WISCONSIN PUBLIC SERVICE CORPORATION
SHEBOYGAN, WI

PILOT TEST WORK PLAN

CAMPMARINA, FORMER COAL GAS FACILITY
WISCONSIN PUBLIC SERVICE CORPORATION
SHEBOYGAN, WISCONSIN

PROJECT NO. 1313

Natural
Resource
Technology

N R T

Natural Resource Technology, Inc.

N R T

PILOT TEST WORK PLAN
CAMPMARINA, FORMER COAL GAS FACILITY
WISCONSIN PUBLIC SERVICE CORPORATION
SHEBOYGAN, WISCONSIN

Project No: 1313

Prepared For:

Wisconsin Public Service Corporation
700 N. Adams Street
Green Bay, WI 54307

Prepared By:

Natural Resource Technology, Inc.
23713 W. Paul Road, Suite D
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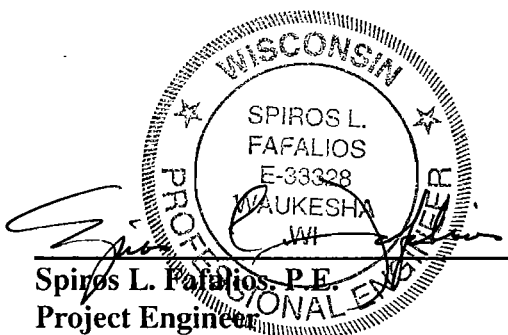
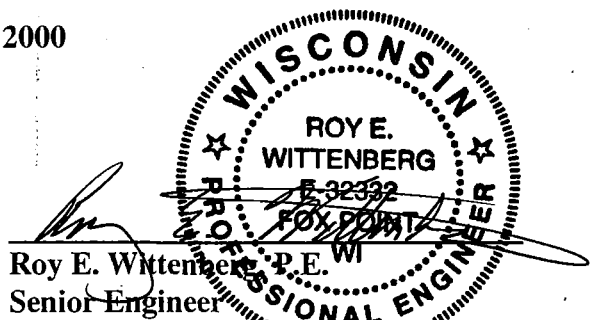
March 30, 2000



Spiros L. Fafalios, P.E.
Project Engineer

"I, Spiros L. Fafalios, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all 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."



Roy E. Wittenberg, P.E.
Senior Engineer

"I, Roy E. Wittenberg, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all 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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1 INTRODUCTION

1.1 Project Description

Presented in this document is a Pilot Test Work Plan for Wisconsin Public Service Corporation's (WPS's) former coal gas facility located at Campmarina in Sheboygan, Wisconsin (Figure 1). Campmarina and the Center Avenue right-of-way encompass approximately 2.6 acres and are bounded on the north by the New York Avenue right-of-way, on the east by North Water Street, on the west by the Sheboygan River and on the south by the Center Avenue right-of-way.

This Pilot Test Work Plan was prepared in substantive conformance with the May 7, 1999 Feasibility Study (FS) as approved by the Wisconsin Department of Natural Resources (WDNR) on October 27, 1999 and the March 5, 1991 Contract between WPS, the City of Sheboygan and the Wisconsin Department of Natural Resources (WDNR). Pilot study requirements are outlined under Task 5 of the Contract. Work described herein also meets the regulatory requirements of the NR 700 series and is in general accordance with WDNR *Guidance for Design, Installation and Operation of In Situ Air Sparging Systems* as well as guidance provided by the United States Environmental Protection Agency's (U.S. EPA's) document *Guide for Conducting Treatability Studies under CERCLA*, EPA/540/R-92/071a, dated October 1992.

The City of Sheboygan is redeveloping Campmarina and the Center Avenue right-of-way immediately to the south as a park. Remedial actions for Campmarina and the Center Avenue right-of-way will be implemented in two phases to better meet site-specific conditions and current scheduling requests from the City. The first phase of the OU RD/RA Work Plan is described in the Phase I Work Plan submitted to the WDNR on February 2, 2000. Phase I site activities will consist of the excavation, site grading, material management and off-site thermal treatment or disposal of MGP affected soil and debris. The Phase II Work Plan will be forwarded under separate cover, and will include installing a vertical sheet pile wall around affected portions of

Campmarina and the right-of-way, constructing a low permeability geosynthetic composite cap, backfilling the site to pre-existing grades and installing a low flow biosparging system.

1.2 Treatment Technology Description

Biosparging has been implemented at other MGP sites. At the Campmarina site, a low flow system will serve as an enhancement for natural biodegradation processes and would not be relied upon as a primary source control action. Based on results from previous studies, substantial reductions in hydrocarbons such as the concentrations of BTEX and low-molecular weight PAH such as napthalene can be achieved. Less success has been observed with heavier end hydrocarbons but these are also generally less mobile and would pose less of concern for on-going contribution to groundwater affects. Low flow air injection would be maintained to facilitate MGP residual biodegradation and minimize volatilization of BTEX compounds. The proposed pilot test will be conducted to establish a basis for full-scale biosparging system design.

2 BASIS FOR PILOT TEST DESIGN

2.1 Test Objectives

The general objective of the pilot test is to gather data for full-scale design of a biosparge system as a secondary component of the remedial action at the site. Specific objectives of the test include:

- Determine actual air entry pressure required to initiate airflow;
- Evaluate optimal biosparging air flowrate by examining pressure/DO characteristics;
- Evaluate optimal well spacing; and,
- Assess vapor off-gas quality during sparging.

2.2 Test Design and Setup Procedures

Pilot test setup will include installation of five pilot test wells. The proposed configuration of pilot test wells is shown in Figure 2. Construction details for pilot test wells are shown on Figures 3 and 4, and are presented below. One well (SW-701) will be used as the pilot test sparge well. Three soil gas probes (GP-701 to GP-703) will be installed to measure soil vapor during the test. Two temporary monitoring wells (TW-701 and TW-702) will be installed to measure groundwater and soil vapor parameters during the test. The two monitoring wells will be installed at distances of 10 and 20 feet from the pilot test well. Existing groundwater monitoring well MW-703 will be used as a monitoring point, located 30 feet from the proposed pilot test sparge well. Three gas probes will be installed at 5, 15, and 25 feet radially from the sparge well. Appendix B contains soil boring logs for nearby borings and MW-703. The well construction log for MW-703 is also included.

2.2.1 Sparge well

The sparge well will be constructed as recommended in the Wisconsin DNR *Guidance for Design, Installation and Operation of In Situ Air Sparging Systems* as shown on Figure 3. Construction will include 2-inch schedule 40 PVC, using a 4¼-inch hollow stem auger drill rig. The sparge well will be installed to approximately 20 feet below ground surface (bgs), or 1 foot into the sandy clay layer. A 0.01-inch, 2 ½ foot well screen will be used, with filter pack consisting of medium sand (#30) extending 6 inches above the top of the screen. A 15-foot riser will be used. Above the medium sand, 6 inches of fine sand (#40-50), and a well seal consisting of 3/8-inch bentonite chips will be installed to surface grade. Bentonite will be hydrated, and the well will be developed in accordance with NR141 to minimize the amount of fines injected into the filter pack. The top of casing may extend above the ground surface and will be threaded, to accommodate pilot test compressor connections. At least 6 inches of the outside of the top of casing should be clear of well construction materials (bentonite, sand, etc.). Grain size samples will be collected in the sparge interval to verify soil characteristics at sparge depth.

