs. TCE was detected at a concentration which exceeded the NR 140 PAL and 1,1-DCE and 1,2-DCA which exceed NR 140 ESs in 1993. However, the MDLs for the 1996 samples exceeded the concentrations detected in 1993. Therefore, it is uncertain if these compounds are still present in the groundwater at this sampling location.

Monitoring well MW-105 is located within the impact plume and approximately 300 feet down gradient of AGI. Toluene, tetrachloroethene (PCE), 1,1-DCE, and 1,1,1-TCA have been detected in samples collected from MW-105 which exceed NR 140 ESs. PCE was detected in the sample collected in October 1996 at a concentration of 59 µg/L, which exceeds the ES of 5 µg/L. PCE was not detected in samples collected from the on-site monitoring wells MW-1, MW-2, and MW-3 which has MDLs for PCE in October 1996 of 5.0, 2.0, and 50 µg/L. TCE, 1,1_DCA, and 1,2-DCA were not detected in samples collected from MW-105; however, the MDLs for these compounds were higher than the concentrations of these compounds detected in samples collected from on-site monitoring wells.

Monitoring well MW-106 is located northeast and approximately 1,050 feet down gradient of AGI. VOC were not detected in the sample collected in August 1996. The samples collected in September and October 1996 contained concentrations of 1,1-DCE and 1,1,1-TCA which exceed NR 140 PALs. 1,1-DCA was also detected, but at concentrations below the NR 140 PAL. This well appears to be located at the eastern extent of the plume at the water table.

Monitoring well MW-108 is located south and adjacent to Chemical Creek, within the impact plume, and approximately 650 feet downgradient of AGI. Compounds 1,1-DCE and 1,1,1-TCA were detected at concentrations in the sample collected which exceed NR 140 ESs. 1,1-DCA was also detected, but at a concentration below the NR 140 PAL.

3.9.3.2 Piezometers

Piezometer PZ-101 is located adjacent to well MW-3 to monitor vertical migration of impacts on the AGI facility. Piezometer PZ-102 is located adjacent to well MW-105 to monitoring vertical migration of impacts within the plume and off the AGI site. Piezometer PZ-103 is located adjacent to well MW-106 to monitor vertical migration of impacts at the eastern extent of the plume.

Benzene was detected in samples collected from PZ-101, PZ-102, and PZ-103 in 1996. Benzene was detected in PZ-101 in October only and in PZ-102 in August only. Benzene was detected in the PZ-103 samples in September and October. All benzene concentrations detected exceed the NR 140 PAL, but are below the ES. The on-site piezometer PZ-101 sample in September 1996 contained 0.76 μg/L benzene and the PZ-103 samples from September and October contained 1.2 and 1.4 μg/L, respectively. Benzene does not appear to be a compound originating from the AGI investigation site.

Low level concentrations of toluene and/or 1,1,1-TCA (less than 5 μg/L) were sporadically detected in samples collected from PZ-101, PZ-102, and PZ-103. All concentrations are below NR 140 PALS. No VOCs, other than chloroform as discussed above, were detected in the sample collected from PZ-104.

4 PRELIMINARY ANALYSIS OF REMEDIAL ALTERNATIVES

4.1 Remedial Action Objectives

A preliminary analysis of appropriate remedial responses for the site was performed based on the historical data and site investigation results. Appropriate response actions for the site must be protective of human health and the environment as well as technically feasible and cost-effective. This section presents an overview of objectives and response actions that may be appropriate for the site. The remedial action objectives for the AGI site include the following:

- Reduction of contaminant levels in soils contributing to groundwater impacts above NR 140 Standards;
- Control of migration of contaminants in groundwater off the AGI property; and,
- Protection of potable water supplies (both public and private);

Remedial alternatives appropriate to achieving these objectives are discussed in detail below.

4.2 Site Considerations

Major site investigation findings which must be considered in the identification of remedial action alternatives at AGI include the following:

- Residual soil contamination on and in the vicinity the AGI property is dispersed and appears to be the result of releases at various times and locations. In addition, monitoring well data suggests the potential presence of other on-site sources which were not specifically evaluated, such as the southeast portion of the property.
- The depth to groundwater on the AGI property (27 to 41 feet bls) precludes the utilization of ex-situ technologies for soil remediation, except for localized removal of near surface soils with high contaminant mass.
- The compounds of concern are relatively easy to volatilize and the subsoils are also permeable. Soil vapor extraction, with the potential for a large area of influence,

would address the concerns with the dispersed nature of contaminant releases and is therefore considered below as an appropriate in-situ technology for source control.

- Until further monitoring of groundwater quality trends and plume migration is conducted, it is unknown if the groundwater impacts observed on and northeast of the site will reach the municipal well system at concentrations above NR 140 Groundwater Quality Standards. In addition, WDNR does not own or control the AGI property and the authority to implement future on-site response actions is uncertain, except in instances where public health and environmental endangerment is shown to be imminent. Therefore, response actions for off-site groundwater migration controls are included in the analysis of alternatives.

Based on the results and conclusions of this investigation, practical remedial responses capable of achieving the objectives stated above focus on one or a combination of the following:

1. <u>Source Control</u>: Controlling and limiting the source of contaminants from the AGI site. Appropriate options for limiting potential continued release of contaminants to groundwater may include:

   - Removal of the existing underground storage tanks; and
   - Limited removal and off-site disposal or treatment of impacted soil, if encountered during the tank removals, and in the area 10 to 40 ft east of the three solvent USTs; or
   - In-situ soil vapor extraction from both the shallow and deeper portion of the unsaturated zone in the northeaster corner of the property to reduce concentration in close proximity to the water table.

2. <u>Migration Control</u>: Controlling and limiting groundwater migration to contain the northeasterly migration of VOC impacted groundwater for the purpose of protecting groundwater supplies. Migration control may include:

   - Groundwater recovery on-site and downgradient to the MW-105 area to control the highest concentration areas of the plume; or
   - Groundwater recovery within the entire plume to capture the zone where NR 140 standards are exceeded.

The groundwater migration control option was analyzed using a capture zone analysis and is discussed further below.

3. Groundwater Monitoring: Monitoring groundwater quality data to evaluate the effectiveness of a remedial action, or to monitor existing conditions to evaluate if natural attenuation is occurring such that the plume is stable or receding. This response action is appropriate for the near future under any alternative developed below.

4. Alternate Water Supply. Providing an alternative water supply option or implement measures to treat the nearest potential receptors. These options include the following:

   - Replace the municipal wells to the northeast of the plume with new wells located in area upgradient of known aquifer impacts. Apparently the Village is planning exploratory drilling to identify a new source of water supply, however, it is early in the process and their schedule for implementation is unknown;
   - Plan for future treatment of municipal well water at Wells 1 and 2; and/or
   - Connect the four private residences to the municipal water supply system or provide point of use treatment should they become impacted in the future.

The scenarios discussed below include conventional approaches, focused on protection of public and private water supplies and does not include significantly higher cost approaches designed to aggressively remediate the contaminant plume. If further evaluation of more aggressive schemes is warranted in the future, we recommend considering air sparging/vapor extraction possibly with steam enhancement or other such measures designed to mitigate soil and groundwater impacts within relatively short time periods.

4.3 Potential Remedial Alternatives

Several of the most practical response actions identified above were incorporated into the remedial alternative scenarios presented in this section. The timeframe for achieving remedial objectives, technical feasibility, site specific constraints that would affect implementation, and cost ranges are discussed for the following scenarios:

- Groundwater Migration Control and Limited Source Control
- Source Control and Groundwater Monitoring
- Groundwater Monitoring

4.3.1 Groundwater Migration Control and Limited Source Control

Groundwater migration control would be a feasible option for containment of either the majority or a portion of the plume. The need for complete plume capture will depend on the results of proposed additional monitoring wells (discussed in Section 6) and future groundwater quality trends. The groundwater extraction system would consist of pumping well(s) located to be protective of groundwater quality northeast of the site. The well(s) could either discharge to the sanitary sewer collection system for treatment at the Village of Goodman Sanitary Sewer District Wastewater Treatment Plant (WWTP) or be treated on-site prior to discharge to Chemical Creek. For purpose of a preliminary analysis, discharge to the creek was assumed due to the potential for high flow rates and associated discharge fees.

A preliminary flow and capture zone analysis was performed using the analytical model Quickflow™ to evaluate the optimal number, spacing, and pumping rates of extraction wells designed to capture the groundwater plume. Methodology, assumptions and results of the capture zone analysis are presented in Appendix L. Based on the assumptions made, one to two extraction wells installed at the approximate locations shown on Figure L-2 (Appendix L) would accomplish the objective of capturing the contaminant plume northeast of the site. The time of travel estimated for the flow lines depicted is approximately 1.5 years. Expected discharge rates are approximately 15 to 20 gpm per well. This analysis assumed one extraction well placed near well MW-105; and a second extraction well near the leading edge of the plume, if necessary for capture of the entire plume. Alternatively, the second well could be installed on the AGI site for a more aggressive groundwater extraction scheme, if complete plume capture is not warranted.

As discussed in Appendix L, the flow analysis used to evaluate this alternative is very preliminary, subject to variability in the physical properties that control groundwater flow in the aquifer. Because the groundwater impacts have not reached the deeper sand and gravel unit, design of a migration control system would likely consist of multiple wells pumping from the shallow flow system at lower rates, rather than fully penetrating wells pumping at rates similar to the water supply well (estimated to be in the 200 gpm range, based on the flow reported on the drilling log). Pump testing of an extraction well would be required to more accurately assess pertinent design parameters should this remedial alternative be considered further.

Available historical information and results of the site investigations performed to date have not identified a significant area of residual soil contamination. However, removal of the USTs would be prudent to eliminate a potential future source of continued contamination, increase the potential for re-use or re-development of the property, and reduce the timeframe required for long term operation of a migration control system.

Effectiveness and Timeframe - Groundwater extraction is an effective response to controlling migration and for the future protection of water supplies. However, groundwater pumping technologies are relatively ineffective at reducing contaminant concentrations to below NR 140 standards. Groundwater pumping to control contaminant migration is a long-term response action. The timeframe for operation of a groundwater extraction system is unknown and for this site may be a function of the Village's progress toward siting an alternative water supply well(s).

The removal of the USTs and associated impacted soils is an immediate and effective measure. However, this limited source removal is not expected to have substantial effect on improving overall groundwater quality in the near future due to the size of the plume and similar magnitude of concentrations both on site and as far as 300 ft downgradient (MW-105 area).

Site Constraints - Installation of a groundwater migration control system will require a number of easements and street crossings. Discharge to the creek is subject to obtaining a WPDES permit, and further evaluation of on-site versus off-site treatment by the WWTP. If it can be shown to be more cost effective, discharge to the WWTP is preferable to avoid the cost of an on-site treatment system. Removal of the USTs would require access to the site and may not be feasible at this time given the lack of a responsible party.

Cost - The estimated preliminary cost to implement migration control and limited source removal is $380,000 in capital costs and $35,000 annual system O&M costs. This includes a pump test, and engineering; and assumes two pumping wells, a maximum flow rate of 40 gpm, treatment on-site, discharge to surface water, UST removal along with 100 cubic yards of soil/UST backfill, and disposal as non-hazardous waste.

4.3.2 Source Control and Groundwater Monitoring

This alternative combines a more aggressive source control strategy with a less active approach to plume management. Source control would consist of installing a network of multi-depth soil vapor extraction wells designed to cover the northeast and eastern portion of the site, where various surface and subsurface releases may have occurred. Site soils are permeable, and amenable to vapor extraction and the compounds of concern are relatively easy to volatilize. This approach would also address the deeper soil impacts between 25 to 32 ft detected at monitoring wells MW-1 and MW-3.

This alternative would also include implementing a groundwater monitoring plan, designed to: 1) detect groundwater impacts prior to reaching water supplies; and 2) further evaluate whether the plume will attenuate prior to reaching the water supply wells. An evaluation of site specific contaminant transport mechanisms through computer modeling would also aid in interpreting the long term effect of the plume on the water supply aquifer.

Effectiveness and Timeframe - Because of the permeable environment, soil vapor extraction would be an effective method for addressing residual soil contamination and minimizing continued leaching of contaminants to groundwater. A properly designed system would likely reach the limit of its effectiveness within 2 to 3 years of operation. Overall improvements to groundwater quality due the on-site soil vapor extraction would not be expected in the near future because a significant portion of the plume has already migrated off-site. The primary disadvantage of this remedy is that additional significant costs would be incurred in the future if the plume reaches the capture zones of the water supply wells and the Village does not proceed with procuring an alternate water supply source.

Site Constraints - There are no significant physical constraints to installing a soil vapor extraction system at the AGI property, with the exception of gaining access approvals.

Cost - The estimated preliminary cost to implement source control via soil vapor extraction is $90,000 in capital costs, including four to five vapor extraction wells and operation for 3 years. Annual monitoring costs may be $15,000 to $20,000 annually, depending on the frequency and number of wells sampled.

4.2.3 Groundwater Monitoring

As discussed previously, groundwater monitoring in the near future is an appropriate response action for this site combined with any alternative considered. Because the plume appears to be confined to the shallow flow system and has not impacted water supply wells, groundwater monitoring for the next year or two may be appropriate prior to proceeding with other such measures discussed above, considering the lack of a funding source. In our opinion, monitoring only is a viable approach for approximately the next two years if the following steps are taken:

- The monitoring network includes the addition of one piezometer located between the interpreted plume extent and the water supply wells to the northeast, one water table well located between the interpreted plume extent to the east, and one water table well located between the interpreted plume extent and private potable wells to the southeast (refer to Section 6 for additional discussion on these locations);
- Quarterly sampling is performed on key monitoring wells, including the private and public wells which are in use; and

- The Village proceeds with planning for procuring an alternate water supply, including a plan to eventually hook-up the four private wells;

Effectiveness and Timeframe: This approach would be protective of water supplies for a time, contingent on data from additional recommended wells supporting the current interpretation of the plume extent. Effectiveness of this program should be re-evaluated as new data is collected and groundwater quality trend information is obtained. Adding natural attenuation indicator parameters such as dissolved oxygen, pH, etc., to the parameter list may also assist in evaluating expected biodegradation rates, particularly for compounds such as toluene (versus chlorinated hydrocarbons). Similar to Alternative 2, an evaluation of site specific contaminant transport mechanisms through computer modeling would also aid in interpreting the long term effect of the plume on the water supply aquifer.

Site Constraints - Access approvals would be required to install additional monitoring wells.

Cost - The estimated preliminary cost to implement groundwater monitoring, including the additional wells is $ 25,000 in capital costs, including installing one additional piezometer and two additional water table wells. Annual monitoring costs may be $15,000 to $20,000 per year, depending on the frequency and number of wells sampled. If results of the new wells indicate an imminent threat to the private wells, significant additional costs may incurred for hook-up to city water.

5 SUMMARY AND CONCLUSIONS

5.1 Site Conditions

- Approximately five to ten feet of fill is present on the former AGI property consisting of fine silty sand with gravel. Generally, 15 to 22 feet of sand and gravel till underlie the fill. The till overlies alluvium which is predominately characterized by fine to medium sand to silty sand. The glacial deposits are estimated to be 100 feet thick and underlain by Precambrian crystalline bedrock.

- The glacial deposits are the source of area potable water supplies. Depth to groundwater at the AGI site ranges from approximately 27 feet bls in the northeastern portion of the property to 41 feet in the southwestern portion of the property. Shallow groundwater flow across the property is generally to the east. Depth to water in the off-site investigation area ranges from approximately 20 feet bls at MW-104 to less than one foot bls at MW-107, which is located adjacent to Chemical Creek. Shallow groundwater flow in the off-site investigation area, south of Chemical Creek, is generally to the northeast, toward Chemical Creek. Shallow groundwater flow north of Chemical is generally to the southeast, toward Chemical Creek. The groundwater flow measured in the piezometers is generally to the northeast, consistent with the shallow groundwater flow.

- The aquifer is characterized by permeable soils and high groundwater velocities on the order of 50 to 100 feet per year at the water table and 470 to 750 feet per year at the piezometer depths.

5.2 Source Areas of Impacts

- Four USTs are present on the site and include one 6,000-gallon solvent blend ("Trichlor Toluol") tank, one 3,000-gallon ethyl acetate tank, one 3,000-gallon tank believed to contain a solvent blend referred to as "Par-4" (a mixture of ethyl, toluol, and Jayosol (it is presently unknown what Jayosol was) and later 1,1,1-TCA, and one 1,200-gallon heating oil tank. A former AGI employee witnessed a spill in association with filling of the UST which contained either Par-4 or 1,1,1-TCA in 1986 or 1987. During filling of the UST, product spilled in the northern loading dock area. The solvent flowed to the east down the AGI driveway and then flowed north down Main Street. It is not known if the USTs leaked.

- On-site soils located in the vicinity of the solvent USTs and former drum storage area appear to be a minor source of impact to groundwater based on the limited on-site soil analytical data collected. Significant impacts were not detected in unsaturated soil samples (above the water table) during this investigation nor the previous REI investigation.

The on-site soil gas survey indicated a limited area of near surface impacts to soil located approximately 10 to 40 feet east of the three solvent USTs. Analyses of on-site soil indicates that acetone, 1,1,1-TCA, methanol, toluene, ethylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and/or total xylenes are present in soil samples collected from depths of 3 to 15 feet bls in the vicinity of the solvent USTs and from 25 to 34 feet bls in the vicinity of monitoring wells MW-1, MW-2, and MW-3. Soil samples collect between 3 to 15 feet represent unsaturated soil conditions (above the water table) and samples collected between 25 to 34 represent were collected near or below the water table. Soil samples between 15 and 25 feet were not collected for analysis.

- Monitoring well MW-102, installed in the southeast portion of the property and side gradient to the USTs, exhibits groundwater impacts at concentrations suggesting the presence of an additional unidentified source in its vicinity.

- A release of ethyl acetate on the AGI facility occurred in 1991 associated with surface water infiltration into a UST and related handling of the spill. The quantity of product released is unknown. Other known releases occurred at the northern loading dock area (north of the UST area) and suspected releases south of the main warehouse. However, soil gas surveys and surface soil sampling indicated no evidence of VOCs in the soil at these locations.

- The review of state and federal environmental data bases and aerial photographs did not identify evidence of other sources for the observed soil and groundwater impacts beyond the AGI property.

- Soil and groundwater impacts detected in samples collected from off-site soil borings SB-122 to SB-127 (located east of the groundwater plume) indicate that a separate unknown off-site source may be attributing to the detected impacts based on the near surface PID readings detected in these soil samples.

5.3 Groundwater Migration

- The plume was detected approximately 1,020 feet to the northeast and downgradient of the AGI property. Benzene, toluene, chloroform, PCE, TCE, 1,1-DCE, 1,1,1-TCA, 1,1-DCA, and 1,2-DCA are compounds which have exceeded PAL and/or ES standards on and off the former AGI site.

