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ASHLAND 346
ERRP

ENVIRONMENTAL ASSESSMENT
CITY OF ASHLAND, WISCONSIN
WASTEWATER TREATMENT PLANT SITE

8/5/89

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ENVIRONMENTAL ASSESSMENT
CITY OF ASHLAND
ASHLAND, WISCONSIN
WASTEWATER TREATMENT PLANT SITE

REVISION 2
August 21, 1989

Prepared For:

Wisconsin Department of Natural Resources
Northwest District
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Project No. BRA10041

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Northern Environmental Investigation - Results

semi-volitals/ PAHs (ppb)	MW-1	MW-2	MW-3	composite soil
Acenaphthene	330	300	88	4400
Fluorene	180	150	83	4900
Phenanthrene	370	300	170	11000
Anthracene	110	320	100	710
Fluoranthene	110	140	260	15000
Pyrene	230	370	790	35000
Benzo(a)anthracene	59	93	180	10000
Chrysene	60	93	180	10000
Bis(2-Ethylhexel)phathalate	18*	28	58	nd
Benzo(b)fluoranthrene	53	77	150	8000
Benzo(a)pyrene	51	79	170	8900
Indeno(1,2,3-cd)pyrene	22	33	80	3500
Dibenz(a,h)anthracene	nd	14*	26	1400
Benzo(g,h,i)perylene	27	45	110	4700
Phenol	nd	14*	nd	nd
Napthalene	150	1600	16*	3300
Ancenaphthylene	38	33	nd	1600
Volatiles (ppb)				
Benzene	190	390	51.4	nd
Ethylbenzene	nd	190	nd	nd
Toluene	27.1	31.7	nd	nd
m- and p-xylene	73.8	130	nd	nd
o-Xylene	150	220	nd	nd
Metals (ppb)				
Arsenic	nd	nd	nd	100000
Chromium	nd	nd	nd	5000
Copper	23	nd	nd	46500
Zinc	12	4	16	16000

nd - not detected * - estimated concentration
ppb - Parts per billion

Northern Environmental Investigation - Results

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1.0 EXECUTIVE SUMMARY

As part of a proposed expansion project for its wastewater treatment plant (WWTP), the City of Ashland conducted a feasibility study of the existing WWTP site. A soil exploration drilling program and environmental assessment of the property were conducted to evaluate soil geotechnical aspects and identify potential soil and/or ground-water impacts that may exist at the site.

The existing WWTP property occupies approximately 10 acres, with about one quarter of the property covered by structures. The property is currently owned and operated by the City of Ashland as the wastewater treatment facility for the city. A portion of the property was reportedly used as a disposal area for wood, wood preservatives, and electrical power transformers possibly containing polychlorinated biphenyls (PCBs).

The firm of Bonestroo, Rosene, Anderlik & Associates (Bonestroo) was retained to provide engineering and design services for the WWTP expansion. Bonestroo located and arranged for drilling of five geotechnical boreholes to be completed to 60 feet. The City of Ashland retained Northern Environmental Technologies, Incorporated (Northern Environmental) to provide an environmental assessment of the proposed expansion property. Northern Environmental completed an existing data review, a magnetometer survey, observed geotechnical drilling and conducted an environmental soil exploration drilling program to assess potential site soil and ground-water impacts. Three permanent stainless steel ground-water quality monitoring wells were also installed in the environmental boreholes as part of this effort.

Six lithostratigraphic units were identified from information gathered during the investigative program. These units are presented in descending order below.

1) Upper Soil Fill
2) Wood Waste Layer
3) Beach Deposit
4) Lacustrine Deposit
5) Glacial Till
6) Glacial Outwash

Two distinct ground-water flow systems were identified in the upper 61 feet of sediments investigated at the Ashland site: a shallow water table system residing in the wood waste layer and the underlying discontinuous beach sand deposit; and a confined (artesian) aquifer residing in the glacial outwash. Hydraulic communication between the two flow systems is limited by a thick sequence of lacustrine clay and glacial till. A strong upward vertical hydraulic gradient (estimated to be 1.5 feet/feet) was measured at the site at an on-site flowing artesian well and flowing artesian geotechnical borings.

Horizontal hydraulic gradients in the shallow ground-water flow system are extremely low (0.0001 foot/foot towards Lake Superior) and appeared to coincide with the water level in Lake Superior. More water level data would be necessary to confirm this information.