2.2.2 Soil Gas Probes

The three soil gas probes will be constructed with 2-inch schedule 40 PVC, using a 4¼-inch hollow stem auger drill rig as shown in Figure 4. The soil gas probes will be installed to approximately 8 feet bgs. A 0.01-inch slot, 5-foot well screen will be used with a 5-foot riser, and filter pack consisting of medium sand (#30) extending 6 inches above the top of the screen. Six inches of fine sand (#40-50), and granular bentonite chips will be installed above the medium sand to surface grade. Bentonite will be hydrated to prevent short-circuiting of air to the surface. At least 6 inches of the outside of the top of casing should be clear of well construction materials (grout, sand, etc.) to accommodate pilot test measurement equipment.

2.2.3 Monitoring Wells

Two temporary monitoring wells will be installed in accordance with NR141 to complement the existing monitoring well (MW-703) that will be used to collect data for the pilot test, as shown in Figure 4. The monitoring wells will be installed to approximately the same elevation as the sparge well, but above the top of the clay confining layer, or approximately 18 ft bgs. The wells will be screened to approximately 3 feet bgs (15 feet of screen). The filter pack will include medium sand (#30) to the top of the screened section, 6 inches of fine sand (#40-50), and finished with granular bentonite (hydrated) to surface grade. At least 6 inches of the outside of the top of casing should be clear of well construction materials (grout, sand, etc.). Monitoring wells will be developed in accordance with NR141.

2.3 Permits and Notifications

In accordance with NR 724.09, this work plan includes a listing of permits and notifications anticipated to be required to conduct the pilot test.

2.3.1 Digger's Hotline Clearance

Prior to any subsurface activities, public and private utilities will be located. Diggers Hotline, WPS, and the City of Sheboygan will be notified to locate underground utilities in and near the pilot test well locations.

2.3.2 Temporary Exemption for Injection of Remedial Materials

In accordance with NR140.28, a temporary exemption is required for a pilot scale study for injection of "remedial materials", defined in NR 140.05 to include naturally occurring gaseous material (air). An exemption will be requested of the WDNR prior to conducting the air sparge pilot test. Based on existing site conditions at the location of the pilot test, injection of air for the duration of the pilot test will not result in off-site migration of contaminants of concern. Free product was not encountered in adjacent borings (sheen only – see Appendix B), and the nearest

utility piping is a storm sewer approximately 50 feet to the north (Figure 2). This storm sewer will be removed as part of the planned Phase I work.

2.3.3 City Access Notification

The City of Sheboygan has provided formal access authorization to the Campmarina and the Center Avenue right-of-way, presented in Appendix A. Notification of electrical power use at the site will be provided prior to the pilot test.

2.4 Equipment and Materials

Monitoring equipment to be used for the pilot test include:

- Multiple parameter downhole Water Quality Meter to measure DO, ORP, temp, cond., and pH;
- Water level indicator;
- Photoionization Detector to measure ionizable air constituents;
- Four-gas meter, including H_2S, O2, CO and LEL (only O2 and LEL will be recorded);
- Carbon dioxide colorimetric tubes;
- Magnahelic pressure gages;
- Pressure, flow and temperature gages on the pilot test compressor unit;
- Thermal anemometer.

Groundwater sampling supplies, fittings for connection to sparge and monitoring wells, and health and safety supplies will also be utilized. In addition, an In-Situ Hermit data logger and pressure transducer will be used to conduct slug tests. Pilot test equipment will include a 1½ hp oil-less rotary vane compressor, as shown in Appendix C. The compressor is capable of 15 scfm at 15 psig, as shown on the performance curve (Model 2067).

3.0 PLAN OF OPERATION

3.1 Sampling and Analysis

One day of operation is assumed for the pilot test. Slug tests and groundwater samples for laboratory analysis will be collected prior to the date of the pilot test. The air sparge pilot test segment will be approximately 8 hours in duration. Test duration may be increased or decreased up to 4 hours if justified based on data required to complete the test. After completion of the test, post-pilot test monitoring activities will be concluded prior to capping the wells. Samples and measurements will be collected as shown in Table 1 on forms presented in Appendix D.

3.1.1 Pre-Pilot Test Measurements

Prior to the date of the pilot test, the following measurements and samples will be collected as shown in Table 1:

- Soil grain size for SW-701;
- Groundwater elevations for sparge and monitoring wells;
- Groundwater sample from a monitoring well; and,
- Slug tests for TW-701 and TW-702.

On the date of the pilot test, wells will be opened and allowed to equilibrate with atmospheric conditions. Groundwater elevation will be measured until stable, at least twice prior to conducting the pilot test. After water levels equilibrate, monitoring wells and gas probes will be fitted with removable seals for measuring pressure and collecting air samples.

3.1.2 Variable Flow Testing

The first 4 hours of the test will be dedicated to incrementally increasing the injection pressure at one hour intervals, allowing for air and water field readings to generally equilibrate at each step. As specified in Table 1, a vapor sample will be collected at the greatest pressure near the end of the first 4 hours of the air sparging pilot test segment for VOC and atmospheric gas analyses (methane, CO_2, O_2) from one of the monitoring wells.

Air samples will be collected using Summa® canisters for VOC and atmospheric gas analyses (methane, CO_2, O_2). These canisters provide a simple method of collecting a large sample volume for multiple analyses. One canister will be collected for each sample. In addition to providing a large sample volume, whole air samples are not subject to shortfalls of media sampling tubes, such as reduced adsorption due to moisture and relatively low breakthrough conditions for compounds such as benzene.

3.1.3 Biosparge Flow Testing

The final 4 hours of the test will consist of sparging at a rate likely to be used for the full-scale biosparge system to achieve the most efficient oxygenation of the aquifer and radius of influence. After 4 hours of biosparge-mode operation, a second vapor sample will be collected, using a Summa® canister for the same parameters stated above, from one of the monitoring wells. Monitoring parameters will be collected, as stated in Table 1. Soil gas probes and monitoring wells will be sealed with fittings and stopcocks to observe any pressure changes that may occur. Seals will be temporarily removed when water quality readings are collected from monitoring wells. Pressure readings will be observed using magnahelic pressure gages. The pilot test sparge well will be fitted with a quick-connect coupling to facilitate proper sealing with the pilot test compressor.

3.1.4 Post Pilot Test Measurements

Post-pilot test data will be collected until groundwater field measurements have equilibrated. Groundwater elevations and water quality parameters will be monitored for approximately one to

two hours after completion of the test. Parameters will be collected as shown in Table 1 following the pilot test. Groundwater will also be sampled from the same monitoring well sampled prior to the pilot test for BTEX, PAH and water quality parameters. Drummed purge water will be analyzed for benzene to evaluate disposal options.

3.2 Data Management

Field monitoring forms included in Appendix D will be used to record measured parameters, shown on Table 1. The frequency of data collection presented in Table 1 may be increased, or decreased based on the rate of parameter changes based on pilot test observations and variations to injection pressure.

Field measurements will be collected using equipment described in Section 2.4, in accordance with the manufacturer's instructions for use, maintenance, and calibration. All samples for laboratory analysis will be collected in laboratory supplied containers. All QA/QC procedures presented in the Phase I Work Plan Quality Assurance Project Plan will be followed. Lab QA/QC summary and chain of custody documentation shall be submitted with analytical results. Wisconsin laboratory certification in accordance with NR 149 does not apply to air analyses.