- Similar concentrations of source compounds, 1,1,1-TCA and toluene, in on-site wells and downgradient off-site well MW-105, indicate that a significant mass of the more highly concentrated plume has migrated off-site.

- Benzene was detected below ESs in the on-site piezometer (PZ-101) and two off-site piezometers (PZ-102 and PZ-103). Benzene was not detected in on or off-site water table monitoring wells. The benzene concentration is also higher in the off-site piezometers. The benzene concentrations appear to originate from a different unknown source.

- Vertical profiling samples taken during drilling of the piezometers and analyzed by field GC and subsequent laboratory analyses of groundwater samples from the piezometers indicates minimal vertical migration of impacts has occurred on and off the former AGI site.

- Depth to water at the AGI site ranges between 27 to 41 feet bls. Shallow groundwater flow across the property is generally to the east. Depth to water in the off-site investigation area is generally depended on local topography and ranges from approximately 20 feet bls to less than one foot bls. Shallow groundwater flow, south of Chemical Creek, is generally to the northeast and to the southeast, north and in close proximity of Chemical Creek. This local flow direction indicates a groundwater discharge area.

- The horizontal groundwater gradient at the water table and the piezometer depth is generally moderate to steep and toward the northeast.

- Vertical gradients are generally slight to moderate and predominately downward. The well nest adjacent to Chemical Creek had a slight downward gradient indicating the creek is not a significant area of groundwater discharge nor an effective barrier to plume migration.

5.4 Potable Water Supply Wells

- Two municipal wells, Municipal Wells #1 and #2, are present approximately 1,000 to 1,200 feet downgradient, respectively, of the former AGI facility to the northeast. Municipal well #1 is screened between 35 to 70 feet bls, and well #2 is screened 38 to 53 feet bls. Both wells pump water from the sand and gravel aquifer at the referenced screen depth. Groundwater samples collected from the wells in 1994 and 1995, indicate sporadic detections of low levels of VOCs in both well samples. Analytical data suggests detections may be the result of the municipal chlorination process.

- Four private potable wells located east-southeast of the former AGI facility were sampled by the WDNR in 1996. VOCs were not detected in the samples collected from the potable wells. These potable wells are located up and side gradient of the plume defined by the monitoring well installations.

5.5 Remedial Action Alternatives

- Response actions and remedial alternatives considered for the site included in order of decreasing relative cost: 1) limited source control by removing the USTs combined with groundwater migration control; 2) more aggressive source control via soil vapor extraction combined with a groundwater monitoring program; and 3) groundwater monitoring only, contingent on the installation of additional monitoring wells;

- A capture zone analysis was performed to evaluated the migration control option (Alternative 1), and resulted in estimating the need for two possibly three wells pumping at 15 to 20 gpm each for capture of the plume as it is currently interpreted. This was the highest cost but would be the most effective for protecting the existing water supply wells;

- Soil vapor extraction combined with groundwater monitoring (Alternative 2) would be an effective method for addressing residual soil contamination and minimizing continued leaching of contaminants to groundwater. However, overall improvements to groundwater quality due to the on-site soil vapor extraction would not be expected in the near future because a significant portion of the plume has already migrated off-site. This is a relatively low cost solution, but does not eliminate future risk to the existing water supply wells;

- Groundwater monitoring only was evaluated as a temporary measure, because the plume appears to be confined to the shallow flow system, and has not impacted water supply wells. Monitoring only may be a viable approach for approximately the next two years if additional sentry wells are installed, an alternative public water supply well is eventually procured, and the data is continually reviewed as it is generated to evaluate changes in the susceptibility of impacts to the existing supply wells that are in use.

6 RECOMMENDATIONS

Based on the above soil and groundwater investigation, the following recommendations are summarized below.

- Remove the three solvent USTs and fuel oil UST and surrounding impacted soil as a source removal action. Sample excavated soil for hazardous waste characterization.
- Install one water table well, following the removal of the USTs, on the former AGI site in the vicinity of the drum storage area and solvent USTs to monitor groundwater quality at the source area.
- Conduct additional assessment to identify potential additional sources associated with the groundwater impacts detected in on-site monitoring well MW-102.
- Install one water table well downgradient (east) of the eastern extent of the groundwater plume to verify the groundwater impacts detected by field GC analysis in samples SB-123 through SB-127 and to monitor plume migration.
- Install one water table well between the south-southeast extent of the groundwater plume and the four private potable wells located along Maple Avenue to monitor plume migration toward the private potable wells.
- Install one piezometer adjacent to water table well MW-109 (north of Chemical Creek) to monitor the groundwater quality and flow direction at depth between the identified northeast edge of the plume and the two municipal water supply wells.
- Continue groundwater sampling of all water table wells, piezometers, private potable wells, and municipal wells to monitor groundwater quality and plume migration. Sampling frequency should be at least on a semi-annual basis and at a greater frequency (quarterly) of key monitoring wells.
- Continue with review of additional collected data as it is generated to evaluate changes in the susceptibility of impacts to the existing supply and private potable wells that are in use.

7 REFERENCES

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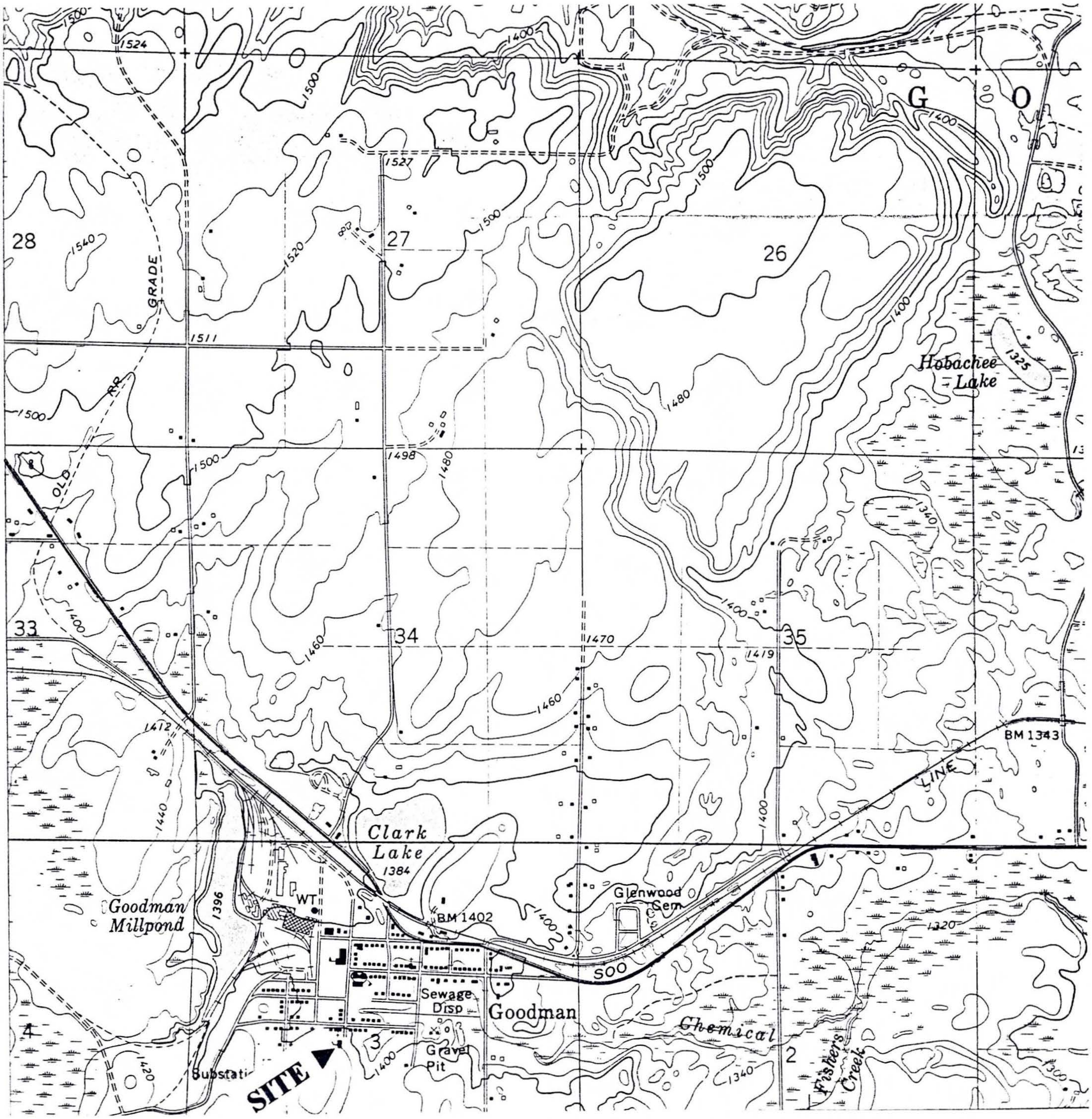


DRAFT

SOURCE: USGS 7.5 MINUTE QUADRANGLE,
GOODMAN. DATED 1972.
PHOTOINSPECTED 1980.

QUADRANGLE LOCATION

N

0 2000 4000

SCALE IN FEET

CONTOUR INTERVAL 20 FEET

Natural Resource Technology

N R T

SITE LOCATION

AMERICAN GRAPHICS, INC.
610 MAIN STREET
GOODMAN, WISCONSIN

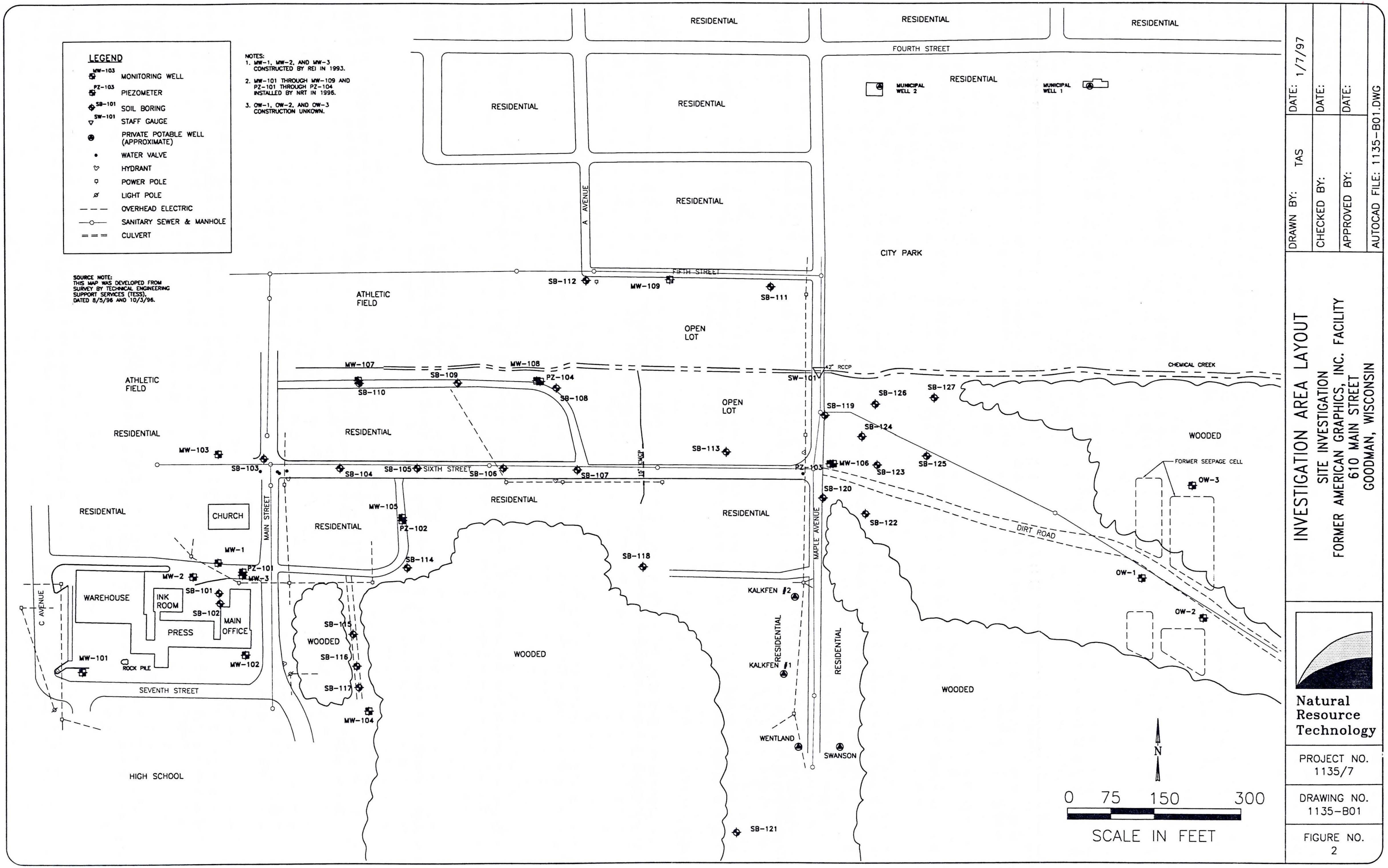
PROJECT NO. 1135/2

DRAWING NO. 1135–A04

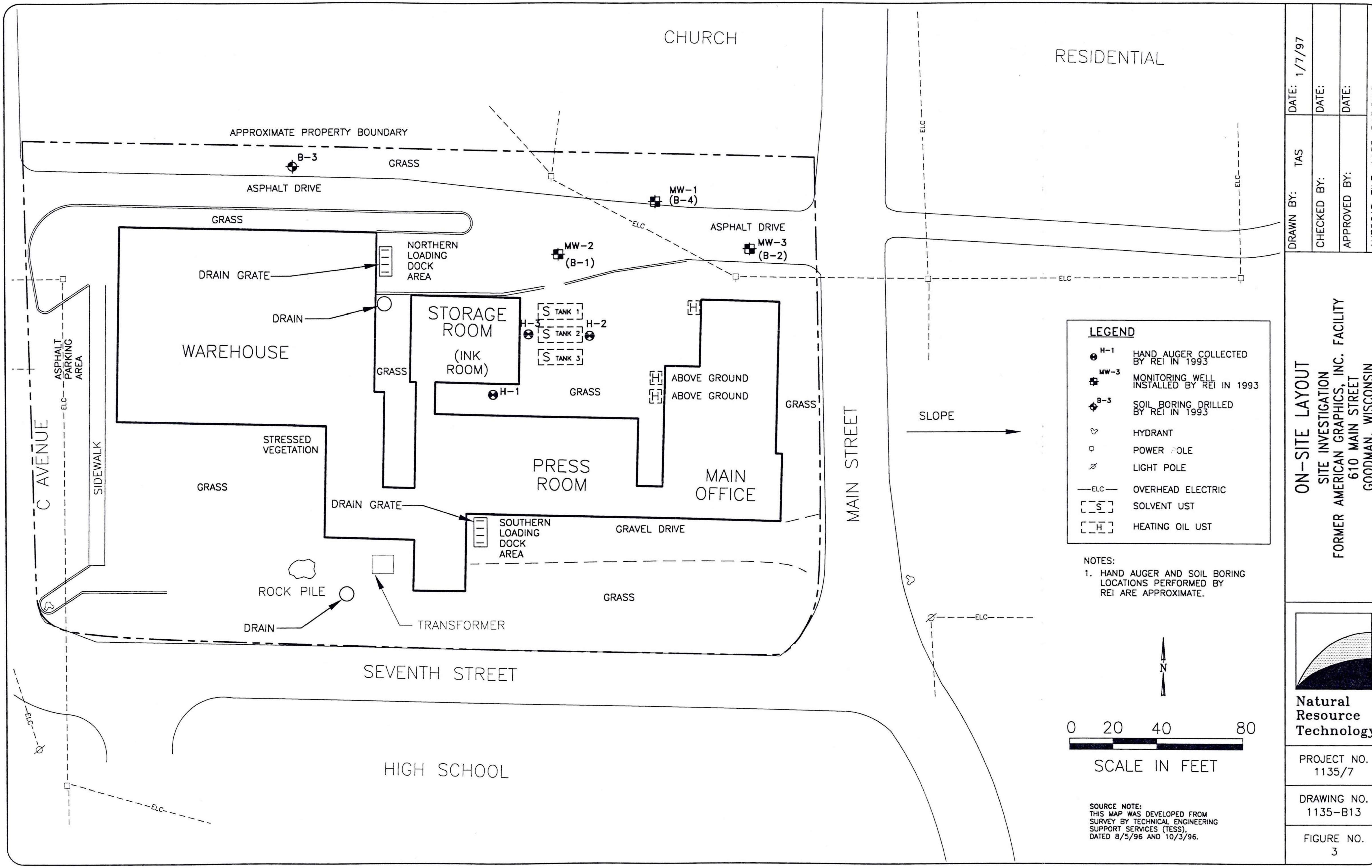
FIGURE NO. 1

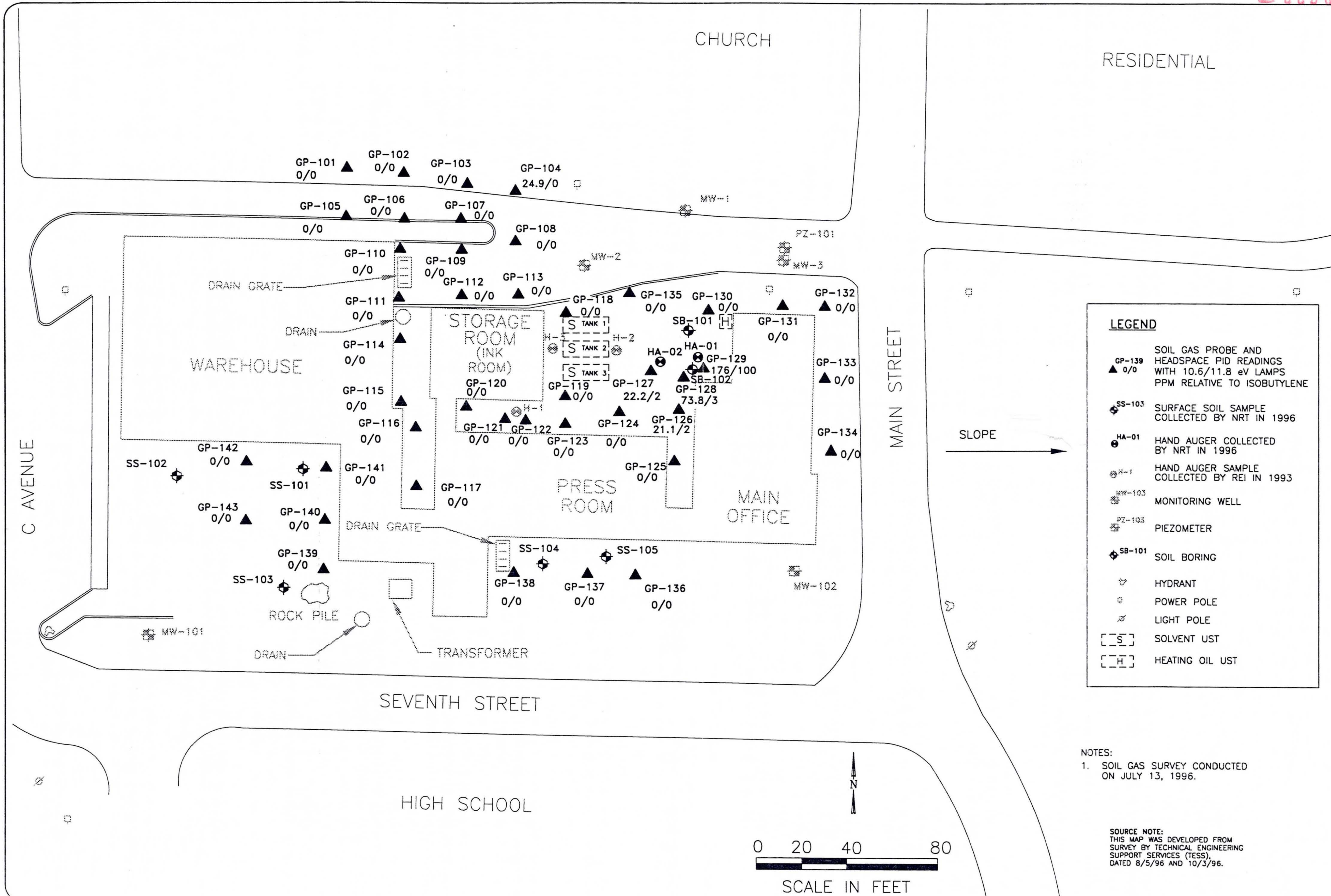
DRAWN BY: TAS APPROVED BY: BJK DATE: 05/16/96