Data from geotechnical and environmental borings indicate that a creosote impacted wood waste layer of variable thickness exists at the existing WWTP site. The occurrence of the water table within the wood waste layer has caused dissolved and suspended constituents of creosote to enter the ground water. Soil and ground-water samples from the wood waste zone were submitted for laboratory analysis of PCBs, base neutral and acid extractable (BNA) compounds, volatile organic compounds (VOCs), selected metals, and waste water indicator parameters. These analysis detected elevated concentrations of BNA compounds that are characteristic constituents of creosote and VOCs which are characteristic compounds of lighter grade petroleum fuels. Concentrations of several parameters exceed State of Wisconsin soil/ground-water guideline, preventative action limits, and enforcement standard concentrations.

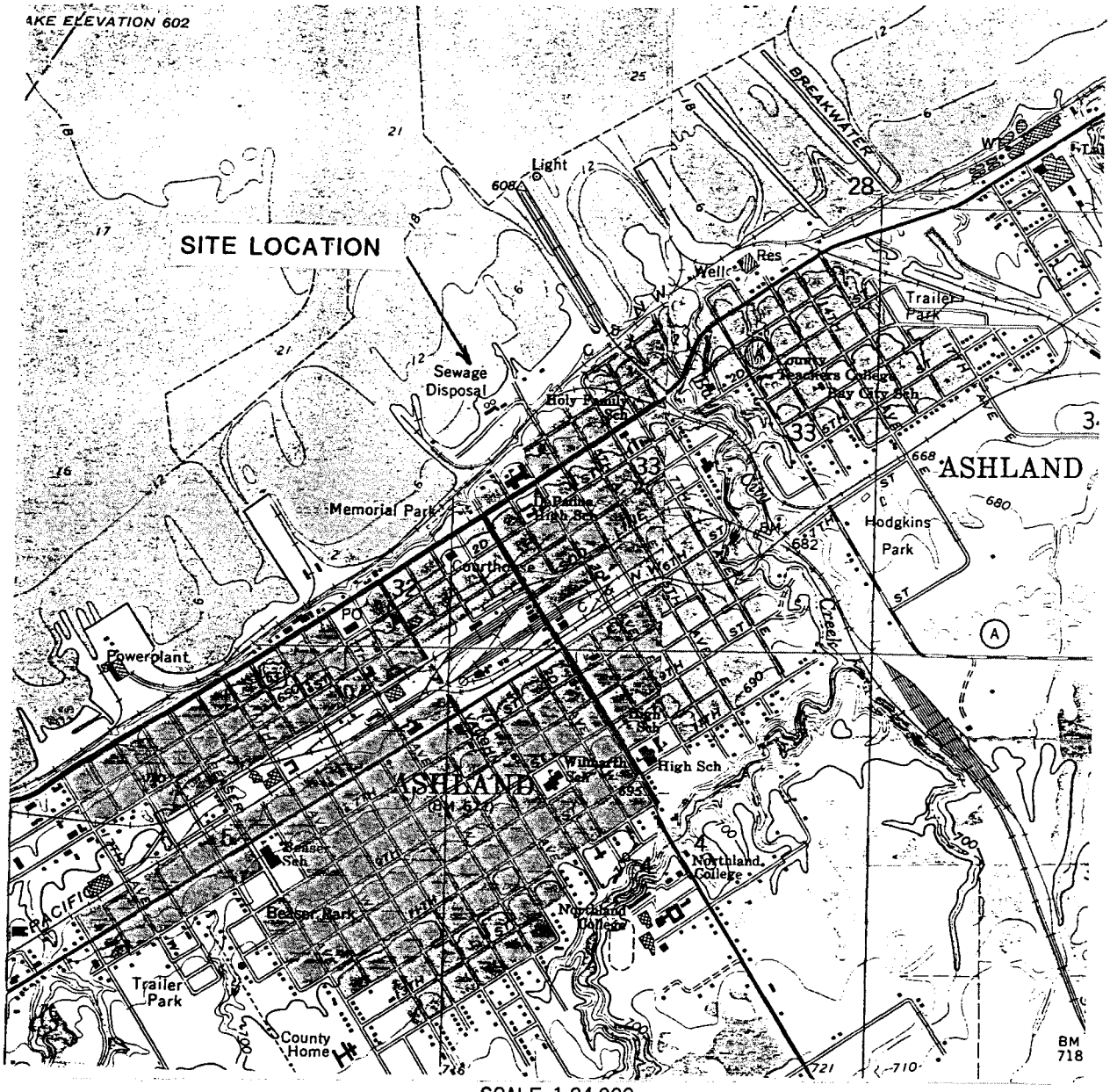
The lateral extent of impacted soil and ground water could not be fully defined in this study. However, impacts appear to be limited to filled areas south of the existing WWTP. The east-west extent of these impacts could not be quantified. The vertical extent of soil/ground-water impacts appeared to be limited to the wood waste layer and underlying layers of lacustrine sand.