3.3 Data Analysis and Interpretation

Data analysis and interpretation will include evaluation of field and laboratory data. Following completion of pilot test activities, data will be analyzed to achieve engineering objectives. Optimal well spacing will be based on observed air injection pressures to obtain an acceptable flowrate of oxygen to the subsurface within a reasonable radius of influence. Vertical and horizontal well configurations will be assessed to optimize air distribution. In addition, alternate means of oxygen delivery to the saturated zone may be reviewed, such as increased sparged oxygen concentrations or the use of oxygen releasing compounds. Following establishment of design parameters, full-scale design of a biosparge system will be incorporated in the Phase II design report. Based on changes to the hydrogeologic conditions caused by the cutoff wall, full-scale system deployment will be

phased, with approximately 1/3 of the system installed and tested weeks prior to the rest of the system. Operational planning will be addressed in the Phase II Work Plan. Phased installation will allow verification of design parameters, including indications of biodegredation prior to completion of system installation.

In addition to the injection well spacing, passive venting configuration will also be established, based on the unsaturated zone pressure gradients achieved during the pilot test. Temperature, carbon dioxide, and oxygen concentration data will be analyzed to evaluate "short circuiting" through the soil surface and underground conduits, as well as biological degredation potential.

3.4 Health and Safety Plan

WPS, its contractors and NRT personnel will be qualified and knowledgeable with respect to health and safety requirements relating to the remedial action. NRT will develop a Health and Safety Plan for NRT and WPS personnel working at the site, as described in the Phase I Work Plan.

3.5 Residuals Management

Drilling and well development waste will be containerized on-site pending characterization and disposal, most likely in the following fashion:

- Soil cuttings to be stockpiled in accordance with NR 718 at the site. Drilling spoil will be placed on and covered by sheet plastic pending remediation activities in the fall.
- Groundwater from well development and sampling to be drummed pending disposal, after receipt of analytical data. If purge water sampling results indicate benzene above 0.5 mg/l, purge water will be disposed as hazardous. Past sampling results for MW-703 indicate purge water from nearby wells may also be hazardous.
- Personal protective equipment and well construction and sampling materials will be disposed as non-hazardous waste.

Pilot test wells will be abandoned in-place according to NR 141. The wells will be filled with bentonite chips and riser piping will be removed to at least 30 inches below surface grade. MW-703 will not be abandoned.

4 REPORTING

4.1 Submittals

The results of the Pilot Test will be included in the Phase II Work Plan, and substantively meet the requirements of Task 5 of the Contract. Results will include data analysis and interpretation described in Section 3.3. Included in the Phase II Work Plan will be field data, analytical results, diagrams, and other design data collected during the pilot test.

4.2 Schedule

We intend to proceed with the Pilot Test within 1-3 weeks from WDNR approval. Installation of wells, pre-pilot test data collection, and pilot testing are planned for completion in 1-2 weeks. Laboratory analytical results will be turned around in 2-3 weeks. Data evaluation and initial full-scale biosparge system design will be completed concurrent with the Phase II Work Plan. This is an approximate schedule subject to field conditions, weather, contractor availability, etc. WDNR will be kept informed of the progress or deviations from this work plan as appropriate via verbal or written correspondence.

4.3 Staffing

Key project principals and personnel are listed below:

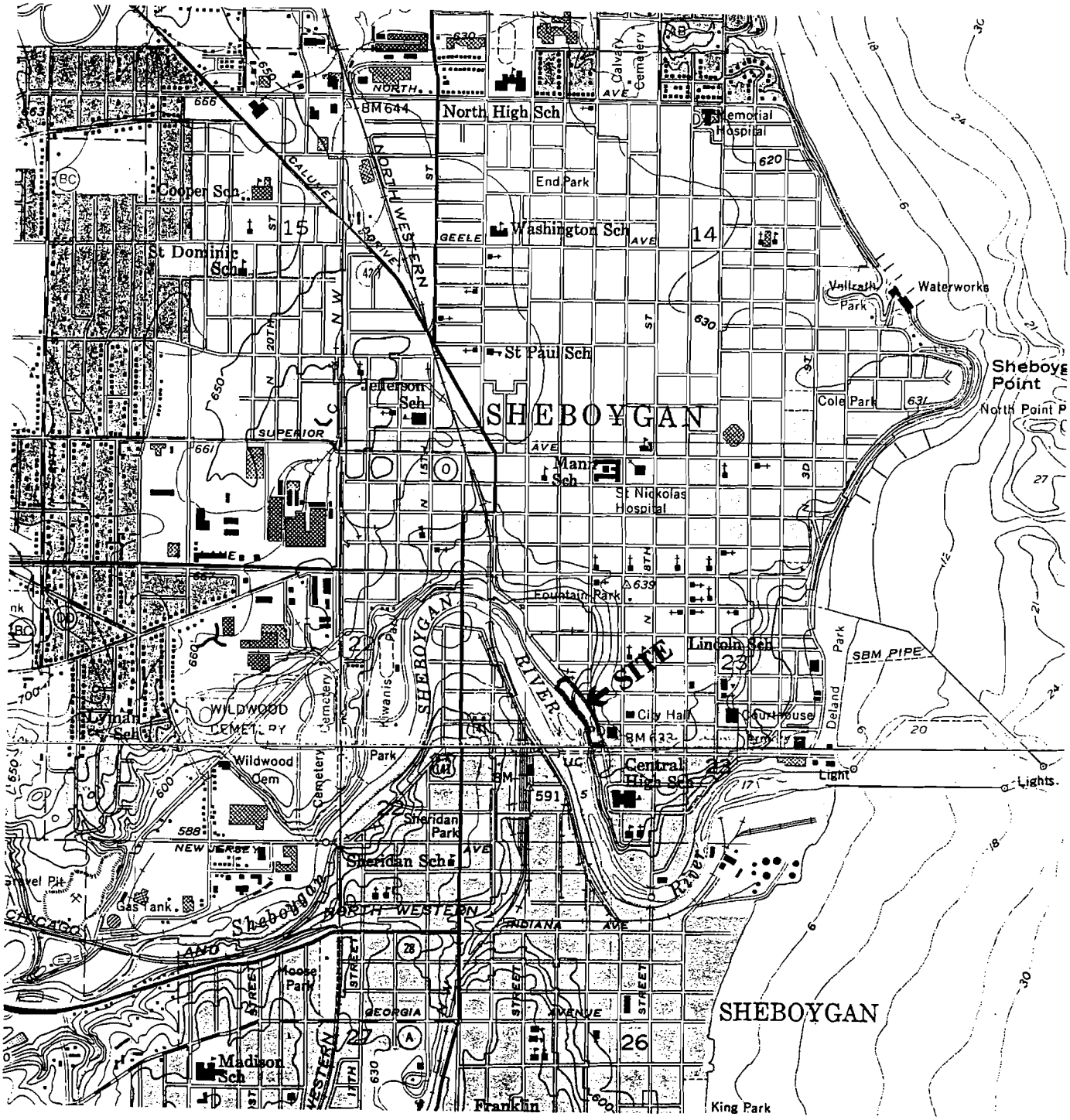
Site Owner:

City of Sheboygan
807 Center Avenue
Sheboygan, WI 53081
Contact: Mr. Bob Peterson
(920) 459-3380

Former MGP Operator:	Wisconsin Public Service Corporation 700 North Adams Street, P. O. Box 19002 Green Bay, WI 54307-9002 Contact: Ms. Connie Lawniczak (920) 433-1140
Site Location:	732 North Water Street Sheboygan , Wisconsin Sheboygan County NW ¼, SW ¼, Section 23, T15N, R23E Refer to Figure 1
Consultant:	Natural Resource Technology, Inc. (NRT) 23713 W. Paul Road, Unit D Pewaukee, WI 53072 Contact: Mr. Roy E. Wittenberg (262) 523-9000

Key WPS personnel that will be involved in the implementation include Ms. Connie Lawniczak, Project Director. Key NRT personnel involved in the implementation of remedial actions at the Campmarina site includes Mr. Roy Wittenberg, P.E. (Project Manager), Ms. Laurie Parsons, P.E. (Senior Review Engineer), Mr. Spiros Fafalios, P.E. (Project Engineer) and Mr. Dan Plovnick (Field Engineer).