DRAFT


LEGEND
MW-103 MONITORING WELL
PZ-103 PIEZOMETER
SB-101 SOIL BORING
SW-101 STAFF GAUGE
PRIVATE POTABLE WELL (APPROXIMATE)
WATER VALVE
HYDRANT
POWER POLE
LIGHT POLE
OVERHEAD ELECTRIC
SANITARY SEWER & MANHOLE
CULVERT
NOTES:
1. MW-1, MW-2, AND MW-3 CONSTRUCTED BY REI IN 1993.
2. MW-101 THROUGH MW-109 AND PZ-101 THROUGH PZ-104 INSTALLED BY NRT IN 1996.
3. OW-1, OW-2, AND OW-3 CONSTRUCTION UNKOWN.
SOURCE NOTE:
THIS MAP WAS DEVELOPED FROM SURVEY BY TECHNICAL ENGINEERING SUPPORT SERVICES (TESS), DATED 8/5/96 AND 10/3/96.
RESIDENTIAL
FOURTH STREET
MUNICIPAL WELL 2
MUNICIPAL WELL 1
CITY PARK
A AVENUE
FIFTH STREET
ATHLETIC FIELD
OPEN LOT
SIXTH STREET
MAIN STREET
MAPLE AVENUE
CHEMICAL CREEK
42" RCCP
DIRT ROAD
FORMER SEEPAGE CELL
WOODED
CHURCH
WAREHOUSE
INK ROOM
PRESS
MAIN OFFICE
ROCK PILE
C AVENUE
SEVENTH STREET
HIGH SCHOOL
KALKFEN #2
KALKFEN #1
WENTLAND
SWANSON
MW-1
MW-2
MW-3
MW-101
MW-102
MW-103
MW-104
MW-105
MW-106
MW-107
MW-108
MW-109
PZ-101
PZ-102
PZ-103
PZ-104
SW-101
OW-1
OW-2
OW-3
SB-101
SB-102
SB-103
SB-104
SB-105
SB-106
SB-107
SB-108
SB-109
SB-110
SB-111
SB-112
SB-113
SB-114
SB-115
SB-116
SB-117
SB-118
SB-119
SB-120
SB-121
SB-122
SB-123
SB-124
SB-125
SB-126
SB-127
N
0 75 150 300
SCALE IN FEET
DRAWN BY: TAS DATE: 1/7/97
CHECKED BY: DATE:
APPROVED BY: DATE:
AUTOCAD FILE: 1135-B01.DWG
INVESTIGATION AREA LAYOUT
SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN
Natural Resource Technology
PROJECT NO. 1135/7
DRAWING NO. 1135-B01
FIGURE NO. 2

DRAFT


CHURCH
RESIDENTIAL
APPROXIMATE PROPERTY BOUNDARY
B-3
GRASS
ASPHALT DRIVE
MW-1
(B-4)
GRASS
ELC
ASPHALT DRIVE
NORTHERN
LOADING
DOCK
AREA
MW-2
(B-1)
MW-3
(B-2)
DRAIN GRATE
DRAIN
STORAGE
ROOM
(INK
ROOM)
S TANK 1
S TANK 2
S TANK 3
H-3
H-2
H-1
WAREHOUSE
GRASS
ASPHALT
PARKING
AREA
ABOVE GROUND
ABOVE GROUND
GRASS
GRASS
SLOPE
STRESSED
VEGETATION
PRESS
ROOM
MAIN
OFFICE
C AVENUE
SIDEWALK
GRASS
DRAIN GRATE
SOUTHERN
LOADING
DOCK
AREA
GRAVEL DRIVE
MAIN STREET
ROCK PILE
DRAIN
TRANSFORMER
GRASS
SEVENTH STREET
HIGH SCHOOL
LEGEND
H-1 HAND AUGER COLLECTED BY REI IN 1993
MW-3 MONITORING WELL INSTALLED BY REI IN 1993
B-3 SOIL BORING DRILLED BY REI IN 1993
HYDRANT
POWER POLE
LIGHT POLE
ELC OVERHEAD ELECTRIC
S SOLVENT UST
H HEATING OIL UST
NOTES:
1. HAND AUGER AND SOIL BORING LOCATIONS PERFORMED BY REI ARE APPROXIMATE.
N
0 20 40 80
SCALE IN FEET
SOURCE NOTE:
THIS MAP WAS DEVELOPED FROM SURVEY BY TECHNICAL ENGINEERING SUPPORT SERVICES (TESS), DATED 8/5/96 AND 10/3/96.
DRAWN BY: TAS
DATE: 1/7/97
CHECKED BY:
DATE:
APPROVED BY:
DATE:
AUTOCAD FILE: 1135-B13.DWG
ON-SITE LAYOUT
SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN
Natural
Resource
Technology
PROJECT NO.
1135/7
DRAWING NO.
1135-B13
FIGURE NO.
3



DRAWN BY: TAS DATE: 1/7/97
CHECKED BY: DATE:
APPROVED BY: DATE:
AUTOCAD FILE: 1135-B03.DWG

ON-SITE SAMPLING LOCATIONS

SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN

Natural Resource Technology

PROJECT NO. 1135/7

DRAWING NO. 1135-B03

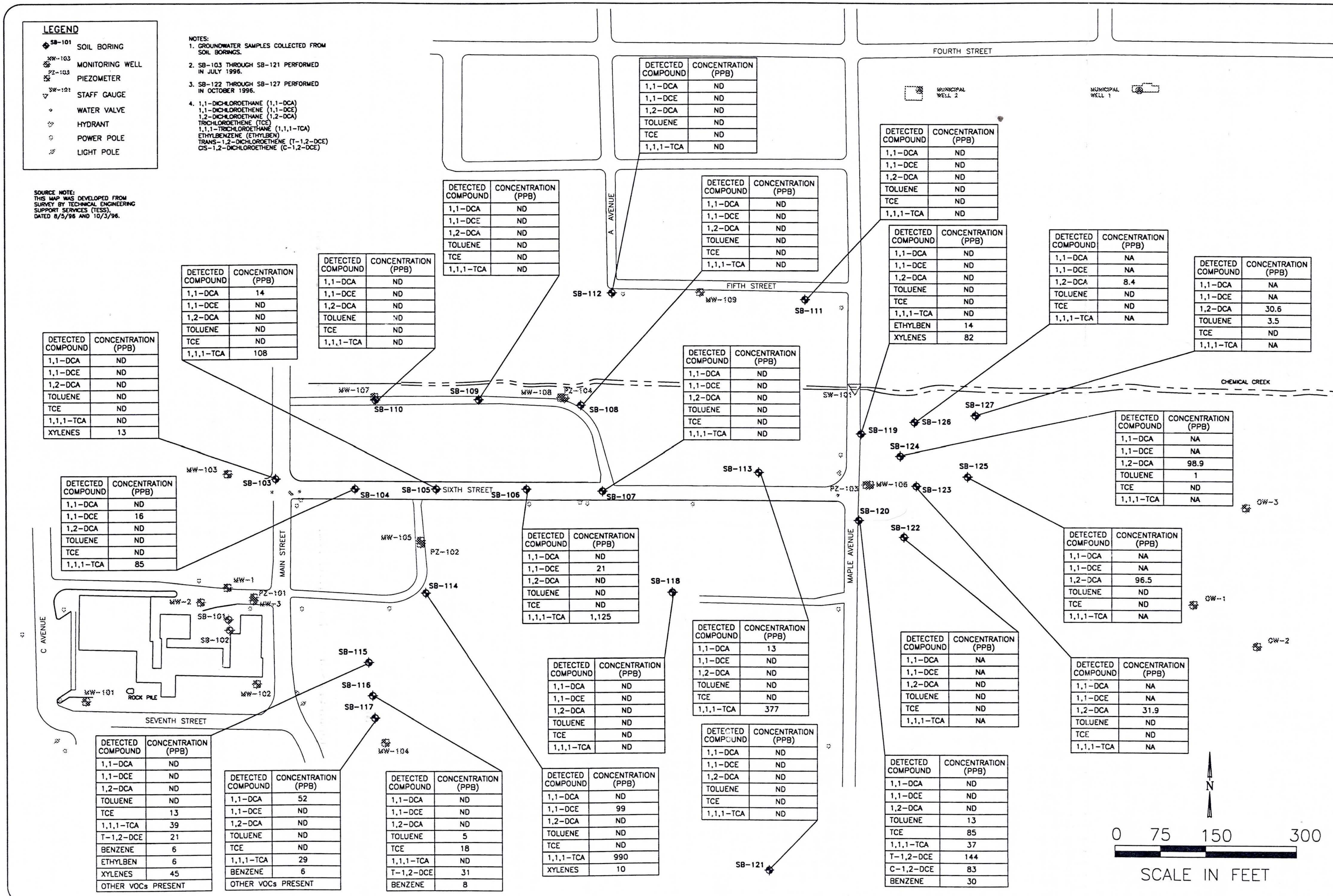
FIGURE NO. 4

LEGEND

- SB-101 SOIL BORING
- MW-103 MONITORING WELL
- PZ-103 PIEZOMETER
- SW-101 STAFF GAUGE
- WATER VALVE
- HYDRANT
- POWER POLE
- LIGHT POLE

NOTES:
1. GROUNDWATER SAMPLES COLLECTED FROM SOIL BORINGS.
2. SB-103 THROUGH SB-121 PERFORMED IN JULY 1996.
3. SB-122 THROUGH SB-127 PERFORMED IN OCTOBER 1996.
4. 1,1-DICHLOROETHANE (1,1-DCA)
   1,1-DICHLOROETHENE (1,1-DCE)
   1,2-DICHLOROETHANE (1,2-DCA)
   TRICHLOROETHENE (TCE)
   1,1,1-TRICHLOROETHANE (1,1,1-TCA)
   ETHYLBENZENE (ETHYLBEN)
   TRANS-1,2-DICHLOROETHENE (T-1,2-DCE)
   CIS-1,2-DICHLOROETHENE (C-1,2-DCE)

SOURCE NOTE:
THIS MAP WAS DEVELOPED FROM SURVEY BY TECHNICAL ENGINEERING SUPPORT SERVICES (TESS), DATED 8/5/96 AND 10/3/96.



DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	ND

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	ND

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	ND

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	ND

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	ND
ETHYLBEN	14
XYLENES	82

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	NA
1,1-DCE	NA
1,2-DCA	8.4
TOLUENE	ND
TCE	ND
1,1,1-TCA	NA

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	NA
1,1-DCE	NA
1,2-DCA	30.6
TOLUENE	3.5
TCE	ND
1,1,1-TCA	NA

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	14
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	108

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	ND

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	ND
XYLENES	13

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	ND

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	NA
1,1-DCE	NA
1,2-DCA	98.9
TOLUENE	1
TCE	ND
1,1,1-TCA	NA

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	16
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	85

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	21
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	1,125

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	NA
1,1-DCE	NA
1,2-DCA	96.5
TOLUENE	ND
TCE	ND
1,1,1-TCA	NA

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	13
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	377

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	NA
1,1-DCE	NA
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	NA

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	ND

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	NA
1,1-DCE	NA
1,2-DCA	31.9
TOLUENE	ND
TCE	ND
1,1,1-TCA	NA

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	ND

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	13
1,1,1-TCA	39
T-1,2-DCE	21
BENZENE	6
ETHYLBEN	6
XYLENES	45
OTHER VOCs PRESENT	

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	52
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	29
BENZENE	6
OTHER VOCs PRESENT	

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	5
TCE	18
1,1,1-TCA	ND
T-1,2-DCE	31
BENZENE	8

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	99
1,2-DCA	ND
TOLUENE	ND
TCE	ND
1,1,1-TCA	990
XYLENES	10

DETECTED COMPOUND	CONCENTRATION (PPB)
1,1-DCA	ND
1,1-DCE	ND
1,2-DCA	ND
TOLUENE	13
TCE	85
1,1,1-TCA	37
T-1,2-DCE	144
C-1,2-DCE	83
BENZENE	30

DRAWN BY: TAS DATE: 1/7/97
CHECKED BY: DATE:
APPROVED BY: DATE:
AUTOCAD FILE: 1135-B07.DWG

WATER TABLE GROUNDWATER SAMPLES VOC FIELD GC ANALYSES SUMMARY

SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN

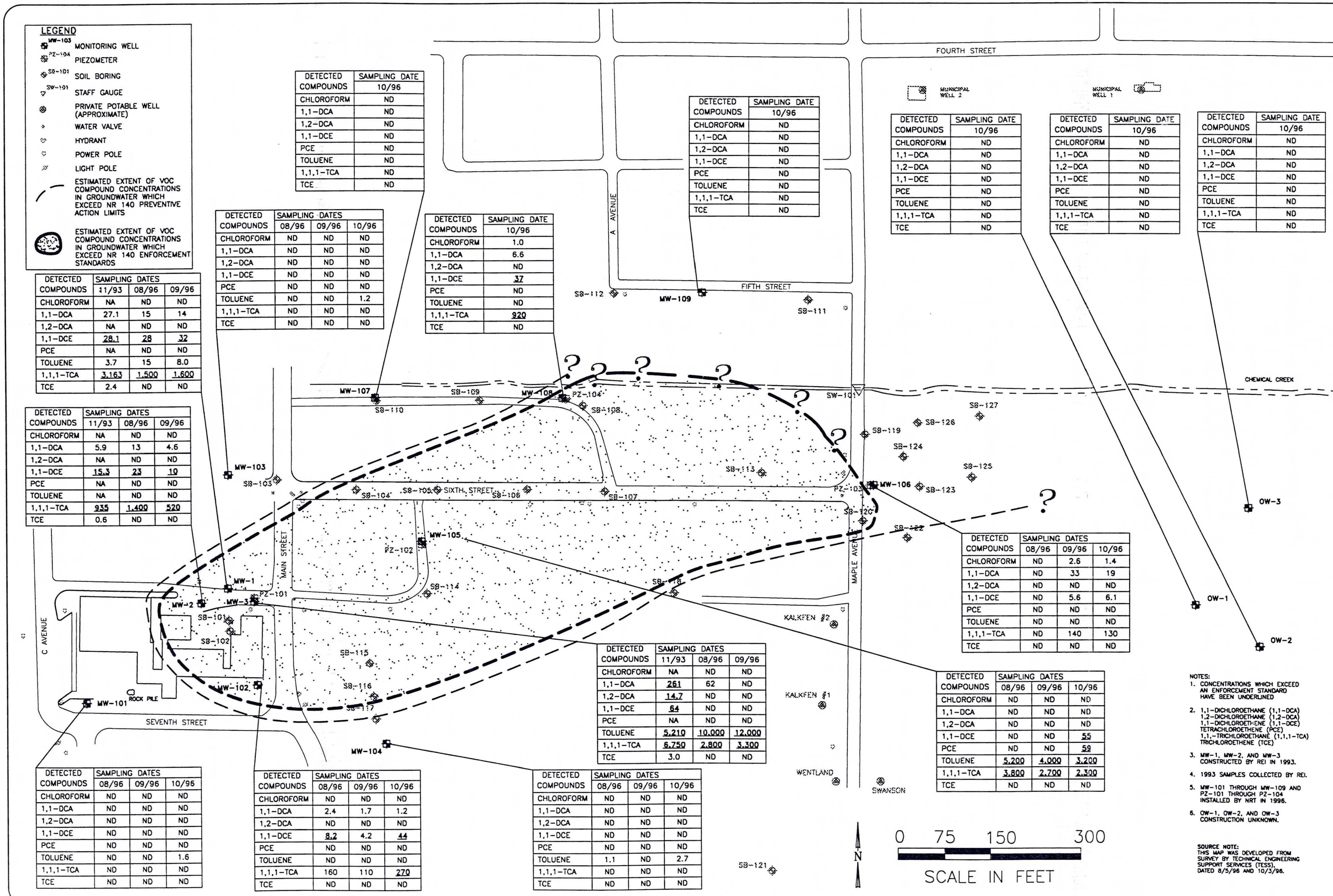
Natural Resource Technology

PROJECT NO. 1135/7

DRAWING NO. 1135-B07

FIGURE NO. 5

DRAFT



LEGEND

- MW-103 MONITORING WELL
- PZ-104 PIEZOMETER
- SB-101 SOIL BORING
- SW-101 STAFF GAUGE
- PRIVATE POTABLE WELL (APPROXIMATE)
- WATER VALVE
- HYDRANT
- POWER POLE
- LIGHT POLE
- ESTIMATED EXTENT OF VOC COMPOUND CONCENTRATIONS IN GROUNDWATER WHICH EXCEED NR 140 PREVENTIVE ACTION LIMITS
- ESTIMATED EXTENT OF VOC COMPOUND CONCENTRATIONS IN GROUNDWATER WHICH EXCEED NR 140 ENFORCEMENT STANDARDS

DETECTED COMPOUNDS	SAMPLING DATE 10/96
CHLOROFORM	ND
1,1-DCA	ND
1,2-DCA	ND
1,1-DCE	ND
PCE	ND
TOLUENE	ND
1,1,1-TCA	ND
TCE	ND