2.0 INTRODUCTION

As part of a proposed expansion of its wastewater treatment plant (WWTP), the City of Ashland conducted a feasibility study at the existing WWTP site. The potential expansion area lies adjacent to the western and southern borders of the existing WWTP facility. The existing WWTP property occupies approximately 10 acres in the City of Ashland on Chequamegon Bay (NW¼ of Section 33, Township 48 North, Range 4 West; Latitude 46° 35′ 43", Longitude 90° 52′ 59") (Figure 1). Approximately one quarter of the existing WWTP property is currently covered by structures. A portion of the property was reportedly used as a disposal area for wood, wood preservatives, and possibly electrical power transformers potentially containing polychlorinated biphenyls (PCBs).

The firm of Bonestroo, Rosene, Anderlik & Associates (Bonestroo) was retained by the City of Ashland to provide engineering and design services for the proposed WWTP expansion. The proposed expansion would have been partially constructed on the suspected wood waste and transformer disposal area. Bonestroo located and arranged for drilling five 60 foot deep geotechnical boreholes. Drilling was performed by Twin City Testing, Incorporated. The City of Ashland retained Northern Environmental Technologies (Northern Environmental) to provide an environmental assessment of the proposed expansion property in conjunction with the geotechnical exploration program. Three additional shallow borings were located by Northern Environmental for environmental purposes.

The environmental assessment was designed to provide information concerning potential environmental liability associated with past present land use practices which could impact site soils and/or ground water and hence impede site development. A Northern Environmental hydrogeologist observed or directed the subsurface investigations which consisted of five deep foundation borings and three shallow environmental borings. The environmental borings were subsequently developed into three ground-water monitoring wells. This study presents the results of this effort and assesses the significance of the findings.



SCALE 1:24 000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETRE

QUADRANGLE LOCATION

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS LOW WATER 601.6 FEET

Base Map Source: USGS Ashland West and
Ashland East, Wisconsin 7.5 Minute Quadrangle

CITY OF ASHLAND
WASTEWATER TREATMENT PLANT

SITE LOCATION
AND
LOCAL TOPOGRAPHY

PROJECT: BRA10041 | DATE: 03/03/89

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FIGURE 1

3.0 METHODS OF INVESTIGATION

3.1 Existing Data Review

Existing sources of data were reviewed to identify land use practices and activities which may have potentially impacted site soil and/or ground-water quality. Additionally, this information was used to guide the placement of soil borings and subsequent field investigations. Northern Environmental interviewed City of Ashland employees at the WWTP and City Hall to assess past land use practices at and near the site (Reference 1).

3.2 Magnetometer Survey

A reconnaissance level magnetometer survey was conducted over the suspected disposal area to assess the presence of buried ferromagnetic objects in January, 1989. A Schoenstedt Magnetic Locator Model 52B was used to perform the survey. Access problems created by snow depths exceeding two feet limited the survey to five 100 foot long parallel east-west traverses over the suspected disposal area. Approximate spacing between traverses was ten feet.

3.3 Near Surface Soil Screening and Sampling

This task was omitted from the field investigations because of heavy snow cover and deeply frozen soils existing during the field investigation.