FIGURES



SOURCE: USGS 7.5 MINUTE QUADRANGLE, SHEBOYGAN NORTH. DATED 1954. PHOTOREVISED 1973.

QUADRANGLE LOCATION

N

0 2000 4000

SCALE IN FEET

CONTOUR INTERVAL 10 FEET

Natural Resource Technology

N R T

SITE LOCATION MAP

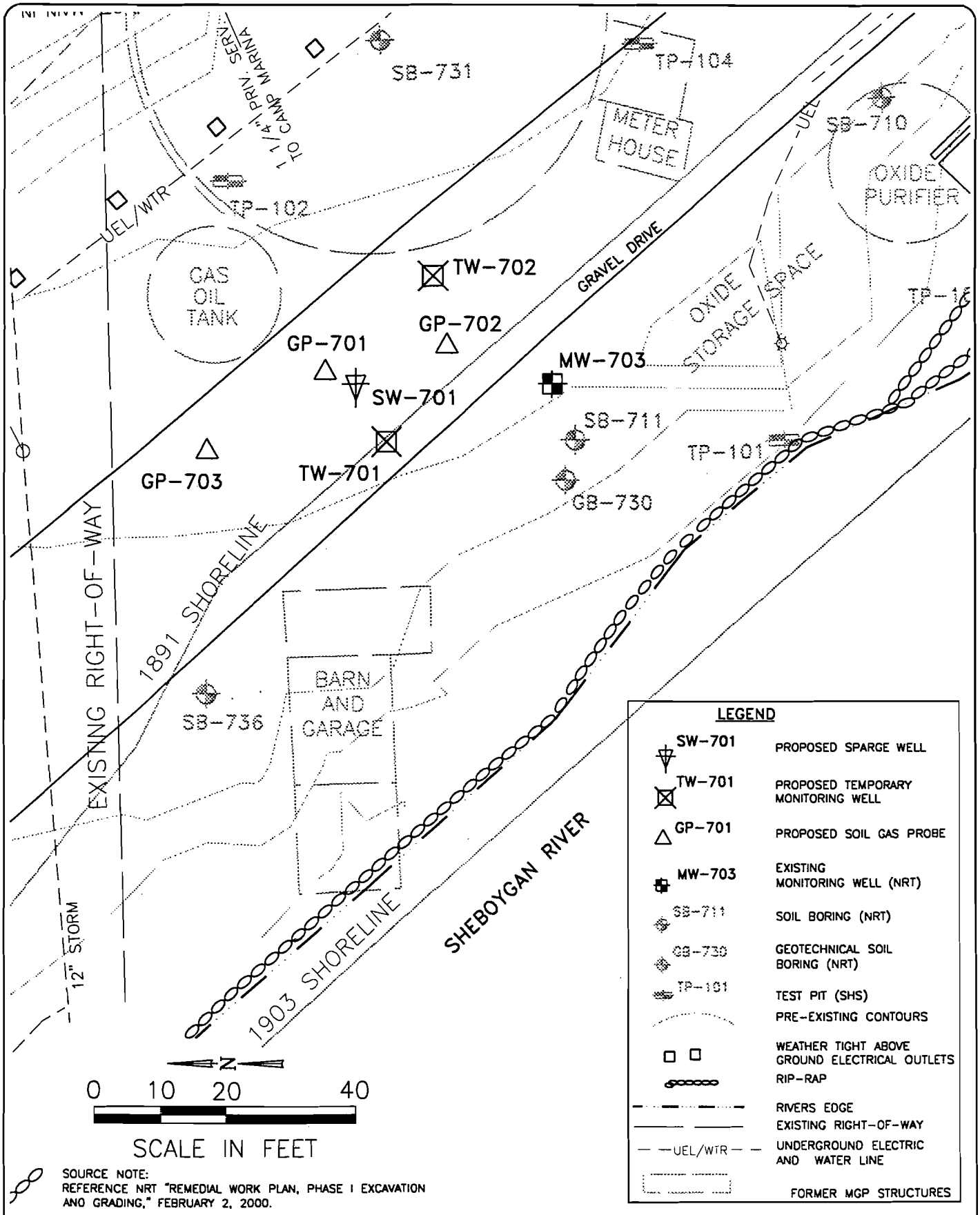
CAMPMARINA, FORMER COAL GAS FACILITY
WISCONSIN PUBLIC SERVICE CORPORATION (WPSC)
SHEBOYGAN, WISCONSIN

DRAWN BY: TAS APPROVED BY: DATE:

PROJECT NO. 1313

DRAWING NO. 1313-A01

FIGURE NO. 1



SOURCE NOTE:
REFERENCE NRT "REMEDIAL WORK PLAN, PHASE I EXCAVATION AND GRADING," FEBRUARY 2, 2000.

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BIOSPARGE PILOT TEST WELLS

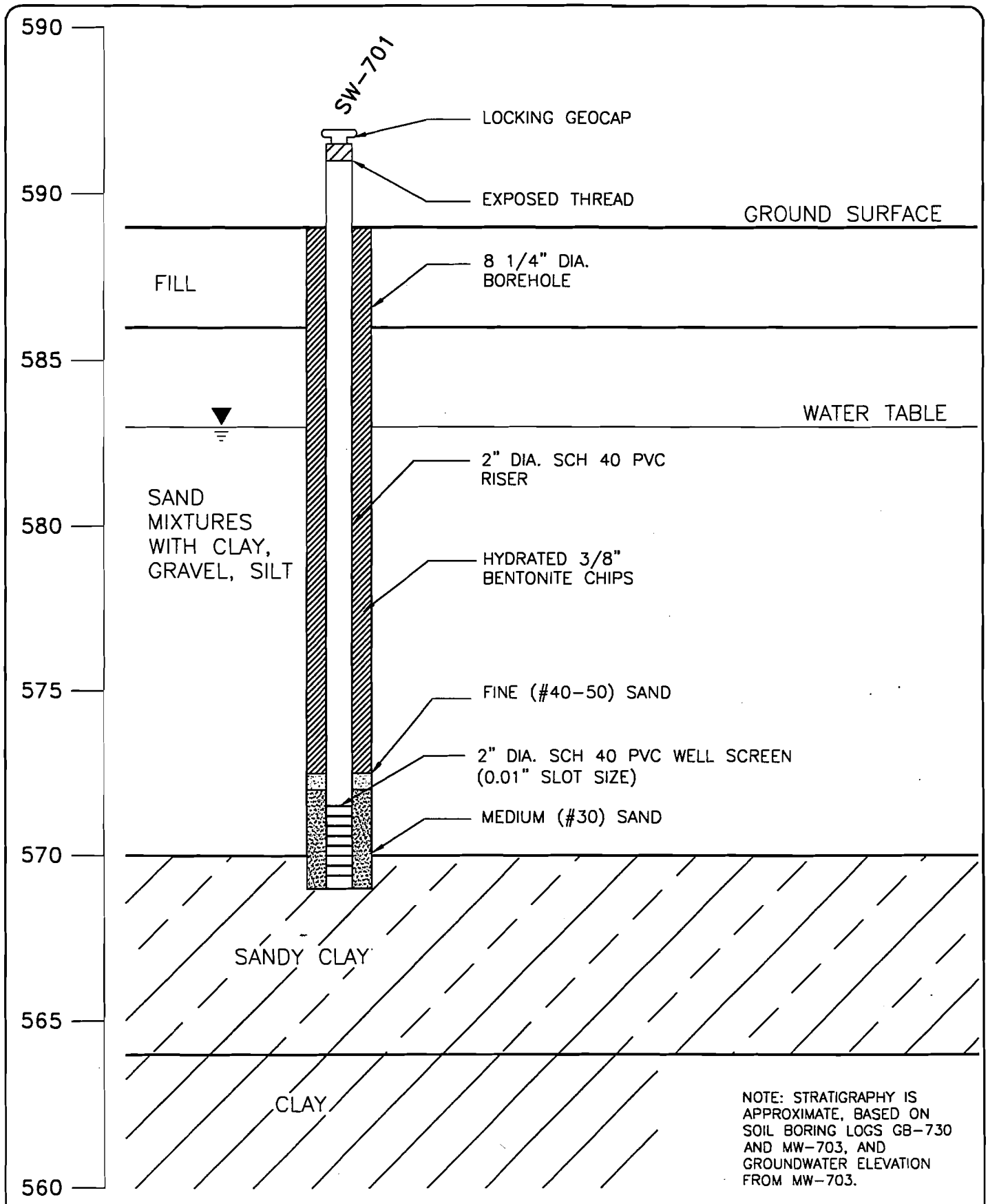
PILOT TEST WORK PLAN
CAMPMARINA AND CENTER AVENUE RIGHT-OF-WAY
WISCONSIN PUBLIC SERVICE CORPORATION
SHEBOYGAN, WISCONSIN