DETECTED COMPOUNDS	SAMPLING DATE 10/96
CHLOROFORM	ND
1,1-DCA	ND
1,2-DCA	ND
1,1-DCE	ND
PCE	ND
TOLUENE	ND
1,1,1-TCA	ND
TCE	ND

DETECTED COMPOUNDS	SAMPLING DATE 10/96
CHLOROFORM	ND
1,1-DCA	ND
1,2-DCA	ND
1,1-DCE	ND
PCE	ND
TOLUENE	ND
1,1,1-TCA	ND
TCE	ND

DETECTED COMPOUNDS	SAMPLING DATE 10/96
CHLOROFORM	ND
1,1-DCA	ND
1,2-DCA	ND
1,1-DCE	ND
PCE	ND
TOLUENE	ND
1,1,1-TCA	ND
TCE	ND

DETECTED COMPOUNDS	SAMPLING DATE 10/96
CHLOROFORM	ND
1,1-DCA	ND
1,2-DCA	ND
1,1-DCE	ND
PCE	ND
TOLUENE	ND
1,1,1-TCA	ND
TCE	ND

DETECTED COMPOUNDS	SAMPLING DATES		
	08/96	09/96	10/96
CHLOROFORM	ND	ND	ND
1,1-DCA	ND	ND	ND
1,2-DCA	ND	ND	ND
1,1-DCE	ND	ND	ND
PCE	ND	ND	ND
TOLUENE	ND	ND	1.2
1,1,1-TCA	ND	ND	ND
TCE	ND	ND	ND

DETECTED COMPOUNDS	SAMPLING DATE 10/96
CHLOROFORM	1.0
1,1-DCA	6.6
1,2-DCA	ND
1,1-DCE	37
PCE	ND
TOLUENE	ND
1,1,1-TCA	920
TCE	ND

DETECTED COMPOUNDS	SAMPLING DATES		
	11/93	08/96	09/96
CHLOROFORM	NA	ND	ND
1,1-DCA	27.1	15	14
1,2-DCA	NA	ND	ND
1,1-DCE	28.1	28	32
PCE	NA	ND	ND
TOLUENE	3.7	15	8.0
1,1,1-TCA	3,163	1,500	1,600
TCE	2.4	ND	ND

DETECTED COMPOUNDS	SAMPLING DATES		
	11/93	08/96	09/96
CHLOROFORM	NA	ND	ND
1,1-DCA	5.9	13	4.6
1,2-DCA	NA	ND	ND
1,1-DCE	15.3	23	10
PCE	NA	ND	ND
TOLUENE	NA	ND	ND
1,1,1-TCA	935	1,400	520
TCE	0.6	ND	ND

DETECTED COMPOUNDS	SAMPLING DATES		
	08/96	09/96	10/96
CHLOROFORM	ND	2.6	1.4
1,1-DCA	ND	33	19
1,2-DCA	ND	ND	ND
1,1-DCE	ND	5.6	6.1
PCE	ND	ND	ND
TOLUENE	ND	ND	ND
1,1,1-TCA	ND	140	130
TCE	ND	ND	ND

DETECTED COMPOUNDS	SAMPLING DATES		
	11/93	08/96	09/96
CHLOROFORM	NA	ND	ND
1,1-DCA	261	62	ND
1,2-DCA	14.7	ND	ND
1,1-DCE	64	ND	ND
PCE	NA	ND	ND
TOLUENE	5,210	10,000	12,000
1,1,1-TCA	6,750	2,800	3,300
TCE	3.0	ND	ND

DETECTED COMPOUNDS	SAMPLING DATES		
	08/96	09/96	10/96
CHLOROFORM	ND	ND	ND
1,1-DCA	ND	ND	ND
1,2-DCA	ND	ND	ND
1,1-DCE	ND	ND	55
PCE	ND	ND	59
TOLUENE	5,200	4,000	3,200
1,1,1-TCA	3,800	2,700	2,300
TCE	ND	ND	ND

DETECTED COMPOUNDS	SAMPLING DATES		
	08/96	09/96	10/96
CHLOROFORM	ND	ND	ND
1,1-DCA	ND	ND	ND
1,2-DCA	ND	ND	ND
1,1-DCE	ND	ND	ND
PCE	ND	ND	ND
TOLUENE	ND	ND	1.6
1,1,1-TCA	ND	ND	ND
TCE	ND	ND	ND

DETECTED COMPOUNDS	SAMPLING DATES		
	08/96	09/96	10/96
CHLOROFORM	ND	ND	ND
1,1-DCA	2.4	1.7	1.2
1,2-DCA	ND	ND	ND
1,1-DCE	8.2	4.2	44
PCE	ND	ND	ND
TOLUENE	ND	ND	ND
1,1,1-TCA	160	110	270
TCE	ND	ND	ND

DETECTED COMPOUNDS	SAMPLING DATES		
	08/96	09/96	10/96
CHLOROFORM	ND	ND	ND
1,1-DCA	ND	ND	ND
1,2-DCA	ND	ND	ND
1,1-DCE	ND	ND	ND
PCE	ND	ND	ND
TOLUENE	1.1	ND	2.7
1,1,1-TCA	ND	ND	ND
TCE	ND	ND	ND

NOTES:

1. CONCENTRATIONS WHICH EXCEED AN ENFORCEMENT STANDARD HAVE BEEN UNDERLINED
2. 1,1-DICHLOROETHANE (1,1-DCA)
   1,2-DICHLOROETHANE (1,2-DCA)
   1,1-DICHLOROETHENE (1,1-DCE)
   TETRACHLOROETHENE (PCE)
   1,1,-TRICHLOROETHANE (1,1,1-TCA)
   TRICHLOROETHENE (TCE)
3. MW-1, MW-2, AND MW-3 CONSTRUCTED BY REI IN 1993.
4. 1993 SAMPLES COLLECTED BY REI.
5. MW-101 THROUGH MW-109 AND PZ-101 THROUGH PZ-104 INSTALLED BY NRT IN 1996.
6. OW-1, OW-2, AND OW-3 CONSTRUCTION UNKNOWN.

SOURCE NOTE:
THIS MAP WAS DEVELOPED FROM SURVEY BY TECHNICAL ENGINEERING SUPPORT SERVICES (TESS), DATED 8/5/96 AND 10/3/96.

DRAWN BY: TAS DATE: 1/7/97
CHECKED BY: DATE:
APPROVED BY: DATE:
AUTOCAD FILE: 1135-B08.DWG

VOC GROUNDWATER DETECTIONS IN WATER TABLE MONITORING WELLS

SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN

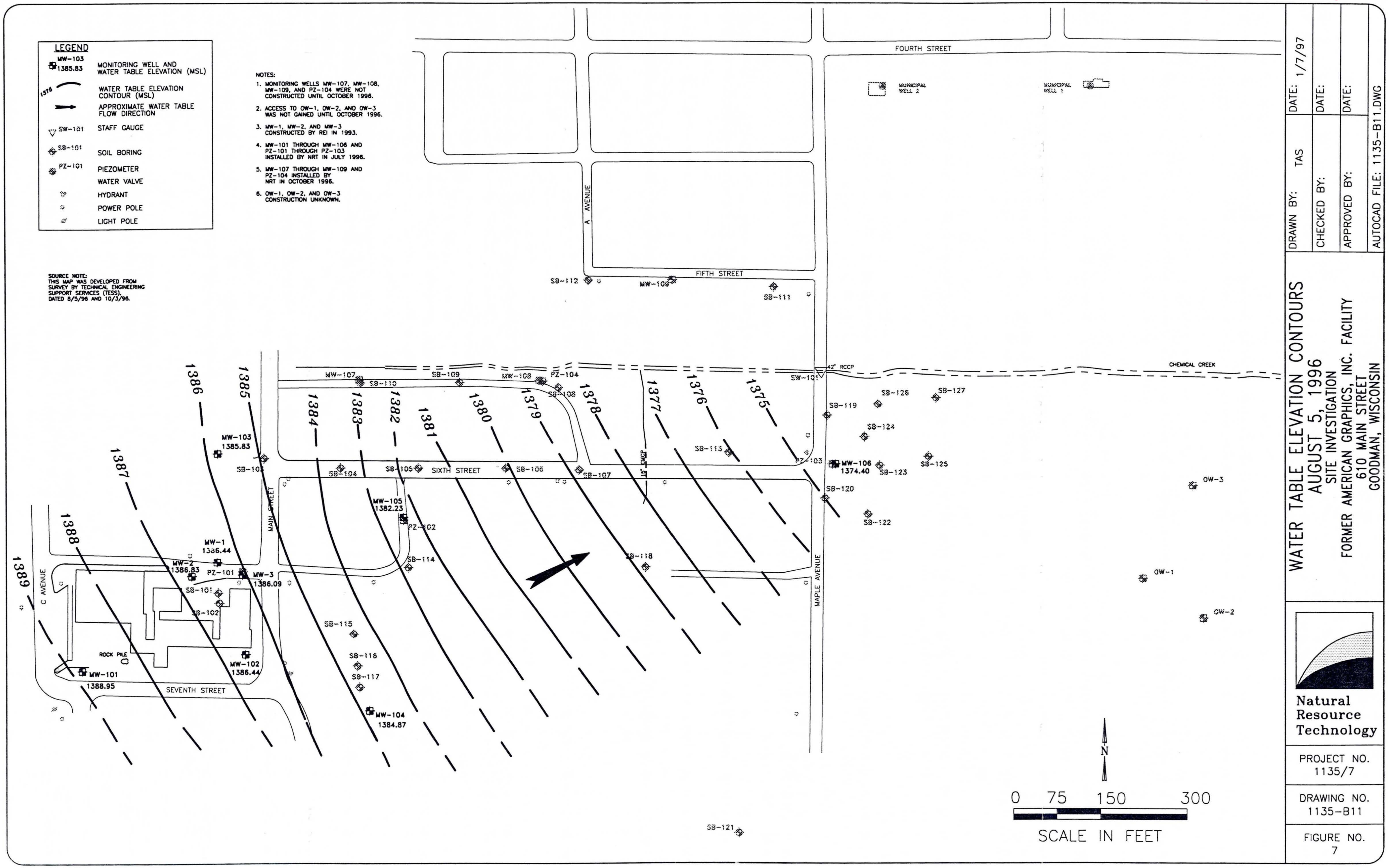
Natural Resource Technology

PROJECT NO. 1135/7

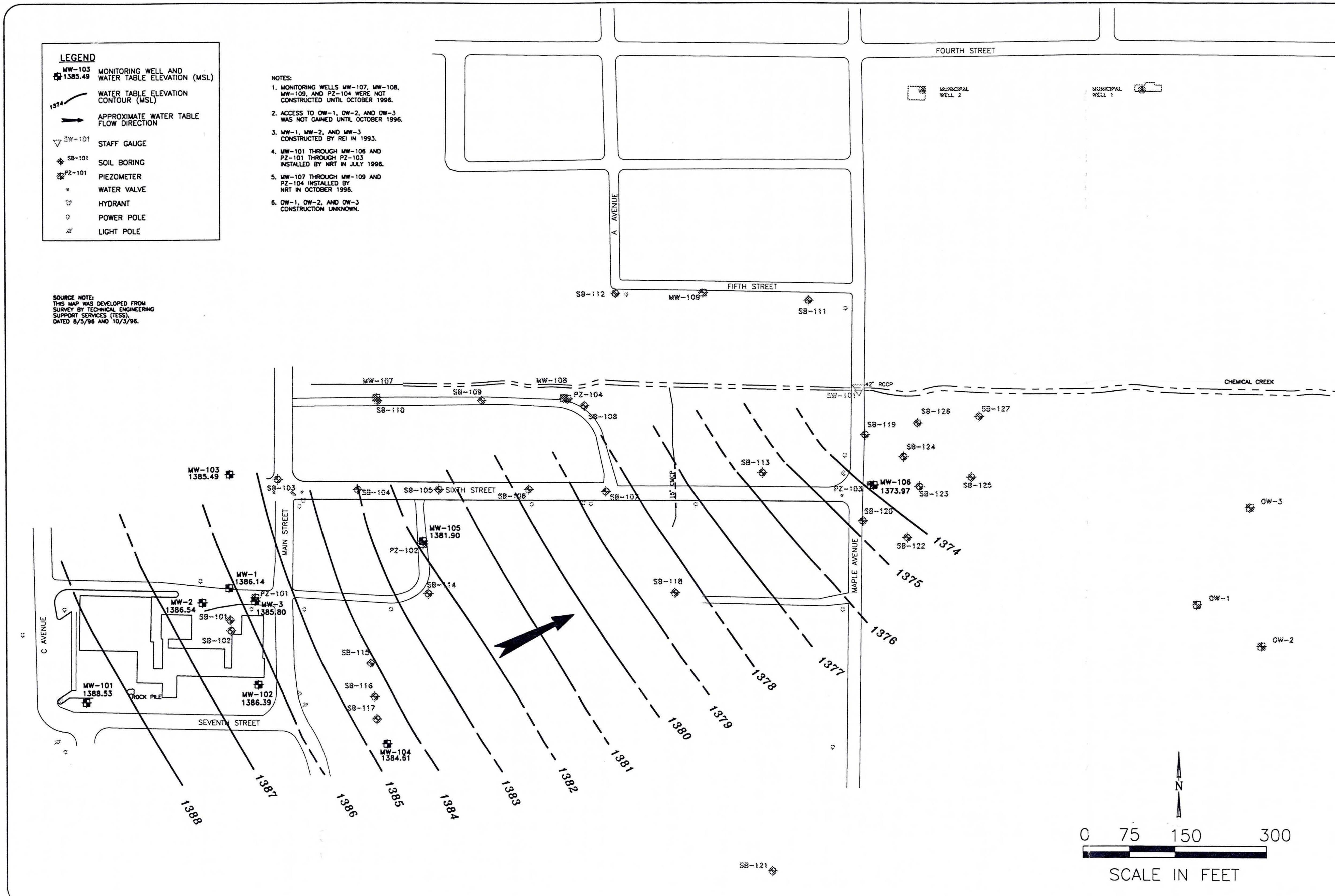
DRAWING NO. 1135-B08

FIGURE NO. 6

DRAFT


LEGEND
MW-103 1385.83 MONITORING WELL AND WATER TABLE ELEVATION (MSL)
1375 WATER TABLE ELEVATION CONTOUR (MSL)
APPROXIMATE WATER TABLE FLOW DIRECTION
SW-101 STAFF GAUGE
SB-101 SOIL BORING
PZ-101 PIEZOMETER
WATER VALVE
HYDRANT
POWER POLE
LIGHT POLE
NOTES:
1. MONITORING WELLS MW-107, MW-108, MW-109, AND PZ-104 WERE NOT CONSTRUCTED UNTIL OCTOBER 1996.
2. ACCESS TO OW-1, OW-2, AND OW-3 WAS NOT GAINED UNTIL OCTOBER 1996.
3. MW-1, MW-2, AND MW-3 CONSTRUCTED BY REI IN 1993.
4. MW-101 THROUGH MW-106 AND PZ-101 THROUGH PZ-103 INSTALLED BY NRT IN JULY 1996.
5. MW-107 THROUGH MW-109 AND PZ-104 INSTALLED BY NRT IN OCTOBER 1996.
6. OW-1, OW-2, AND OW-3 CONSTRUCTION UNKNOWN.
SOURCE NOTE:
THIS MAP WAS DEVELOPED FROM SURVEY BY TECHNICAL ENGINEERING SUPPORT SERVICES (TESS), DATED 8/5/96 AND 10/3/96.
FOURTH STREET
FIFTH STREET
SIXTH STREET
SEVENTH STREET
A AVENUE
C AVENUE
MAIN STREET
MAPLE AVENUE
CHEMICAL CREEK
12" RCCP
MUNICIPAL WELL 2
MUNICIPAL WELL 1
MW-103 1385.83
MW-1 1386.44
MW-2 1386.83
MW-3 1386.09
MW-101 1388.95
MW-102 1386.44
MW-104 1384.87
MW-105 1382.23
MW-106 1374.40
MW-107
MW-108
MW-109
PZ-101
PZ-102
PZ-103
PZ-104
SW-101
ROCK PILE
SB-101
SB-102
SB-103
SB-104
SB-105
SB-106
SB-107
SB-108
SB-109
SB-110
SB-111
SB-112
SB-113
SB-114
SB-115
SB-116
SB-117
SB-118
SB-119
SB-120
SB-121
SB-122
SB-123
SB-124
SB-125
SB-126
SB-127
OW-1
OW-2
OW-3
1389
1388
1387
1386
1385
1384
1383
1382
1381
1380
1379
1378
1377
1376
1375
N
0 75 150 300
SCALE IN FEET
DRAWN BY: TAS
DATE: 1/7/97
CHECKED BY:
DATE:
APPROVED BY:
DATE:
AUTOCAD FILE: 1135-B11.DWG
WATER TABLE ELEVATION CONTOURS
AUGUST 5, 1996
SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN
Natural Resource Technology
PROJECT NO. 1135/7
DRAWING NO. 1135-B11
FIGURE NO. 7