DRAWN BY: TAS 03/30/00 APP'D BY: REW DATE: 4/4/00

PROJECT NO. 1313/3.6

DRAWING NO. 1313-A03

FIGURE NO. 2



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PROPOSED PILOT TEST SPARGE WELL DETAIL

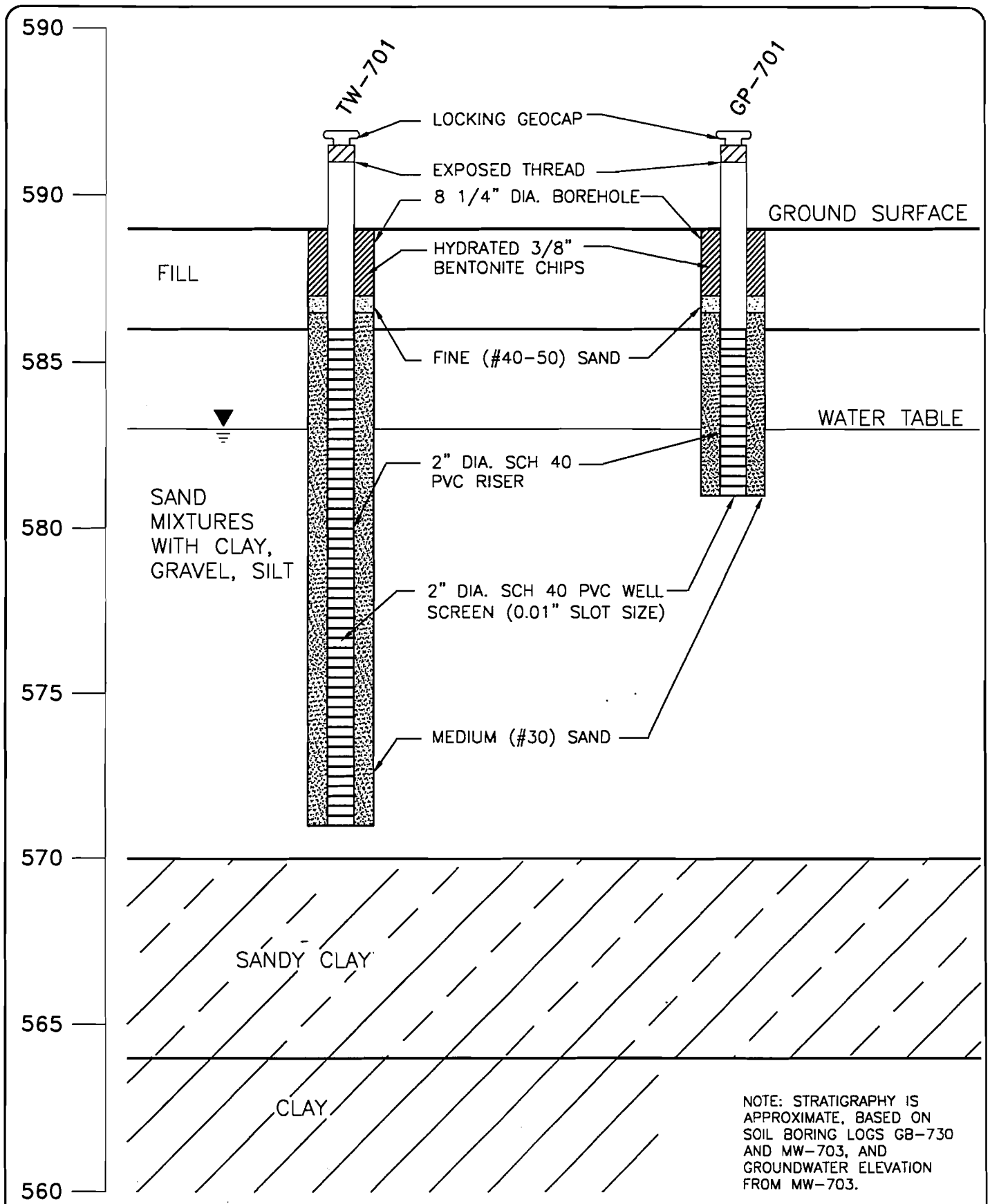
PILOT TEST WORK PLAN
CAMPMARINA AND CENTER AVENUE RIGHT-OF-WAY
WISCONSIN PUBLIC SERVICE CORPORATION
SHEBOYGAN, WISCONSIN

DRAWN BY: TAS 03/30/00 APP'D BY: REW DATE: 4/4/00

PROJECT NO. 1313/3.6

DRAWING NO. 1313-A04

FIGURE NO. 3



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PROPOSED TEMPORARY MONITORING WELL AND GAS PROBE DETAIL

PILOT TEST WORK PLAN
CAMPMARINA AND CENTER AVENUE RIGHT-OF-WAY
WISCONSIN PUBLIC SERVICE CORPORATION
SHEBOYGAN, WISCONSIN

DRAWN BY: TAS 03/30/00 APP'D BY: REW DATE: 4/4/00

PROJECT NO. 1313/3.6

DRAWING NO. 1313-A05

FIGURE NO. 4

TABLE

Table 1 - Pilot Test Measurement Matrix
Pilot Test Work Plan
WPSC - Sheboygan Campmarina MGP

Parameter	Frequency***	Air Sparge Well	Monitoring Wells	Gas Probes
		SW-701	TW-701, TW-702, MW-703	GP-701, GP-702, GP-703
Pre-pilot Test Data				
Hydraulic Conductivity	1x	Slug Test	Slug Tests (TW-701, TW-702)	
GW Field Parameters	2x or until stable	Elevation, Water Quality Meter (DO, ORP, temp., cond., pH)	Elevation, Water Quality Meter (DO, ORP, temp., cond., pH)	
Lab Parameters	1x	Grain Size	BTEX (8260) PAH (8310) WQ Parameters*	
Pilot Test Data				
Sparge-Air Measurements	every 10 to 15 minutes	Pressure, Temperature, Flowrate	Pressure, GW Elevation	Pressure
Sparge-Air Quality	every 30 minutes		PID, 4-gas Meter**, CO_2	PID, 4-gas meter**, CO_2
Sparge-Water Quality	every 30 minutes		Water Quality Meter (DO, ORP, temp., cond., pH)	
Lab Parameters	2x			BTEX + naphthalene (EPA TO-14) methane, oxygen, CO_2 (ASTM 1946)
Post-pilot Test Data				
GW Field Parameters	2x or until stable	Elevation, Water Quality Meter (DO, ORP, temp., cond., pH)	GW Elevation, Water Quality Meter (DO, ORP, temp., cond., pH)	
Lab Parameters	1x		BTEX (8260) PAH (8310) WQ Parameters*	

Notes:
*WQ Parameters = methane, sulfate, nitrate + nitrite, dissolved iron, and alkalinity.
**4-gas Meter to measure O2 and LEL only.
***Frequency is meant as a guide only. Actual measurement frequency may vary, based on observed conditions.

by: DVP
ch'd: SLF

APPENDIX A

CITY OF SHEBOYGAN ACCESS AGREEMENT

City of Sheboygan
spirit on the lake.

February 21, 2000

Wisconsin Public Service Corp.
Attn: Connie K. Lawniczak
700 N. Adams Street
P.O. Box 19002
Green Bay, WI 54307-9002

Dear Ms. Lawniczak:

Please let this letter serve as your permission to enter onto the property on Water Street (known as Camp Marina).

It is my understanding that you will be conducting some remedial work in the site and on the Center Avenue right-of-way extended to the west of Water Street.

Proper signing is required to safeguard the public.

The City retains the right to enter onto the property at anytime.

Please call my office if you have any questions. Thank you for your time in this matter.

Sincerely yours,

Lloyd L. Turner, P.E.
Director of Public Works

c Bob Peterson, City Development
Tom Holtan, Engineering

DEPARTMENT OF
PUBLIC WORKS AND
CITY ENGINEERING

333 CENTER AVENUE
SHEBOYGAN, WI
53081

DPW 920/459-3366
ENG. 920/459-3394
FAX 920/459-0227

APPENDIX B

SELECTED SOIL BORING LOGS AND MW-703 WELL CONSTRUCTION FORM

State of Wisconsin
Department of Natural Resources

Route To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other:

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 5-92

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
C - Vacant City Property South of Campmarina		GB-730

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
Boart Longyear Randy Radtke	12/14/98	12/14/98	4 1/4" (ID) HSA / ROTAR

DNR Facility Well No.	WI Unique Well No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	588.66 Feet MSL	8.25 / 6 inches

Boring Location State Plane	Feet N Feet E	Lat Long	Local Grid Location (if applicable)
			4863.2 feet ☒ N ☐ S 5231.3 feet ☒ E ☐ W

County	DNR County Code	Civil Town/City/ or Village
Sheboygan	60	Sheboygan

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
GB730 (1)	9	10,11 11,12	2	Grassy surface w/ associated top soil to 1' BGS (sand, fine and medium grained, some organics)	SP			0.0						
GB730 (3)	14	4,5 5,6		1'-3' FILL SILTY CLAY, reddish brown (5YR 5/4), few medium sand, stiff-dry, no odor.	FILL			8.1						
GB730 (5)	0	11,13 18,7	4	.In=3 3'-6'FILL SAND, dark gray, fine grained, **some cinders**, little silt and clay, loose-dry, no odor.				NR						
				NO RECOVERY 4'-6' BGS.										
GB730 (7)	10	3,2 3,1	6	6'-8' SAND W/ SILT, dark gray (5Y 4/1), little coarse sand and fine gravel, soft-moist to very moist, **minor tar, visual staining, strong odor.**	SM			16.3						
GB730 (9)	16	3,1 1,1	8	**Minor tar and strong odors continue to 10' BGS**				32.7						
GB730 (11)	0	pushed	10	Wet at 9'	SW			NR						Shelby Tube 10' - 12'
GB730 (13)	18	1,1 1,3	12	At 9.5', 4" lense of SAND, well graded, predominanty fine to medium, some coarse sand, **slight odor.**	SM			24.5						Shelby Tube 12' - 14'
GB730 (15)	20	1,1 1,1	14	SHELBY TUBE SAMPLE 10'-12' NO RECOVERY										
GB730 (17)	18	1,1 1,1	16	SHELBY TUBE SAMPLE 12'-14' NO RECOVERY, drove 2" split spoon	SW			40.9						
GB730 (19)	20	5,5 10,17	18	At 12.5', some lenses of SAND, well graded, predominantly fine to medium, some coarse sand, **slight odor.**	SM			40.9						
GB730 (21)	18	7,7 7,13	20	At 14.5', 6" lense of SAND as at 9.5'.				24.5						
				At 15', little organics, few medium sand, trace coarse sand, **slight odor.**										
				At 16'-18', lenses of SAND as at 12.5', little clay.	CL			8.1						
GB730 (23)	24	pushed	22					NS						Shelby Tube 22' - 24'

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Natural Resource Technology

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than $10 nor more than $5,000 for each violation. Fined not less than $10 or more than $100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comm
GB730 (25)	24	7,12 19,22	26	19'-25' SILTY CLAY, dark grayish brown (10YR 4/2), few medium sand, trace coarse sand and fine gravel, stiff-moist to slightly moist,no odor.	CL			8.1						Augered to 24' bgs
GB730 (27)	24	5,10 10,10	28	SHELBY TUBE SAMPLE COLLECTED FROM 22'-24' BGS.	CL			8.1						
GB730 (29)	20	pushed	30	At 24.6', 2" lense clayey silt, light gray (10YR 7/2).	SP			NS						
GB730 (31)	24	10,11 13,10	32	25'-32' CLAY, dark grayish brown and dusky red (10YR 4/2 and 2.5YR 4/4), few silt, trace coarse sand, hard-slightly moist, no odor.	CL			8.1						
			34	At 26', some clayey silt seams, light gray.										
			36	At 26.6', 6" lense of GRAVELLY SAND, coarse grained sand, fine gravel, little clay, loose-wet.										
			38	At 27.2', grades to CLAY, dark grayish brown (10YR 4/2), few silt, trace coarse sand and fine gravel, very stiff-slightly moist, no odor.										
			40	End of Boring at 32' BGS										
			42											
			44											
			46											
			48											
			50											
			52											
			54											
			56											
			58											
			60											
			62											

State of Wisconsin
Department of Natural Resources

Route To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other:

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 5-92

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
WPSC-Sheboygan Water Street Feasibility Study		*SB-731*

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
Boart Longyear Environmental Drilling, Inc. *Randy Radke*	*12/10/98*	*12/10/98*	*HSA and Mud Rotary*

DNR Facility Well No.	WI Unique Well No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	*590.70 Feet MSL*	*inches*

Boring Location State Plane	Feet N Feet E	Lat Long	Local Grid Location (If applicable)
			4889.6 feet ☒ *N* ☐ *S* *5298.2 feet* ☒ *E* ☐ *W*