DRAFT



DATE: 1/7/97
DATE:
DATE:
DRAWN BY: TAS
CHECKED BY:
APPROVED BY:
AUTOCAD FILE: 1135-B12.DWG

WATER TABLE ELEVATION CONTOURS
SEPTEMBER 4, 1996
SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN

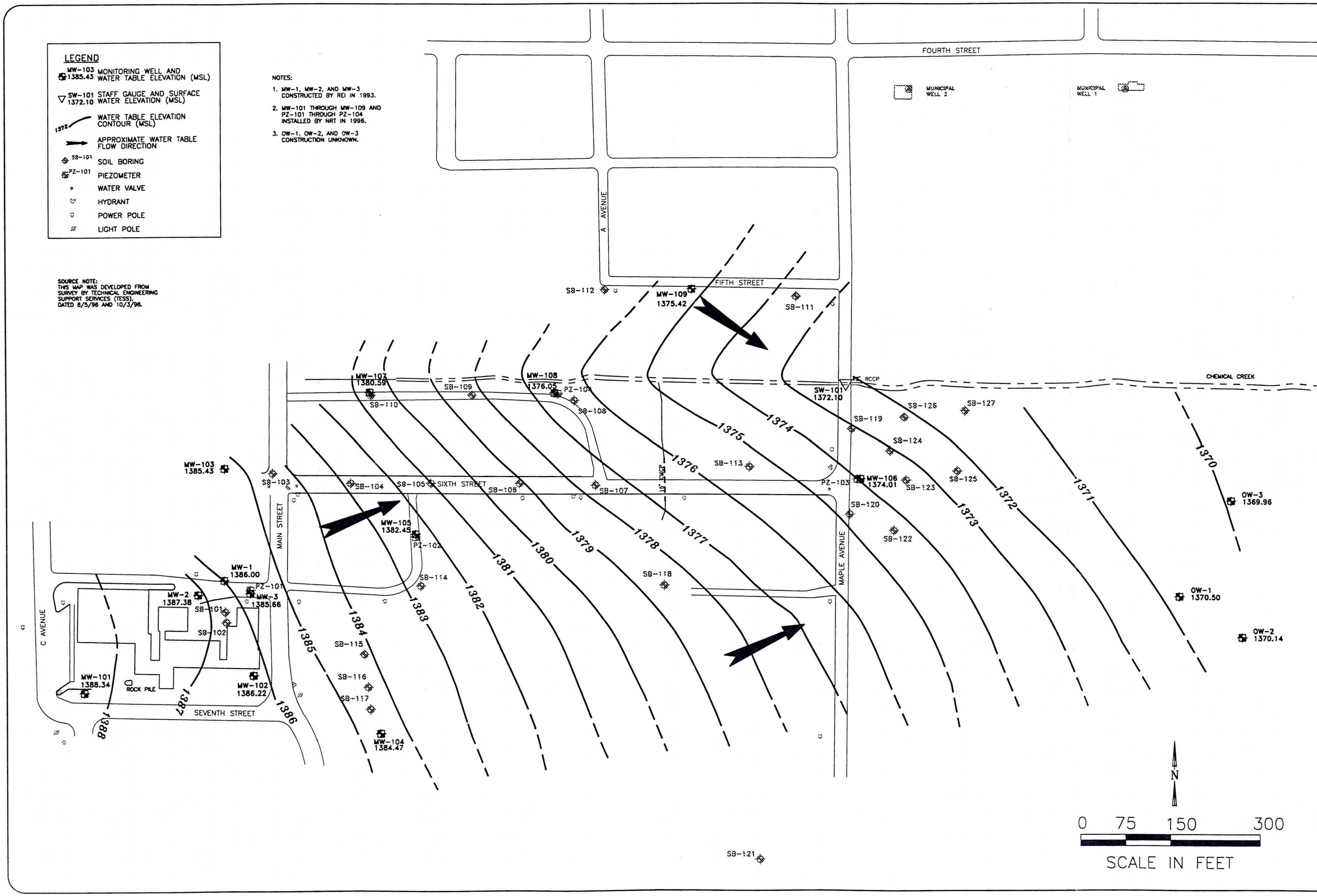
Natural Resource Technology

PROJECT NO.
1135/7

DRAWING NO.
1135-B12

FIGURE NO.
8

DRAFT



WATER TABLE ELEVATION CONTOURS
OCTOBER 10, 1996
SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN

DRAWN BY: TAS	DATE: 1/7/97
CHECKED BY:	DATE:
APPROVED BY:	DATE:
AUTOCAD FILE: 1135-B04.DWG	

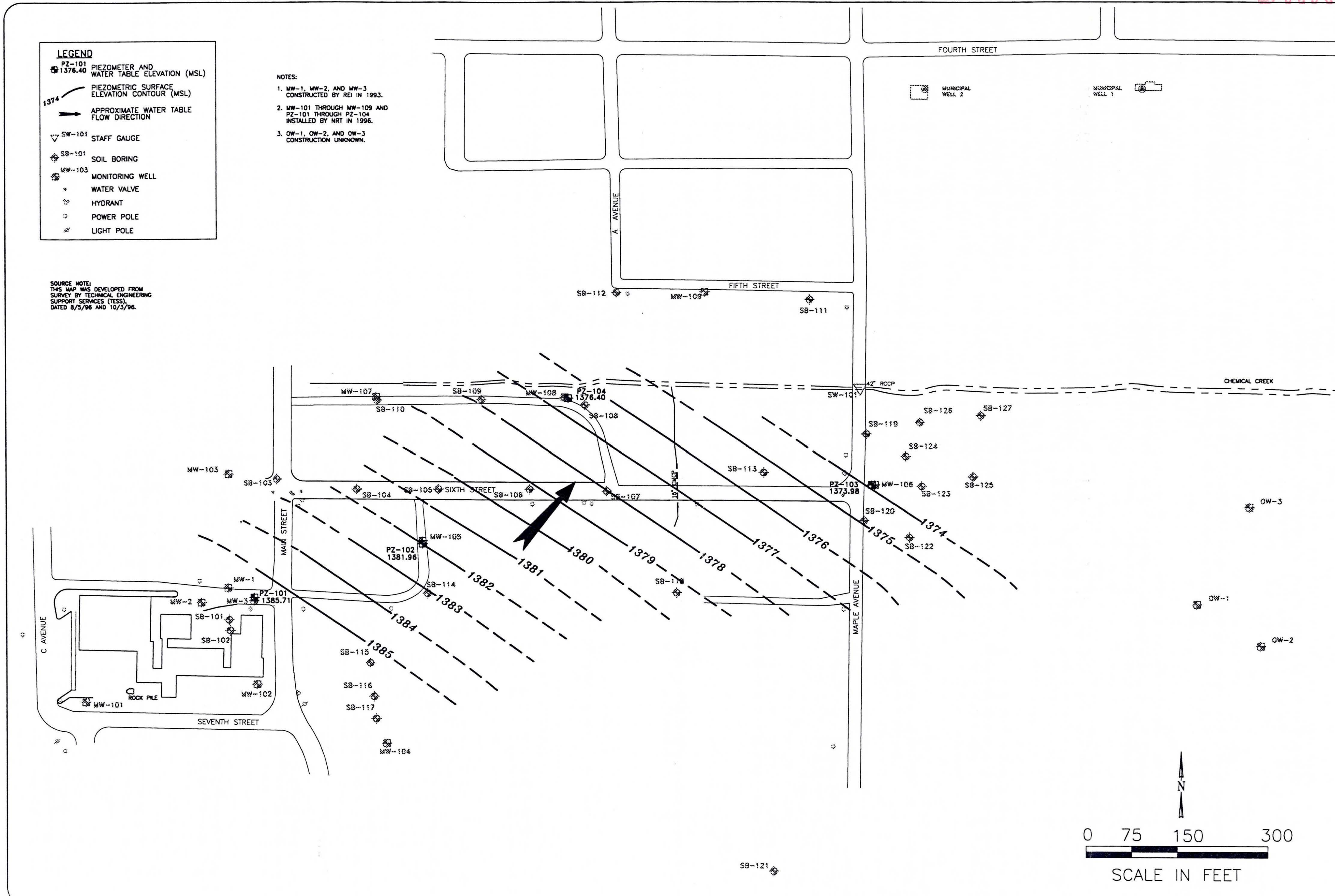
Natural Resource Technology

PROJECT NO. 1135/7

DRAWING NO. 1135-B04

FIGURE NO. 9

DRAFT



PIEZOMETRIC SURFACE ELEVATION CONTOURS – OCTOBER 10, 1996

SITE INVESTIGATION

FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN

DRAWN BY: TAS DATE: 1/7/97
CHECKED BY: DATE:
APPROVED BY: DATE:
AUTOCAD FILE: 1135-B10.DWG

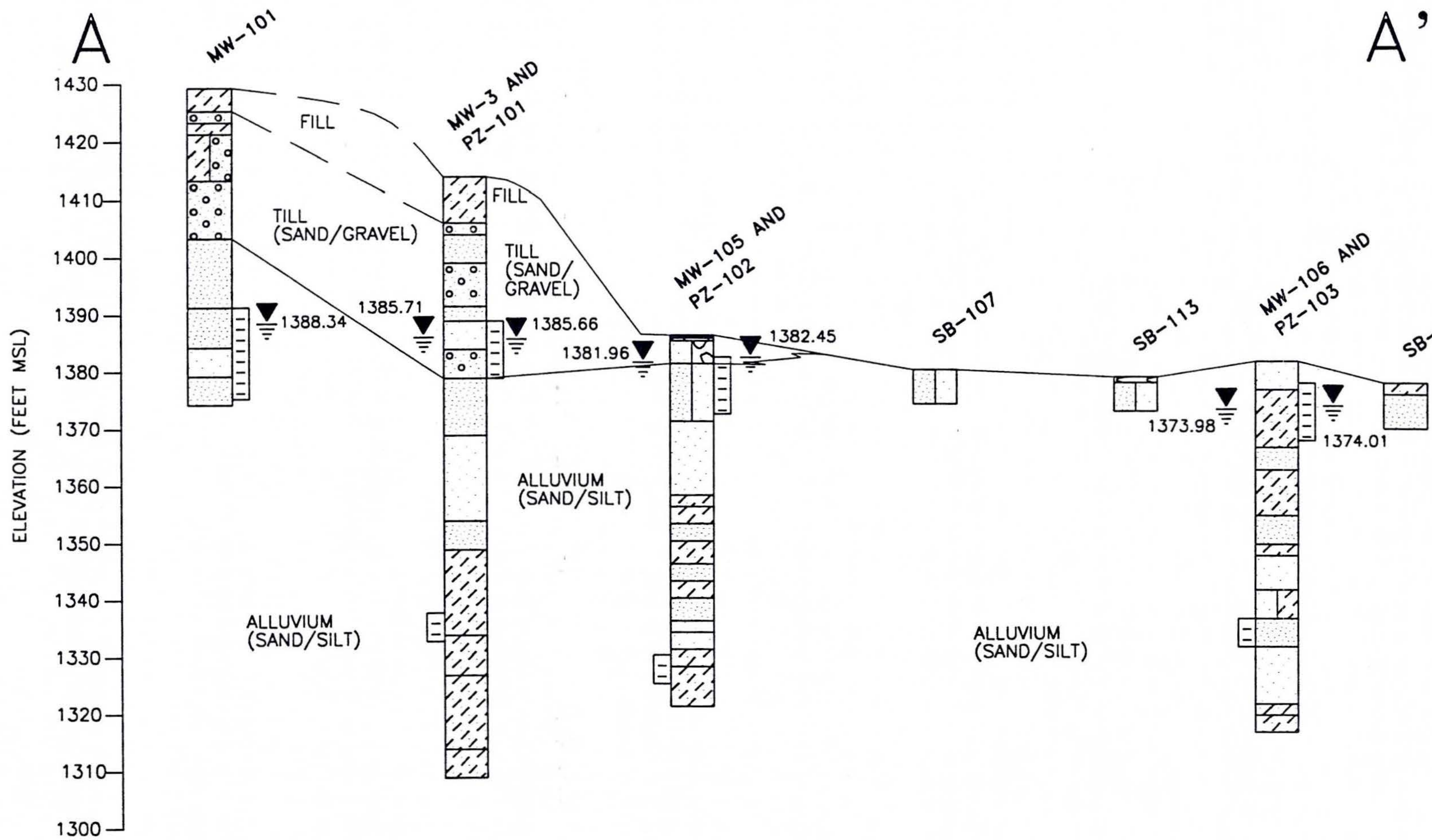
Natural Resource Technology

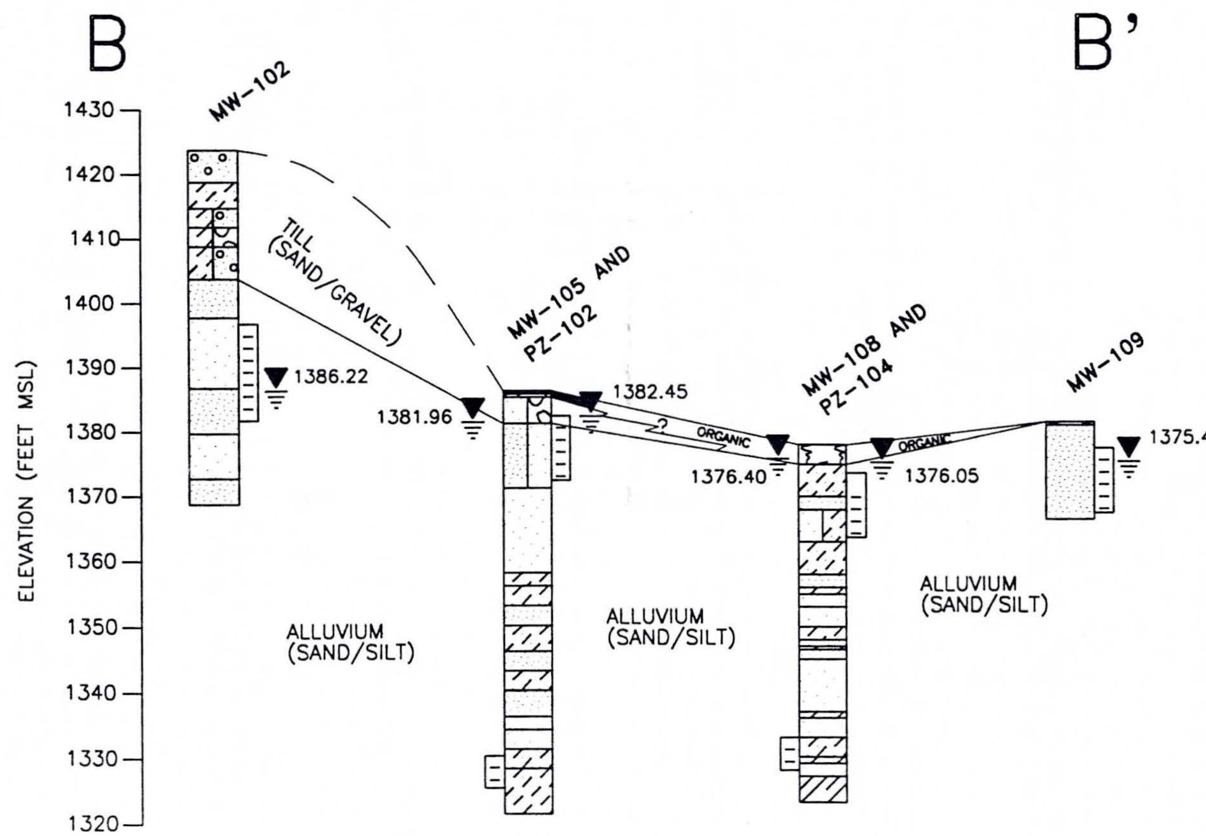
PROJECT NO. 1135/7

DRAWING NO. 1135-B10

FIGURE NO. 10

DRAFT





0 200
FEET

VERTICAL EXAGGERATION = 6.67

LEGEND

SAND WITH GRAVEL OR GRAVEL WITH SAND

GRAVEL

SANDY GRAVEL

SILT

SILTY SAND OR SANDY SILT

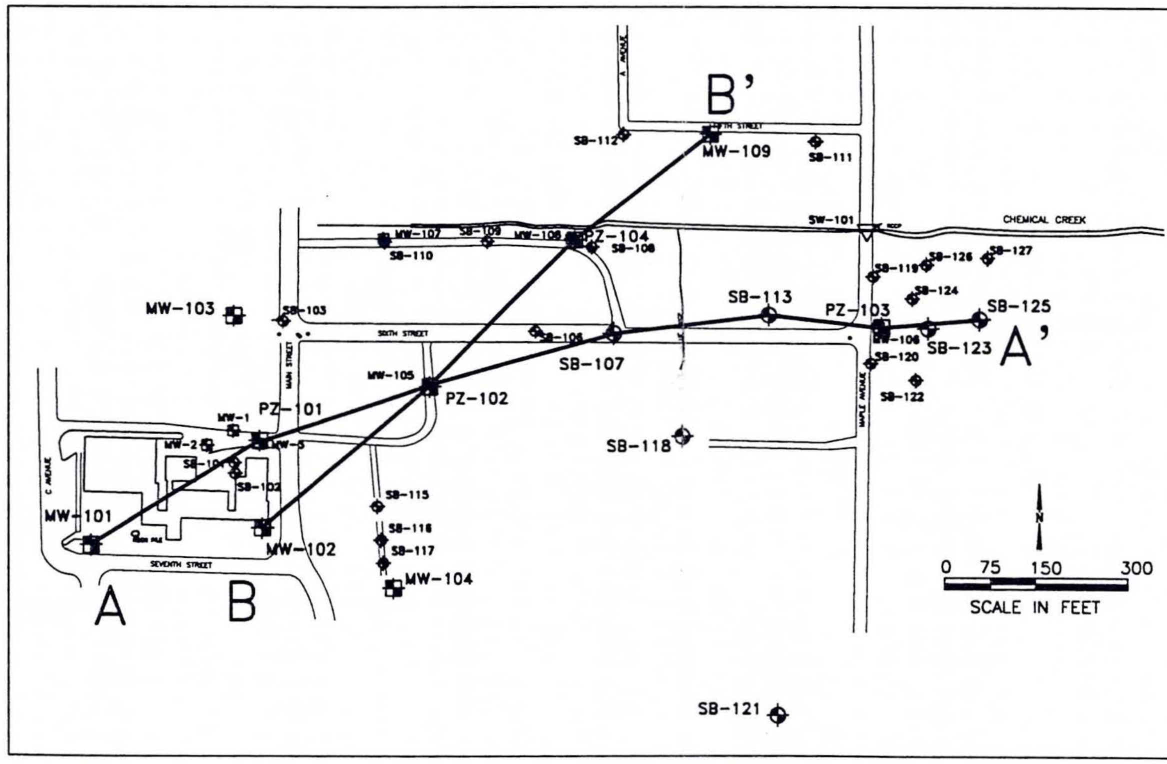
SILTY CLAY OR CLAYEY SILT

ORGANIC

SAND

SCREENED INTERVAL

1376.40 WATER TABLE/ PIEZOMETRIC SURFACE ELEVATION ON OCTOBER 10, 1996



DATE: 11/4/96

DRAWN BY: TAS

DATE:

CHECKED BY:

DATE:

APPROVED BY:

AUTOCAD FILE: 1135-B05.DWG

GEOLOGIC CROSS SECTION A-A' AND B-B'

SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN

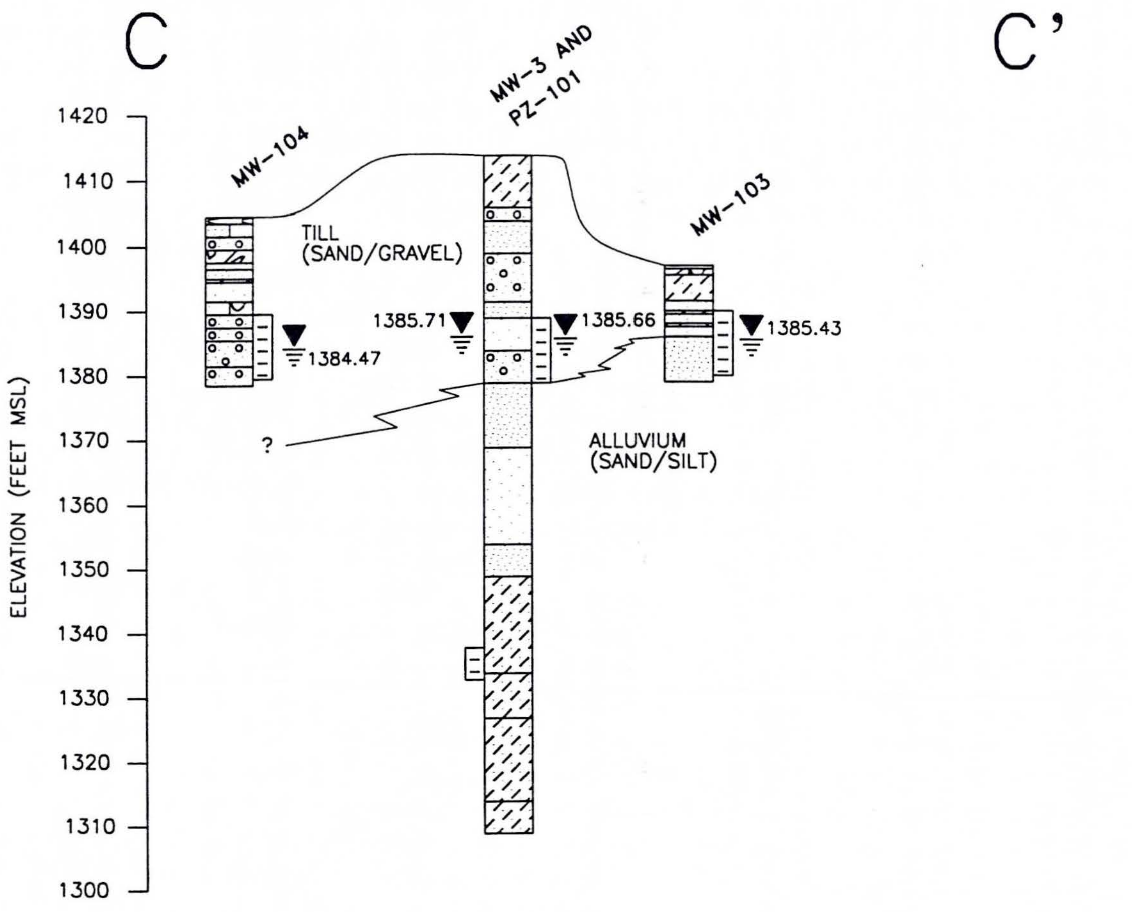
Natural Resource Technology

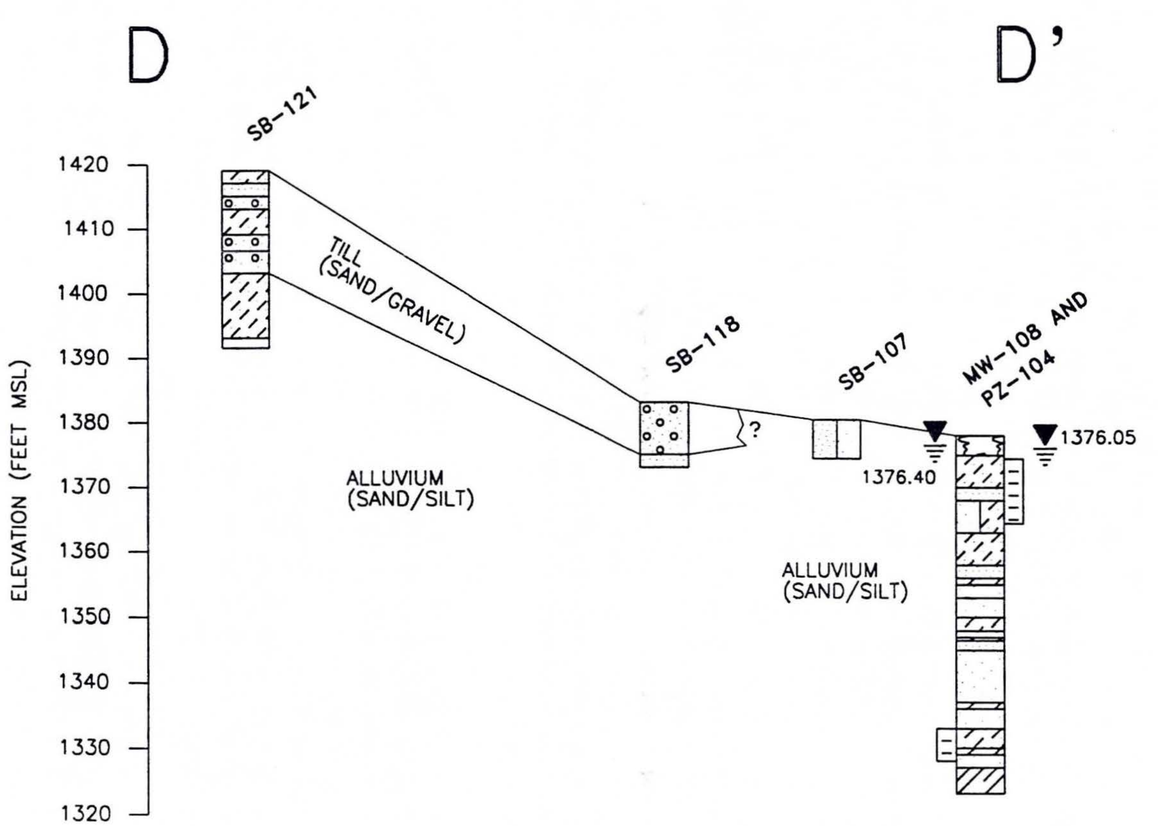
PROJECT NO.
1135/7

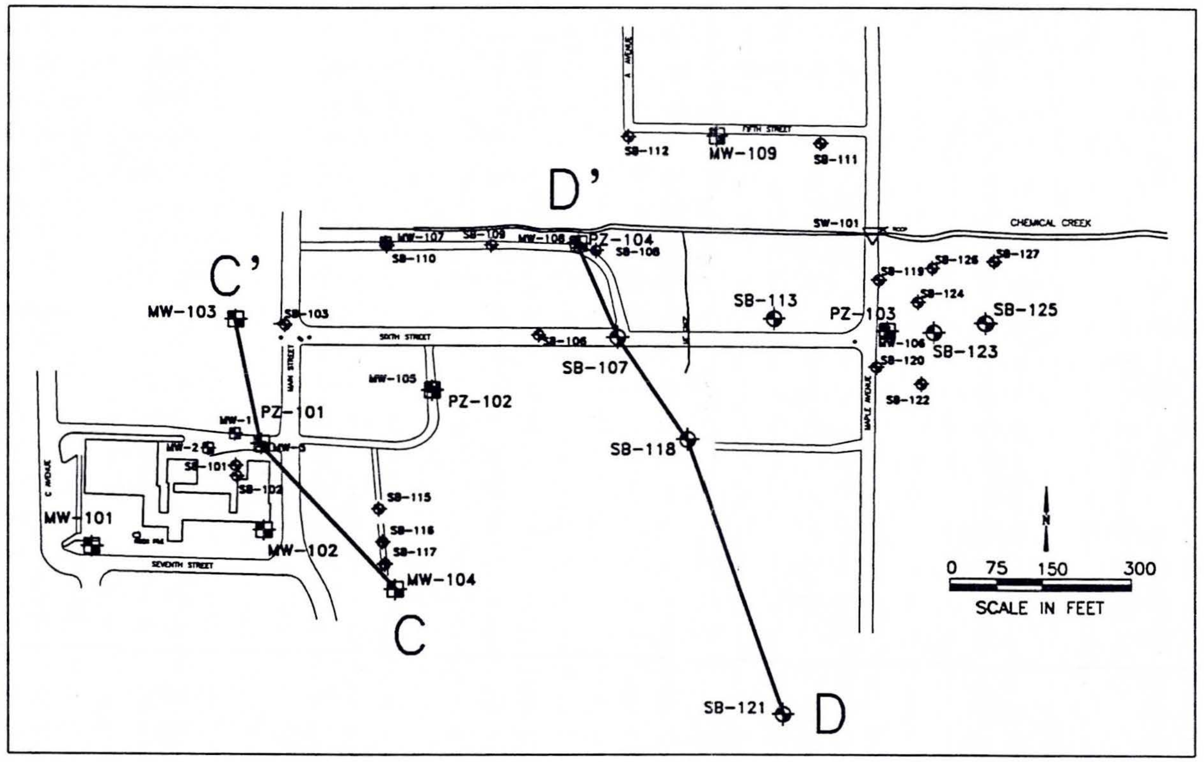
DRAWING NO.
1135-B05

FIGURE NO.
11

DRAFT







LEGEND

0 200
FEET

VERTICAL EXAGGERATION = 6.67

DRAWN BY: TAS	DATE: 1/7/96
CHECKED BY:	DATE:
APPROVED BY:	DATE:
AUTOCAD FILE: 1135-B06.DWG	

GEOLOGIC CROSS SECTION C-C' AND D-D'

SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN

Natural Resource Technology

PROJECT NO. 1135/7

DRAWING NO. 1135-B06

FIGURE NO. 12

Table 1
Soil VOC Laboratory Analyses Summary
Site Investigation
Former American Graphics, Inc. Facility
Village of Goodman, Wisconsin

Sampling Location	Sampling Date	Sampling Depth (feet)	Acetone (µg/kg)	1,1,1-Trichloro-ethane (µg/kg)	Methanol (mg/kg)	Toluene (µg/kg)	Ethyl-benzene (µg/kg)	1,2,4-Trimethyl-benzene (µg/kg)	1,3,5-Trimethyl-benzene (µg/kg)	Total Xylenes (µg/kg)
H-1	12/21/92	4	<20.0	<4.0	<35.1	<4.0	na	na	na	na
H-2	12/21/92	4	<20.0	**4.3***	<40.9	<4.1	na	na	na	na
H-3	12/21/92	5.5	<22.0	**496***	<28.1	<4.4	na	na	na	na
MW-1	11/11/93	29-31	**35.9**	nd	**118.9**	nd	na	na	na	na
	11/11/93	32-34	**35.8**	nd	**156**	nd	na	na	na	na
MW-2	11/11/93	15	**33**	nd	**114.4**	nd	na	na	na	na
	11/19/93	30-32	nd	nd	nd	nd	na	na	na	na
MW-3	11/22/93	25-30	**23,358**	**19.1**	**175**	**51.4**	na	na	na	na
	11/22/93	30-32	**5,390**	**12**	nd	nd	na	na	na	na
HA-01	10/04/96	3	na	na	na	**58**	**120**	**1,500**	**1,100**	**860**
HA-02	10/04/96	3	na	na	na	<25	<25	<25	<25	<75
				NR 720 Generic Residual Contaminant Levels						
		ne	ne	ne	ne	1500	2900	ne	ne	4100

BJK/DVP/SAV - 11/05/96

nd: not detected
* QC anamoly -result may be biased slightly high
ne: ne: NR 720 Generic Residual Contaminant Level has not been established

Notes:
1. Detected concentrations are shown in bold.
2. Soil sampling locations H-1, H-2, H-3, MW-1, MW-2, and MW-3 were collected by REI.
3. Only compounds detected by laboratory analyses are presented in the above table.

Table 2
Summary of Groundwater Laboratory VOC Analyses
Site Investigation
Former American Graphics, Inc. Facility
Village of Goodman, Wisconsin

Sampling Location	Sampling Date	Benzene (µg/L)	Chloro-form (µg/L)	Ethyl-benzene (µg/L)	Toluene (µg/L)	Total Xylenes (µg/L)	Tetra-chloro-ethene (µg/L)	Trichloro-ethene (µg/L)	1,1-Dichloro ethane (µg/L)	1,1-Dichloro ethene (µg/L)	1,2-Dichloro ethane (µg/L)	1,1,1-Trichloro ethane (µg/L)
MW-1	11/24/93	nr	nr	nr	**3.7**	nr	nr	2.4	**27.1**	28.1	nr	3163
	08/06/96	<5.0	<10	<10	**15**	<30	<10	<10	**15**	28	<10	1500
	09/05/96	<2.5	<5.0	<5.0	**8.0**	<15	<5.0	<5.0	**14**	32	<5.0	1600
MW-2	11/24/93	nr	nr	nr	nr	nr	nr	0.6	**5.9**	15.3	nr	935
	08/06/96	<5.0	<10	<10	<10	<30	<10	<10	**13**	23	<10	1400
	09/05/96	<1.0	<2.0	<2.0	<2.0	<6.0	<2.0	<2.0	**4.6**	10	<2.0	520
MW-3	11/24/93	nr	nr	nr	5,210	nr	nr	3	261	64.0	14.7	6750
	08/06/96	<25	<50	<50	10,000	<150	<50	<50	**62**	<100	<50	2800
	09/05/96	<25	<50	<50	12,000	<150	<50	<50	<50	<100	<50	3300
PZ-101	08/06/96	<0.50	35	<1.0	**1.4**	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	**2.6**
	09/05/96	0.76	17	<1.0	**2**	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	**1.6**
	10/03/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-101	08/06/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	09/05/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	10/03/96	<0.50	<1.0	<1.0	**1.6**	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-102	08/06/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	**2.4**	8.2	<1.0	160
	09/05/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	**1.7**	4.2	<1.0	110
	10/03/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	**1.2**	44	<1.0	270
MW-103	08/06/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	09/05/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	10/03/96	<0.50	<1.0	<1.0	**1.2**	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-104	08/06/96	<0.50	<1.0	<1.0	**1.1**	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	09/05/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	10/03/96	<0.50	<1.0	<1.0	**2.7**	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-105	08/06/96	<25	<50	<50	5,200	<150	<50	<50	<50	<100	<50	3800
	09/05/96	<25	<50	<50	4,000	<150	<50	<50	<50	<100	<50	2700
	10/03/96	<25	<50	<50	3,200	<150	59	<50	<50	55	<50	2300

Sampling Location	Sampling Date	Benzene (µg/L)	Chloro-form (µg/L)	Ethyl-benzene (µg/L)	Toluene (µg/L)	Total Xylenes (µg/L)	Tetra-chloro-ethene (µg/L)	Trichloro-ethene (µg/L)	1,1-Dichloro ethane (µg/L)	1,1-Dichloro ethene (µg/L)	1,2-Dichloro ethane (µg/L)	1,1,1-Trichloro ethane (µg/L)
PZ-102	08/06/96	0.54	61	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	09/05/96	<0.50	34	<1.0	**1.7**	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	**1.7**
	10/03/96	<0.50	2.4	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-106	08/06/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	09/05/96	<0.50	2.6	<1.0	<1.0	<3.0	<1.0	<1.0	**33**	5.6	<1.0	140
	10/03/96	<0.50	1.4	<1.0	<1.0	<3.0	<1.0	<1.0	**19**	6.1	<1.0	130
PZ-103	08/06/96	<0.50	26	<1.0	**1.5**	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	09/05/96	1.2	6.6	<1.0	**2.0**	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	10/03/96	1.4	1.8	<1.0	**1.3**	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-107	10/03/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-108	10/03/96	<0.50	1.0	<1.0	<1.0	<3.0	<1.0	<1.0	**6.6**	37	<1.0	920
PZ-104	10/03/96	<0.50	1.4	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-109	10/03/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
OW-1	10/03/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
OW-2	10/03/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
OW-3	10/04/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
					Quality Assurance / Quality Control Samples							
MW-198 (MW-105 Duplicate)	08/06/96	<25	<50	<50	4,900	<150	<50	<50	<50	<100	<50	2800
MW-199 (MW-1 Duplicate)	08/06/96	<5.0	<10	<10	<10	<30	<10	<10	**16**	23	<10	1300
MW-196 (MW-108 Duplicate)	10/03/96	<2.5	<5.0	<5.0	<5.0	<15	<5.0	<5.0	**6.0**	22	<5.0	1000
MW-195 (MW-106 Duplicate)	10/03/96	<0.50	1.4	<1.0	<1.0	<3.0	<1.0	<1.0	**21**	3.9	<1.0	140

Sampling Location	Sampling Date	Benzene (µg/L)	Chloro-form (µg/L)	Ethyl-benzene (µg/L)	Toluene (µg/L)	Total Xylenes (µg/L)	Tetra-chloro-ethene (µg/L)	Trichloro-ethene (µg/L)	1,1-Dichloro ethane (µg/L)	1,1-Dichloro ethene (µg/L)	1,2-Dichloro ethane (µg/L)	1,1,1-Trichloro ethane (µg/L)
Trip Blank	08/06/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	09/05/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	10/03/96	<0.50	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
NR 140 Groundwater Quality Standards												
Preventive Action Limit		0.5	0.6	140	68.6	124	0.5	0.5	85	0.7	0.5	40
Enforcement Standard		5	6	700	343	620	5	5	850	7	5	200

BJK/DVP/SAV - 10/23/96

nd: not detected

nr: Detection of compound was not report in the REI report

Notes:

1. Detected concentrations are shown in bold
2. A Preventive Action Limit exceedance is underlined and boxed.
3. An Enforcement Standard exceedance is underlined, shaded, and boxed.
4. Monitoring wells MW-1, MW-2, and MW-3 were installed by REI. REI collected 1993 groundwater samples.
5. Only compounds detected by laboratory analyses are presented in the above table.

Table 3
Municipal and Private Potable Wells Laboratory Analytical Summary
Site Investigation
Former American Graphics, Inc. Facility
Village of Goodman, Wisconsin

Well	Sampling Date	Chloro-form (µg/L)	Bromo-dichloro-methane (µg/L)	Total Xylenes (µg/L)	Isopropyl benzene (µg/L)	n-Propyl-benzene (µg/L)	1,2,4-Trimethyl-benzene (µg/L)	2,2-Dichloro-propane (µg/L)	1,3,5-Trimethyl-benzene (µg/L)	Chloro-methane (µg/L)	Dibromo-chloro-methane (µg/L)	Bromo-methane (µg/L)	Ethyl-benzene (µg/L)
Well #1	12/19/94	nd	**0.61**	nd	nd	nd	nd	**42**	nd	nd	nd	nd	nd
	04/18/95	**100**	**4.6**	nd	nd	nd	nd	nd	nd	**0.17**	**0.087**	nd	nd
	05/09/95	**74**	**5.2**	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	06/14/95	**37**	**0.6**	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Well #2	12/14/94	nd	nd	**4.32**	**0.33**	**0.54**	**4.2**	nd	**0.5**	nd	nd	**0.19**	nd
	12/19/94	nd	nd	**3.8**	**0.3**	**0.52**	**3.7**	nd	nd	nd	nd	nd	nd
	04/18/95	**60**	**2.4**	nd	nd	nd	nd	nd	nd	**0.1**	nd	nd	nd
	05/09/95	**3.6**	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	09/25/95	**24**	**0.81**	**0.66**	nd	nd	nd	nd	nd	nd	nd	nd	nd
	11/29/95	**24**	**1**	nd	nd	nd	nd	nd	nd	**0.11**	nd	nd	**0.37**
Wentland (804 Maple)	07/23/96	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	na	<0.50	<0.50	<0.50
Kalkfen #1 (710 Maple)	07/30/96	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	na	<0.50	<0.50	<0.50
Kalkfen #2 (706 Maple)	07/24/96	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	na	<0.50	<0.50	<0.50
Swanson (803 Maple)	08/01/96	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	na	na	<0.50	<0.50
NR 140 Groundwater Quality Standards													
Preventive Action Limit		0.6	0.06	124	ne	ne	ne	ne	ne	0.3	6	1	140
Enforcement Standard		6	0.6	620	ne	ne	ne	ne	ne	3	60	10	700

BJK/EPK/DVP-08/26/96

nd: not detected.
ne: A groundwater quality standard for this compound has not been established.
na: Analysis was not performed.
Note
1. Detected concentrations are shown in bold.
2. Concentrations exceeding Preventive Action Limits are underlined and boxed.
3. Concentrations exceeding Enforcement Standards are underlined, boxed, and shaded.
4. Only compounds detected by laboratory analysis are presented in above table.