County	DNR County Code	Civil Town/City/ or Village
Sheboygan	*60*	*Sheboygan*

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
SB731 (1)	10	4/4 6/8	0	0'-4.5' FILL, SILTY GRAVEL WITH SAND, light yellowish brown (10YR 6/4), poorly graded, fine to coarse subround sand - predominantly medium, fine to medium subangular gravel - predominantly medium, compact, slightly moist, no odor.	FILL			1.0						
SB731 (3)	14	5/3 6/8	2					3.4						
SB731 (5)	21	3/4 4/4	4	mixed with organics, **trace cinders, red brick fragments**, CLAY WITH SILT, and SILTY SAND, compact, moist, no odor.	PEAT CL			21						
SB731 (7)	0	2/4 6/5	6	4.5'-5' PEAT.	CL			ns						
SB731 (9)	19	5/5 6/9	8	grading to CLAY, greenish gray (5GY 5/1), trace organics, trace silt and very fine sand, high plasticity, soft, wet, no odor.				5.6						
SB731 (11)	15	4/6 7/4	10	grading to SANDY CLAY WITH ORGANICS	SM			4.3						
SB731 (13)	19	3/4 4/4	12	8'-14' SILTY SAND WITH CLAY, olive gray (5Y 5/2), poorly graded, very fine to medium sand, predominantly fine, fine laminations throughout with varying amounts of silt and clay, soft, wet, no odor.				3.1						
SB731 (15)	17	4/7 16/20	14	trace to no clay				6.9						
SB731 (17)	22	6/10 15/17	16	14'-18' CLAY WITH SILT, dark reddish gray (5YR 4/2), trace to 5% fine subangular to subround gravel, medium plasticity, very hard, slightly moist, no odor.	CL			4.7						
			18	few very fine to fine laminations of silt and fine to medium sand.										
			20	*End Of Boring @ 18'*										
			22											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [signature] Firm **Natural Resource Technology**

State of Wisconsin
Department of Natural Resources

Route To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other:

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 5-92

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
WPSC-Sheboygan I /1060/ Site Investigation		MW-703

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
Boart Longyear Scott/Kurt	07/18/95	07/18/95	HSA 4 1/4" (ID)

DNR Facility Well No.	WI Unique Well No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-703	583.17 Feet MSL	589.18 Feet MSL	8.25 inches

Boring Location State Plane	Feet N Feet E	Lat Long	Local Grid Location (If applicable)
NW1/4, SW1/4, 23, T15N, R23E			4864.4 feet ☒ N ☐ S 5245.7 feet ☒ E ☐ W

County	DNR County Code	Civil Town/City/ or Village
Sheboygan	60	Sheboygan

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			2	GRAVEL, base for drive w/ bricks/ silt/ CINDERS. (FILL) BRICKS w/ silt, dry, compact, no odor (FIIL)	GP FILL									
MW703 (3)	18	12						69.4						
MW703 (5)	8	8	4	4'-6' SANDY CLAY W/ GRAVEL, grysh brn (2.5Y 5/2), 5% CINDERS, sand, firm, mst, sl. odor (FILL)	CL (FILL)			185						
MW703 (7)	12	2	6	6'-8' CLAYEY SAND W/ GRAVEL, grysh brn (2.5Y 5/2) w/ blck mtting, TRC CINDERS, pred f-med, subrnd, soft, v. mst, sl. odor (FILL)	SC (FILL)			118						
MW703 (9)	14	2	8	8'-10' interbedded CLAY & SANDY CLAY, drk gry (2.5Y 4/1), few blk lamin, med plast, soft, wet, sl. odor (FILL)	CL (FILL)			125						
MW703 (11)	17	2	10	10'-14' CLAY, grading drk grnsh gry (10Y 4/1) abund brwn orgnc to grysh gry (10Y 5/1), abund gast. shells, v. mst, firm, sl. odor	CL									
MW703 (13)	15	2	12	no shells, some sand, soft, wet, grdng to below										
MW703 (15)	13	6	14	14'-16' SAND, blk (N 2.5), prly grd, med-crs, compact, SHEEN, wet, odor	SP									
MW703 (17)	21	13	16	16'-20' SANDY CLAY, drk grysh brn, med plast, soft, wet	CL									
MW703 (19)	14	7	18	firm, moist										
			20	EOB @ 20'										
			22											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

ature [signature] Firm Natural Resource Technology

This form is authorized by Chapters 144.147 and 182, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than $10 nor more than $5,000 for each violation. Fined not less than $10 or more than $100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 182.08, Wis. Stats.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: WDSC - Sheboygan II	Local Grid Location of Well: 4864.4 ft. ☒N. ☐S. 5245.7 ft. ☒E. ☐W.	Well Name: MW-703
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ° ' " Long. ° ' " or	Wis. Unique Well Number: DNR Well Number:
Type of Well: Water Table Observation Well ☒11; Piezometer ☐12	St. Plane _____ ft. N, _____ ft. E.	Date Well Installed: 07/18/95
Distance Well is From Waste/Source Boundary: ft.	Section Location of Waste/Source: NW 1/4 of SW 1/4 of Sec. 23 T. 15 N. R. 23 ☒E. ☐W.	Well Installed By: (Person's Name and Firm): Scott Buttke; Boart Longyear
Is Well A Point of Enforcement Std. Application? ☒Yes ☐No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☒ Sidegradient; d ☒ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation 589.16 ft. MSL
B. Well casing, top elevation 588.80 ft. MSL
C. Land surface elevation 589.16 ft. MSL
D. Surface seal, bottom _____ ft. MSL or 1.0 ft.

12. USC classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒Yes ☐No

14. Drilling method used: Rotary ☐50; Hollow Stem Auger ☒41; _____ Other ☐

15. Drilling fluid used: Water ☐02 Air ☐01; Drilling Mud ☐03 None ☒99

16. Drilling additives used? ☐Yes ☒No

Describe _____

17. Source of water (attach analysis): NA

E. Bentonite seal, top _____ ft. MSL or _____ ft.
F. Fine sand, top _____ ft. MSL or _____ ft.
G. Filter pack, top _____ ft. MSL or 3.0 ft.
H. Screen joint, top _____ ft. MSL or 3.5 ft.
I. Well bottom _____ ft. MSL or 13.5 ft.
J. Filter pack, bottom _____ ft. MSL or 14.5 ft.
K. Borehole, bottom _____ ft. MSL or 20.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.37 in.
N. I.D. well casing 2.06 in.

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 04; _____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☐ 30; Concrete ☒ 01; _____ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; #30 American Material Other ☒
5. Annular space seal: a. Granular Bentonite ☒ 33
b. _____ Lbs/gal mud weight . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☒ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. _____ Other ☐
7. Fine sand material: Manufacturer, product name and mesh size
a. _____
b. Volume added _____ ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. #30 American Material
b. Volume added _____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; _____ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11; Continuous slot ☐ 01; _____ Other ☐
b. Manufacturer Boart Longyear
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 14; #30 American Material Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm: Boart Longyear, 101 Alderson Street Tel: (715) 359-7090 Fax: (715) 355-5715

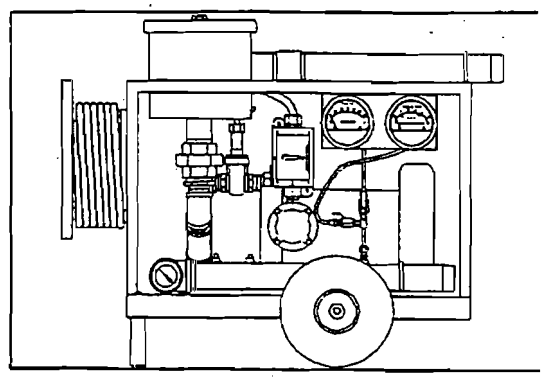
Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

APPENDIX C

SPECIFICATIONS FOR PILOT TEST EQUIPMENT

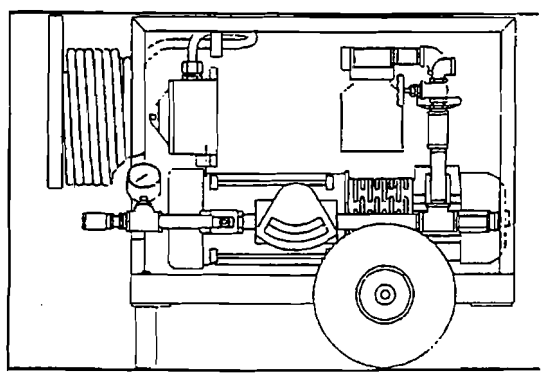
Pilot Test Systems
Vacuum Extraction
Air Sparging

Vacuum Extraction



- Regenerative Vacuum Extractor
  - Maximum Air Flow: 100 SCFM
  - Maximum Vacuum: 50" w.c.
- 1 HP 115 VAC 1Ø Explosion-proof Electric Motor
- Explosion-proof On/Off Switch With Thermal Protection
- 100' Heavy Duty Service Cord
- Inline Air Filter
- Vacuum Gauge
- Air Flow Meter
- Inlet Temperature Gauge
- Outlet Temperature Gauge
- Inlet Sample Port
- Outlet Sample Port
- Frame Mounted
- Inlet Connection 2" MIPT and/or 2" PVC Schedule 40 Slip Fitting
- Approximately 125 Pounds

Air Sparging



- Oil-less Rotary Vane Compressor
  - Maximum Airflow: 15 SCFM
  - Maximum Pressure: 15 psig
- 1 HP 115 VAC 1Ø Electric Motor
- Explosion-proof On/Off Switch With Thermal Protection
- 100' Heavy Duty Service Cord
- Inlet Air Filter
- Discharge Temperature Gauge
- Discharge Pressure Gauge
- Air Bleed Valve
- Pressure Relief Valve
- Direct Reading Flow Meter
- Regulating Valve
- Outlet Connection ¾" FNPT
- Approximately 90 Pounds

For Sale or Rental

Product Specifications

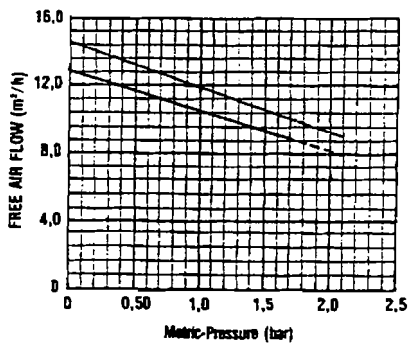
Model Number	Motor	RPM		HP	kW	Net Wt.	
		60 cycle	50 cycle			lbs.	kg
1067-P2	Not included	1725	1425	1½	1,1	33	15,0
1067-P4 (metric)	Not included	1725	1425	1½	1,1	33	15,0
†1067-P6-G561X (like 1067-P2 plus motor)	110/220-240; 115/208-230; 50/60-1	1725	–	1	0,75	65	29,5
2067-P2	Not included	1725	1425	1½	1,1	46	20,9
2067-P4 (metric)	Not included	1725	1425	1½	1,1	46	20,9
†2067-P6-G561X (like 2067-P2 plus motor)	110/220-240; 115/208-230; 50/60-1	1725	–	1	0,75	88	39,9
2567-P2	Not included	1725	1425	2	1,5	48	21,8
2567-P4 (metric)	Not included	1725	1425	2	1,5	48	21,8
2567-P6-G475 (like 2567-P2 plus motor)	230/460-60-3	1725	–	2	1,5	83	37,7

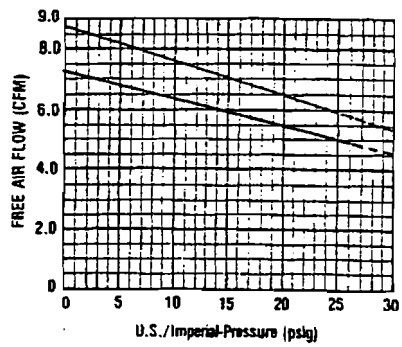
†Motor includes Thermotector.

Product Performance (Metric U.S. Imperial)

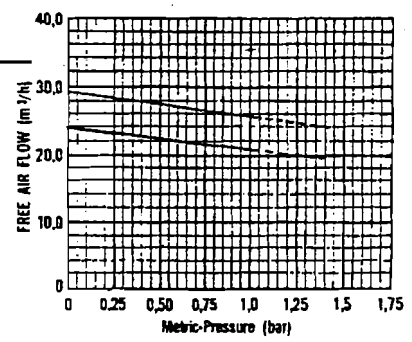
Black line on curve is for 60 cycle performance.
Blue line on curve is for 50 cycle performance.

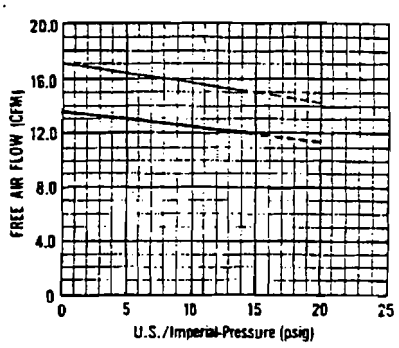
Model 1067



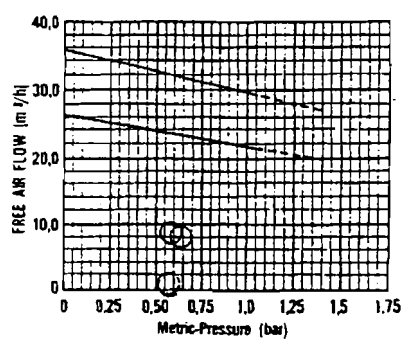


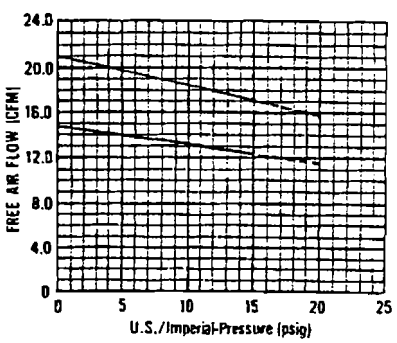
Model 2067





Model 2567





APPENDIX D

EXAMPLE PILOT TEST FIELD FORMS

	TIME								
SW-701	Pressure								
	Temp								
	Flowrate								
GP-701	DTW								
	Pressure								
GP-702	DTW								
	Pressure								
GP-703	DTW								
	Pressure								
TW-701	DTW								
	Pressure								
TW-702	DTW								
	Pressure								
MW-703	DTW								
	Pressure								

	TIME								
SW-701	Pressure								
	Temp								
	Flowrate								
GP-701	DTW								
	Pressure								
GP-702	DTW								
	Pressure								
GP-703	DTW								
	Pressure								
TW-701	DTW								
	Pressure								
TW-702	DTW								
	Pressure								
MW-703	DTW								
	Pressure								

Notes:

Sheboygan Campmarina Pilot Test 30 Minute Measurements PAGE _____

	TIME							
GP-701	oxygen							
	VOC							
	methane							
	PID							
	CO2							
GP-702	oxygen							
	VOC							
	methane							
	PID							
	CO2							
GP-703	oxygen							
	VOC							
	methane							
	PID							
	CO2							
TW-701	Tem							
	DO							
	SpC							
	pH							
	ORP							
	oxygen							
	VOC							
	methane							
	PID							
	CO2							
TW-702	Tem							
	DO							
	SpC							
	pH							
	ORP							
	oxygen							
	VOC							
	methane							
	PID							
	CO2							
MW-703	oxygen							
	VOC							
	methane							
	PID							
	CO2							
	Tem							
	DO							
	SpC							
	pH							
	ORP							