Table 4

Soil Gas Survey Summary

Site Investigation

Former American Graphics, Inc. Facility

Village of Goodman, Wisconsin

Sample Location	10.6 PID (iu)	11.8 PID (iu)	Sample Location	10.6 PID (iu)	11.8 PID (iu)	Sample Location	10.6 PID (iu)	11.8 PID (iu)	Sample Location	10.6 PID (iu)	11.8 PID (iu)
GP-101	0.0	0.0	GP-112	0.0	0.0	GP-123	0.0	0.0	GP-134	0.0	0.0
GP-102	0.0	0.0	GP-113	0.0	0.0	GP-124	0.0	0.0	GP-135	0.0	0.0
GP-103	0.0	0.0	GP-114	0.0	0.0	GP-125	0.0	0.0	GP-136	0.0	0.0
GP-104	24.9	0.0	GP-115	0.0	0.0	GP-126	21.1	2	GP-137	0.0	0.0
GP-105	0.0	0.0	GP-116	0.0	0.0	GP-127	22.2	2	GP-138	0.0	0.0
GP-106	0.0	0.0	GP-117	0.0	0.0	GP-128	73.8	3	GP-139	0.0	0.0
GP-107	0.0	0.0	GP-118	0.0	0.0	GP-129	176	100	GP-140	0.0	0.0
GP-108	0.0	0.0	GP-119	0.0	0.0	GP-130	0.0	0.0	GP-141	0.0	0.0
GP-109	0.0	0.0	GP-120	0.0	0.0	GP-131	0.0	0.0	GP-142	0.0	0.0
GP-110	0.0	0.0	GP-121	0.0	0.0	GP-132	0.0	0.0	GP-143	0.0	0.0
GP-111	0.0	0.0	GP-122	0.0	0.0	GP-133	0.0	0.0			

BJK/SAV - 11/05/96

PID: Photoionization detector (10.6 eV and 11.8 eV lamps)
IU: Instrument units (ppm relative to isobutylene)
NOTE: Soil Gas Survey was conducted on July 13, 1996

Table 5
Soil Sample Field Screening Summary
Site Investigation
Former American Graphics, Inc. Facility
Village of Goodman, Wisconsin

Sample Location	Sample Interval (feet)	10.6 PID (iu)	11.8 PID (iu)
SB-101	0-2	*3*	*1*
	2-4	*6*	*3*
	4-6	*2*	*0*
	6-8	*0*	*0*
	8-10	*0*	*0*
	10-12	*0*	*0*
	12-14	*ns*	*ns*
SB-102	0-2	*5*	*0*
	2-4	*21*	*0*
	4-6	*6*	*0*
	6-8	*14*	*0*
	8-10	*ns*	*ns*
	10-12	*6*	*0*
	12-14	*8*	*0*
	14-16	*2*	*0*
	16-18	*7*	*0*
	18-20	*ns*	*ns*
SB-103	0-2	*0*	*0*
	2-4	*0*	*0*
	4-6	*0*	*0*
	6-8	*0*	*0*
	8-10	*28.6*	*0*
	10-12	*10.7*	*6*
	12-14	*26.7*	*0*
SB-104	0-2	*5.2*	*0*
	2-4	*146*	*0*
	4-6	*105*	*0*
	6-8	*86*	*0*
SB-105	0-2	*18.7*	*17*
	2-4	*21.5*	*168*
	4-6	*71.2*	*164*
SB-106	0-2	*37.6*	*21*
	2-4	*62.0*	*224*
	4-6	*94.8*	*232*
SB-107	0-2	*1479*	*175*
	2-4	*571*	*0*
	4-6	*77.2*	*0*
SB-108	0-2	*98.2*	*0*
	2-4	*176*	*0*
	4-6	*26.8*	*0*
	6-8	*ns*	*ns*
SB-109	0-2	*121*	*0*
	2-4	*185*	*0*
	4-6	*94.7*	*0.6*
	6-8	*112*	*0*
SB-110	0-2	*24.3*	*0*
SB-111	0-2	*12.4*	*0*
	2-4	*0*	*0*
	4-6	*87.0*	*0*
SB-112	0-2	*0*	*0*
	2-4	*0*	*0*
	4-6	*0*	*0*
	6-8	*0*	*0*
	8-10	*0*	*0*
SB-113	0-2	*0*	*0*
	2-4	*0*	*0*
	4-6	*0*	*0*
SB-114	0-2	*0*	*0*
	2-4	*0*	*0*
	4-6	*0*	*0*
	6-8	*0*	*0*
SB-115	0-2	*0*	*0*
	2-4	*0*	*0*
	4-6	*0*	*0*
	6-8	*0*	*0*
	8-10	*0*	*0*
	10-12	*0*	*0*
	12-14	*0*	*0*
	14-16	*0*	*0*
	16-18	*0*	*0*
SB-116	0-2	*0*	*0*
	2-4	*0*	*0*
	4-6	*0*	*0*
	6-8	*0*	*0*
	8-10	*0*	*0*
	10-12	*0*	*0*
	12-14	*0*	*0*
	14-16	*0*	*0*
	16-18	*0*	*0*
	18-20	*0*	*0*
	20-22	*0*	*0*
SB-117	0-2	*0*	*0*
	2-4	*0*	*0*
	4-6	*0*	*0*
	6-8	*0*	*0*
	8-10	*0*	*0*
	10-12	*0*	*0*
	12-14	*0*	*0*
	14-16	*0*	*0*
	16-18	*0*	*0*
	18-20	*0*	*0*
	20-22	*0*	*0*
	22-24	*0*	*0*

Sample Location	Sample Interval (feet)	10.6 PID (iu)	11.8 PID (iu)
SB-118	0-2	*0*	*0*
	2-4	*0*	*0*
	4-6	*0*	*0*
	6-8	*0*	*0*
	8-10	*0*	*0*
SB-119	0-2	*0*	*0*
	2-4	*0*	*0*
	4-6	*0*	*0*
	6-8	*0*	*0*
SB-120	0-1	*0*	*0*
	1-3	*0*	*0*
	3-5	*0*	*0*
	5-7	*0*	*0*
	7-9	*0*	*0*
	9-11	*0*	*0*
	11-12	*0*	*0*
SB-121	0-2	*0*	*0*
	2-4	*0*	*0*
	4-6	*0*	*0*
	6-8	*0*	*0*
	8-10	*0*	*0*
	10-12	*0*	*0*
	12-14	*0*	*0*
	14-16	*0*	*0*
	16-18	*0*	*0*
	18-20	*0*	*0*
	20-22	*0*	*0*
	22-24	*0*	*0*
	24-26	*0*	*0*
	26-27.5	*0*	*0*
SB-122	0-2	***1847***	*na*
	2-4	*nr*	*na*
	4-6	***>2500***	*na*
	6-8	***444***	*na*
SB-123	0-2	***157***	*na*
	2-4	***200***	*na*
	4-6	***1888***	*na*
	6-8	***>2500***	*na*
	8-10	***200***	*na*
SB-124	0-2	***61.8***	*na*
	2-4	***11.0***	*na*
	4-6	***1.5***	*na*
	6-8	***3.4***	*na*
SB-125	0-2	*0*	*na*
	2-4	*0*	*na*
	4-6	***1.5***	*na*
	6-8	***2.8***	*na*
SB-126	0-2	***58.4***	*na*
	2-4	***447***	*na*
	4-6	***15.1***	*na*
	6-8	***63.5***	*na*
SB-127	0-2	***76.5***	*na*
	2-4	***32.4***	*na*
	4-6	***15.2***	*na*
PZ-101	0-1.7	***61.8***	***8***
	1.7-3.4	***21.1***	*0*
	3.4-5	***19***	***19***
	5-6.7	*0*	*0*
	6.7-8.4	*0*	*0*
	8.4-10	*0*	*0*
	10-11.7	*0*	*0*
	11.7-13.4	*0*	*0*
	13.4-15	*0*	*0*
	15-16.7	*0*	*0*
	16.7-18.4	***16.6***	*0*
	18.4-20	*0*	*0*
	20-25	*0*	*0*
	25-30	*0*	*0*
	30-35	*0*	*0*
	35-40	*0*	*0*
	40-45	*0*	*0*
	45-50	*0*	*0*
	50-55	*0*	*0*
	55-60	*0*	*0*
	60-65	*0*	*0*
	65-70	*0*	*0*
	70-75	*0*	*0*
	75-80	*0*	*0*
	80-85	*0*	*0*
	85-90	*0*	*0*
	90-95	*0*	*0*
	95-100	*0*	*0*
	100-105	*0*	*0*

Sample Location	Sample Interval (feet)	10.6 PID (iu)	11.8 PID (iu)
MW-101	4-6	*0*	*0*
	6-8	***2.5***	*0*
	8-10	***13.8***	*0*
	10-12	***76.4***	***16.8***
	12-14	***5.7***	***1***
	14-16	***4.6***	*0*
	16-18	***5.7***	*0*
	18-20	*0*	*0*
	20-22	***19.8***	*0*
	22-24	*0*	*0*
	25-27.5	***4.1***	*0*
	27.5-30	*0*	*0*
	30-32.5	*0*	*0*
	32.5-35	***3.3***	*0*
	35-37.5	*0*	*0*
	37.5-40	***19.1***	*0*
	40-42.5	***8.1***	*0*
	42.5-45	***6.0***	*0*
	45-47.5	***17.4***	*0*
	47.5-50	*0*	*0*
	50-52.5	*0*	*0*
	52.5-55	*0*	*0*
MW-102	0-1.7	***309***	*0*
	1.7-3.4	***54.3***	*0*
	3.4-5	*0*	*0*
	5-6.7	***10.6***	*0*
	6.7-8.4	*0*	***4***
	8.4-10	***141***	***3***
	10-11.7	***2.3***	*0*
	11.7-13.4	*0*	*0*
	13.4-15	*0*	*0*
	15-16.7	*0*	*0*
	16.7-18.4	*0*	*0*
	18.4-20	*0*	*0*
	20-21.7	*0*	*0*
	21.7-23.4	*0*	*0*
	23.4-25	***6.2***	*0*
	25-26.7	*0*	*0*
	26.7-28.4	*0*	*0*
	28.4-30	*0*	*0*
	30-31.7	***4.1***	*0*
	31.7-33.4	*0*	*0*
	33.4-35	*0*	*0*
	35-36.7	*0*	*0*
	36.7-38.4	*0*	*0*
	38.4-40	*0*	*0*
	40-41.7	***3.0***	*0*
	41.7-43.4	*0*	*0*
	43.4-45	*0*	*0*
	45-46.7	*0*	*0*
	46.7-48.4	*0*	*0*
	48.4-50	*0*	*0*
	50-51.7	*0*	*0*
	51.7-53.4	*0*	*0*
	53.4-55	*0*	*0*
MW-103	1-3	*0*	*0*
	3-5	*0*	*0*
	5-7	*0*	*0*
	7-9	*0*	*0*
	9-11	*0*	*0*
	11-13	*0*	*0*
	13-15	*0*	*0*
	15-17	*0*	*0*
MW-104	1-3	*0*	*0*
	3-5	*0*	*0*
	5-7	*0*	*0*
	7-9	*0*	*0*
	9-11	*0*	*0*
	11-13	*0*	*0*
	13-15	*0*	*0*
	15-17	*0*	*0*
	17-19	*0*	*0*
	19-21	*0*	*0*
	21-23	*0*	*0*
	23-25	*0*	*0*
	25-26	*0*	*0*
MW-105	**Reference PZ-102**		
MW-106	**Reference PZ-103**		

Sample Location	Sample Interval (feet)	10.6 PID (iu)	11.8 PID (iu)	Sample Location	Sample Interval (feet)	10.6 PID (iu)	11.8 PID (iu)	Sample Location	Sample Interval (feet)	10.6 PID (iu)	11.8 PID (iu)
PZ-102	0-2.5	*0*	*0*	**PZ-103**	0-2.5	*0*	*0*	**PZ-104**	0-2.5	***131***	*na*
	2.5-5	*0*	*0*		2.5-5	*0*	*0*		2.5-5	***255***	*na*
	5-7.5	*0*	*0*		5-7.5	*0*	*0*		5-7.5	***52.0***	*na*
	7.5-10	*0*	*0*		7.5-10	*0*	*0*		7.5-10	***55.1***	*na*
	10-12.5	*0*	*0*		10-12.5	*0*	*0*		10-12.5	***74.6***	*na*
	12.5-15	*0*	*0*		12.5-15	*0*	*0*		12.5-15	***146***	*na*
	15-17.5	*0*	*0*		15-17.5	*0*	*0*		15-17.5	***28.5***	*na*
	17.5-20	*0*	*0*		17.5-20	*0*	*0*		17.5-20	***25.1***	*na*
	20-25	*0*	*0*		20-25	*0*	*0*		20-22.5	***31.7***	*na*
	25-30	*0*	*0*		25-30	*0*	*0*		22.5-25	***41.9***	*na*
	30-35	*0*	*0*		30-35	*0*	*0*		25-27.5	***43.1***	*na*
	35-40	*0*	*0*		35-40	*0*	*0*		27.5-30	***144***	*na*
	40-45	*0*	*0*		40-45	*0*	*0*		30-32.5	***207***	*na*
	32.5-35	*0*	*0*		32.5-35	*0*	*0*		32.5-35	***111***	*na*
	35-40	*0*	*0*		35-40	*0*	*0*		35-37.5	***39.3***	*na*
	40-45	*0*	*0*		40-45	*0*	*0*		37.5-40	***54.5***	*na*
	45-50	*0*	*0*		45-50	*0*	*0*		40-42.5	***47.6***	*na*
	50-55	*0*	*0*		50-55	*0*	*0*		42.5-45	***34.1***	*na*
	55-60	*0*	*0*		55-60	*0*	*0*		45-47.5	***33.8***	*na*
	60-65	*0*	*0*		60-65	*0*	*0*		47.5-50	***46.1***	*na*
									50-52.5	***18.9***	*na*
				MW-107	0-2.5	*nr*	*na*		52.5-55	***16.2***	*na*
					2.5-5	***447***	*na*				
					5-7.5	***479***	*na*	**MW-109**	0-2.5	*nr*	*na*
					7.5-10	***416***	*na*		2.5-5	***3.4***	*na*
					10-12.5	***94.1***	*na*		5-7.5	***12.2***	*na*
					12.5-15	***211***	*na*		7.5-10	***10.8***	*na*
									10-12.5	***9.6***	*na*
									12.5-15	***7.9***	*na*

BJK/SAV - 10/01/96

na: analysis not performed
nr: no sample recovery
ns: no sample

PID: Photoionization detector
IU: instrument units, concentrations in ppm relative to isobutylene (the PID calibration gas)

Table 6
Soil and Groundwater Field GC VOC Analyses Summary
Site Investigation
Former American Graphics, Inc. Facility
Village of Goodman, Wisconsin

Sampling Location	1,1-Di-chloro-ethene (ppb)	1,1,1-Tri-chloro-ethane (ppb)	Tri-chloro-ethene (ppb)	Acetone (ppb)	1,1-Di-chloro-ethane (ppb)	Ethyl Acetate (ppb)	Trans 1,2 Dichloro-ethene (ppb)	Cis-1,2-Dichloro-ethene (ppb)	Tetra-chloro-ethene (ppb)	Benzene (ppb)	Ethyl-benzene (ppb)	Toluene (ppb)	Total Xylenes (ppb)	1,2-Dichloro-ethane (ppb)
Soil Boring Groundwater Samples Collected July 1996														
SB-103	nd	nd	nd	**Peak Detected**	nd	nd	nd	nd	nd	nd	<5	<5	**13**	nd
SB-104	**16**	**85**	nd	nd	nd	nd	nd	nd	nd	nd	<5	<5	<10	nd
SB-105	nd	**108**	<10	nd	**14**	nd	nd	nd	nd	nd	nd	nd	nd	nd
SB-106	**21**	**1125**	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	<10	nd
SB-107	nd	<10	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
SB-108	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	<10	nd
SB-109	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	<5	<10	nd
SB-110	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
SB-111	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
SB-112	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
SB-113	<10	**377**	nd	nd	**13**	nd	nd	nd	nd	nd	nd	nd	<10	nd
SB-114	**99**	**990**	<10	nd	nd	nd	nd	nd	nd	nd	<5	<5	**10**	nd
SB-115	nd	**39**	**13**	**Peak Detected**	nd	nd	**21**	nd	nd	**6**	**6**	<5	**45**	nd
SB-116	nd	nd	**18**	nd	nd	nd	**31**	nd	nd	**8**	<5	**5**	<10	nd
SB-117	nd	**29**	nd	nd	**52**	nd	nd	nd	nd	**6**	nd	<5	nd	nd
SB-118	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	<10	nd
SB-119	nd	nd	nd	nd	nd	nd	nd	nd	nd	<5	<5	nd	**49**	nd
SB-120	nd	**37**	**85**	**Approx. 1000**	nd	**Peak Present**	**136**	**75**	<10	**24**	<5	**13**	<10	nd
SB-121	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Sampling Location	1,1-Di-chloro-ethene (ppb)	1,1,1-Tri-chloro-ethane (ppb)	Tri-chloro-ethene (ppb)	Acetone (ppb)	1,1-Di-chloro-ethane (ppb)	Ethyl Acetate (ppb)	Trans 1,2 Dichloro-ethene (ppb)	Cis-1,2-Dichloro-ethene (ppb)	Tetra-chloro-ethene (ppb)	Benzene (ppb)	Ethyl-benzene (ppb)	Toluene (ppb)	Total Xylenes (ppb)	1,2-Dichloro-ethane (ppb)
Soil Boring Groundwater Samples Collected October 1996														
SB-122	na	na	nd	na	na	na	na	na	nd	nd	nd	nd	nd	nd
SB-123	na	na	nd	na	na	na	na	na	nd	nd	nd	nd	nd	**31.9**
SB-124	na	na	nd	na	na	na	na	na	nd	nd	nd	**1**	nd	**98.9**
SB-125	na	na	nd	na	na	na	na	na	nd	nd	nd	nd	nd	**96.5**
SB-126	na	na	nd	na	na	na	na	na	nd	nd	nd	nd	nd	**8.4**
SB-127	na	na	nd	na	na	na	na	na	nd	nd	nd	**3.5**	nd	**30.6**
Piezometer Groundwater Samples Collected July 1996														
PZ-101														
55 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
80 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
105 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
PZ-102														
35 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
65 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
PZ-103														
35 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
65 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Piezometer Soil Samples Collected July 1996														
PZ-101														
80-85 feet	nd	nd	nd	nd	nd	nd	**16**	nd	nd	nd	**10**	**7**	**26**	nd
105 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
PZ-102														
0-5 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**14**	nd
5-10 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10-15 feet	**138**	**344**	nd	nd	nd	nd	nd	nd	nd	nd	nd	**160**	nd	nd
15-20 feet	nd	**16**	nd	nd	nd	nd	nd	nd	nd	nd	nd	**24**	nd	nd
20-25 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
25-30 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
30-35 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
35-40 feet	nd	nd	nd	nd	nd	nd	**30**	nd	nd	nd	nd	nd	nd	nd

Sampling Location	1,1-Di-chloro-ethene (ppb)	1,1,1-Tri-chloro-ethane (ppb)	Tri-chloro-ethene (ppb)	Acetone (ppb)	1,1-Di-chloro-ethane (ppb)	Ethyl Acetate (ppb)	Trans 1,2 Dichloro-ethene (ppb)	Cis-1,2-Dichloro-ethene (ppb)	Tetra-chloro-ethene (ppb)	Benzene (ppb)	Ethyl-benzene (ppb)	Toluene (ppb)	Total Xylenes (ppb)	1,2-Dichloro-ethane (ppb)
Piezometer Soil Samples Collected July 1996														
PZ-102 Continued...														
40-45 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
45-50 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
50-55 feet	nd	nd	nd	nd	nd	nd	**24**	nd	nd	nd	nd	nd	nd	nd
55-60 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
60-65 feet	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Surface Soil Samples Collected July 1996														
SS-101	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
SS-102	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
SS-103	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
SS-104	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
SS-105	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

BJK/SAV - 11/05/96

Notes:

1. Detected concentrations are shown in bold
2. For soil boring groundwater samples collected and analyzed in October 1996 - Field GC analysis qualifier - "under current temperature program 1,1,1-trichloroethane elutes closely, but slightly after 1,2-dichloroethane. GC was not calibrated for 1,1,1-trichloroethane."
3. SB-122 through SB-127 detection limits are 1 part per billion (ppb).
4. Only compounds detected by field GC laboratory analysis are presented in the above table.

Table 7
Monitoring Well Construction Summary and Groundwater Elevations
Site Investigation
Former American Graphics, Inc. Facility
Village of Goodman, Wisconsin

Monitoring Location	Ground Surface Elevation (MSL)	TOC Elevation (MSL)	Total Well Depth from TOC (feet)	Well Screen Length (feet)	Top of Well Screen Elevation (MSL)	Base of Well Elevation (MSL)	Monitoring Date	Depth to Water from TOC (feet)	Groundwater Elevation (MSL)
MW-1	1415.30	1415.07	34.22	10	1390.85	1380.85	05-Aug-96	28.63	1386.44
							06-Aug-96	28.66	1386.41
							04-Sep-96	28.93	1386.14
							10-Oct-96	29.07	1386.00
MW-2	1417.67	1417.34	36.71	10	1390.63	1380.63	05-Aug-96	30.51	1386.83
							06-Aug-96	30.53	1386.81
							04-Sep-96	30.80	1386.54
							10-Oct-96	29.96	1387.38
MW-3	1413.90	1413.42	34.23	10	1389.19	1379.19	05-Aug-96	27.33	1386.09
							06-Aug-96	27.35	1386.07
							04-Sep-96	27.62	1385.80
							10-Oct-96	27.76	1385.66
PZ-101	1413.77	1413.42	81.73	5	1336.69	1331.69	05-Aug-96	27.32	1386.10
							06-Aug-96	27.34	1386.08
							04-Sep-96	27.57	1385.85
							10-Oct-96	27.71	1385.71
MW-101	1429.24	1431.69	56.51	10	1385.18	1375.18	05-Aug-96	42.74	1388.95
							06-Aug-96	42.93	1388.76
							04-Sep-96	43.16	1388.53
							10-Oct-96	43.35	1388.34

Monitoring Location	Ground Surface Elevation (MSL)	TOC Elevation (MSL)	Total Well Depth from TOC (feet)	Well Screen Length (feet)	Top of Well Screen Elevation (MSL)	Base of Well Elevation (MSL)	Monitoring Date	Depth to Water from TOC (feet)	Groundwater Elevation (MSL)
MW-102	1423.74	1423.44	42.65	10	1390.79	1380.79	05-Aug-96	36.80	1386.64
							06-Aug-96	36.81	1386.63
							04-Sep-96	37.05	1386.39
							10-Oct-96	37.22	1386.22
MW-103	1396.89	1396.57	17.03	10	1389.54	1379.54	05-Aug-96	10.74	1385.83
							06-Aug-96	10.76	1385.81
							04-Sep-96	11.08	1385.49
							10-Oct-96	11.14	1385.43
MW-104	1404.50	1407.11	27.61	10	1389.50	1379.50	05-Aug-96	22.24	1384.87
							06-Aug-96	22.27	1384.84
							04-Sep-96	22.50	1384.61
							10-Oct-96	22.64	1384.47
MW-105	1386.21	1385.87	13.58	10	1382.29	1372.29	05-Aug-96	3.64	1382.23
							06-Aug-96	3.07	1382.80
							04-Sep-96	3.97	1381.90
							10-Oct-96	3.42	1382.45
PZ-102	1386.28	1385.91	60.92	5	1329.99	1324.99	05-Aug-96	3.07	1382.84
							06-Aug-96	3.65	1382.26
							04-Sep-96	3.37	1382.54
							10-Oct-96	3.95	1381.96
MW-106	1381.68	1381.39	13.85	10	1377.54	1367.54	05-Aug-96	6.99	1374.40
							06-Aug-96	7.03	1374.36
							04-Sep-96	7.42	1373.97
							10-Oct-96	7.38	1374.01

Monitoring Location	Ground Surface Elevation (MSL)	TOC Elevation (MSL)	Total Well Depth from TOC (feet)	Well Screen Length (feet)	Top of Well Screen Elevation (MSL)	Base of Well Elevation (MSL)	Monitoring Date	Depth to Water from TOC (feet)	Groundwater Elevation (MSL)
PZ-103	1381.66	1381.24	49.83	5	1336.41	1331.41	05-Aug-96	6.91	1374.33
							06-Aug-96	6.93	1374.31
							04-Sep-96	7.26	1373.98
							10-Oct-96	7.26	1373.98
MW-107	1381.60	1381.22	13.16	10	1378.06	1368.06	10-Oct-96	0.63	1380.59
MW-108	1378.02	1377.80	12.84	10	1374.96	1364.96	10-Oct-96	1.75	1376.05
PZ-104	1377.94	1377.30	47.68	5	1334.62	1329.62	10-Oct-96	0.90	1376.40
MW-109	1381.51	1380.96	13.82	10	1377.14	1367.14	10-Oct-96	5.54	1375.42
OW-1	1380.12	1381.61	14.26	nk	nk	1367.35	10-Oct-96	11.11	1370.50
OW-2	1382.79	1384.85	20.78	nk	nk	1364.07	10-Oct-96	14.71	1370.14
OW-3	1375.07	1376.86	16.71	nk	nk	1360.15	10-Oct-96	6.90	1369.96
SW-101	na	1375.33	na	na	na	na	05-Aug-96	2.93	1372.40
							06-Aug-96	2.91	1372.42
							04-Sep-96	3.19	1372.14
							10-Oct-96	3.23	1372.10

BJK/DVP - 10/23/96

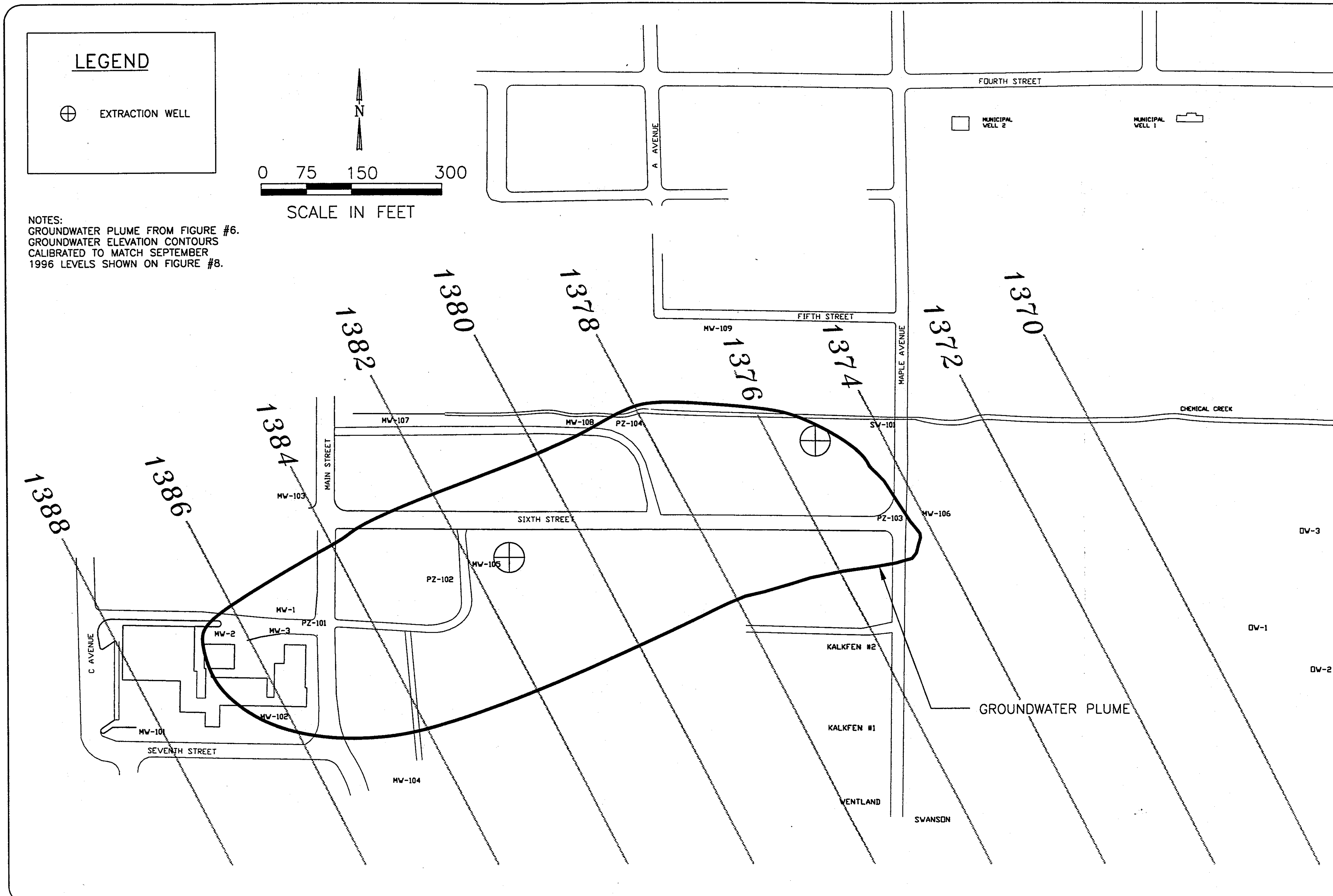
MSL: Elevation in feet above mean sea level
TOC Top of PVC casing
na: not applicable
nk: not known

Table 8
Water Table Monitoring Wells and Piezometer Hydraulic Conductivity and Linear Velocity Estimates
Site Investigation
Former American Graphics, Inc. Facility
Village of Goodman, Wisconsin

Sampling Location	Screened Material	Average Hydraulic Conductivity (cm/sec) *	Hydraulic Conductivity (feet/minute)	Hydraulic Conductivity (cm/sec)	Average Horizontal Velocity (feet/year)
MW-1	SAND, fine to medium with small gravel	1.0E-03 to 1.0E+01	4.0E-03	2.0E-03	5.6E+01
MW-2	SAND, medium to coarse with gravel	1.0E-03 to 1.0E+01	5.0E-03	2.5E-03	7.0E+01
MW-3	SAND, medium to coarse with heavy gravel	1.0E-03 to 1.0E+01	5.0E-03	2.5E-03	7.0E+01
MW-101	SAND, very fine to fine, trace silt, round	1.0E-03 to 1.0E+01	5.1E-02	2.6E-02	7.1E+02
MW-102	SAND, fine to coarse, predominantly medium, trace to 5% silt	1.0E-03 to 1.0E+01	7.0E-03	3.6E-03	9.8E+01
MW-103	SAND, fine	1.0E-03 to 1.0E+01	5.0E-03	2.5E-03	7.0E+01
MW-104	SAND and GRAVEL WITH SAND, fine sand, fine subround gravel	1.0E-03 to 1.0E+01	2.0E-03	1.0E-03	2.8E+01
MW-105	SILTY SAND, fine to medium, predominantly medium, trace fine gravel	1.0E-04 to 1.0E+00	7.0E-03	3.6E-03	9.8E+01
MW-106	SAND, grades from fine to medium, round, trace fine subround gravel, trace silt	1.0E-03 to 1.0E+01	4.0E-03	2.0E-03	5.6E+01
MW-107	SILTY SAND, very fine to fine, round	1.0E-04 to 1.0E+00	not tested	not tested	not tested
MW-108	SAND, 5-10% silt, very fine to fine	1.0E-03 to 1.0E+01	not tested	not tested	not tested
MW-109	SAND, very fine to fine, trace silt	1.0E-03 to 1.0E+01	not tested	not tested	not tested
PZ-101	SAND WITH SILT, very fine	1.0E-04 to 1.0E+00	5.0E-03	2.5E-03	4.7E+02
PZ-102	SILTY SAND, fine to medium	1.0E-04 to 1.0E+00	8.0E-03	4.1E-03	7.5E+02
PZ-103	SILTY SAND, fine to medium	1.0E-04 to 1.0E+00	7.0E-03	3.6E-03	6.5E+02
PZ-104	SILTY SAND, fine	1.0E-04 to 1.0E+00	5.0E-03	2.5E-03	4.7E+02

BJK/SAV - 11/03/96

*: Average hydraulic conductivity referenced from Freeze and Cherry (1979).



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CHECKED BY: DATE:

APPROVED BY: DATE:

AUTOCAD FILE: 1135-B15.DWG

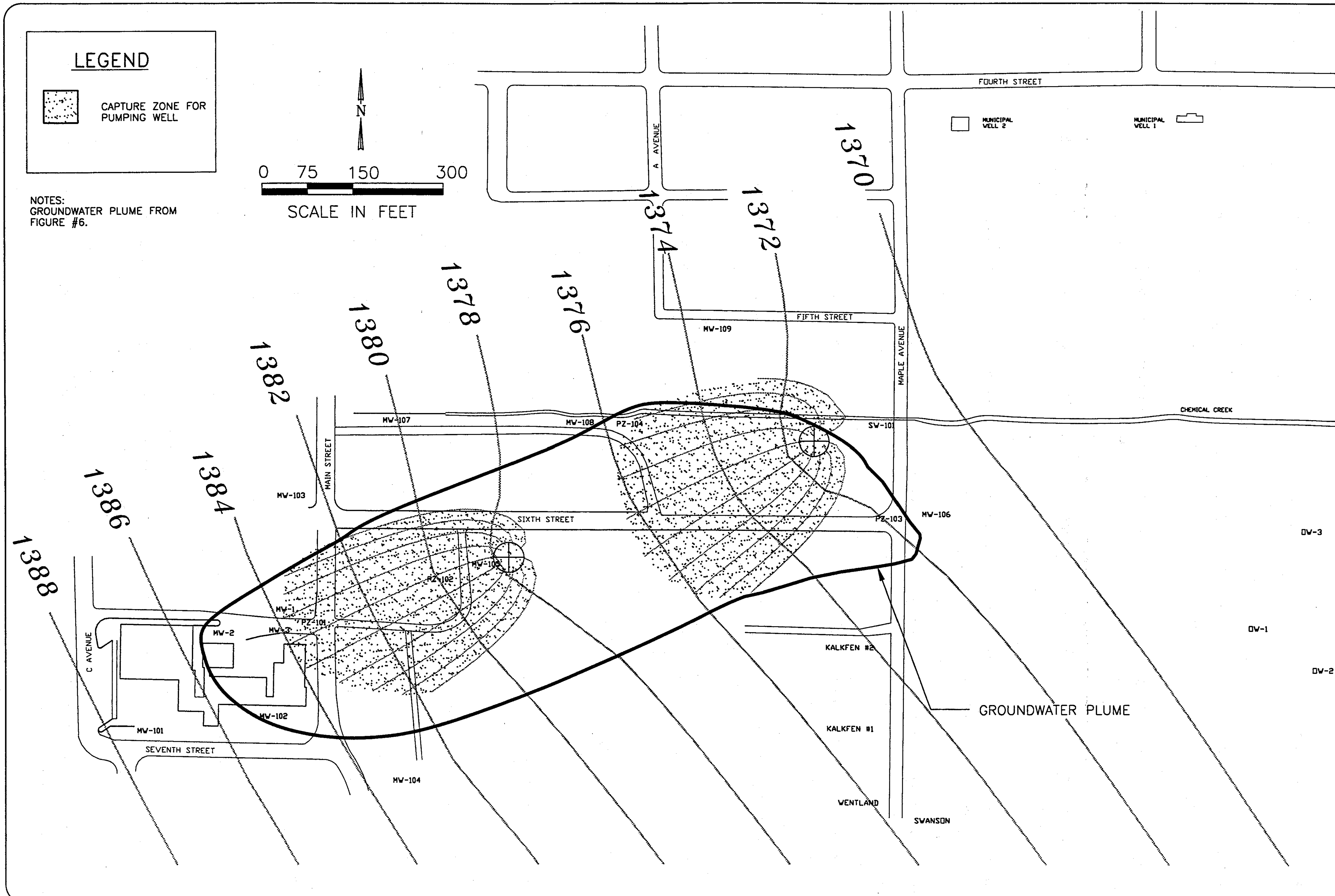
CAPTURE ZONE
BASE MAP – NO PUMPING
SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN

Natural Resource Technology

PROJECT NO. 1135/7

DRAWING NO. 1135-B15

APPENDIX L1



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CHECKED BY: | DATE:
APPROVED BY: | DATE:
AUTOCAD FILE: 1135-B14.DWG

CAPTURE ZONE
TWO PUMPING WELLS @ 15 GPM

SITE INVESTIGATION
FORMER AMERICAN GRAPHICS, INC. FACILITY
610 MAIN STREET
GOODMAN, WISCONSIN

Natural Resource Technology

PROJECT NO.
1135/7

DRAWING NO.
1135-B14

APPENDIX
L2