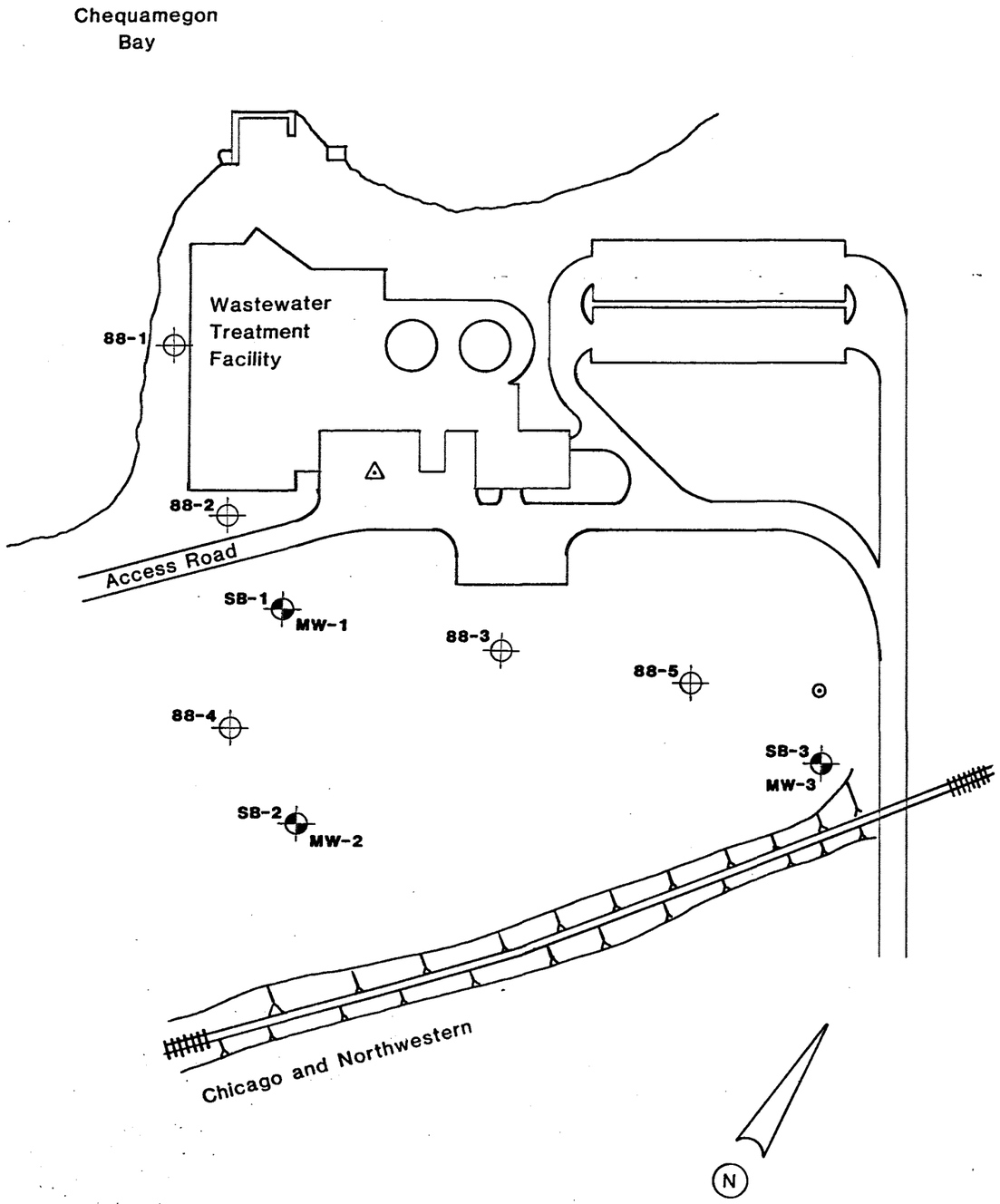
3.4 Soil Exploration, Drilling, and Sampling

The original objectives of the investigative program were to complete five deep geotechnical soil borings for foundation analysis and three environmental borings to assess soil impacts. The geotechnical and environmental borings were to be drilled to a total depth of 60 feet and 15 feet, respectively. The geotechnical boring locations were specified by Bonestroo and the environmental borings were located by Northern Environmental within the suspected disposal area (Figure 2).

3.4.1 Geotechnical Borings

Five geotechnical borings (88-1, 88-2, 88-3, 88-4, and 88-5) were drilled at the locations shown in Figure 2 in January, 1989. Three borings (88-1, 88-2, and 88-3) were drilled to 61.0 feet and two borings (88-4 and 88-5) were drilled to 41.0 feet. Borings 88-4 and 88-5 were abandoned at 41.0 feet because of problems associated with caving saturated sand and gravels and flowing artesian conditions.

Drilling at the first geotechnical borehole (88-2) was temporarily halted when a short interval of saturated wood waste was encountered at 12.1 - 12.4 feet. At this juncture, measures



LEGEND

- MONITORING WELL
- SOIL BORING
- FLOWING ARTESIAN WELL
- SITE BENCHMARK

0' 50' 100' 150' 200'

CITY OF ASHLAND
WASTEWATER TREATMENT PLANT

SOIL BORING AND MONITORING
WELL LOCATIONS

PROJECT: BRA10041 | DATE: 03/03/89

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Incorporated

FIGURE 2

were taken to avoid spreading near surface soil impacts to deeper permeable zones and/or aquifers. Northern Environmental recommended that any geotechnical borings that penetrated the saturated impacted zone be installed with a surface casing and grout seal to isolate this zone from deeper sediments. Borings 88-2, 88-3, 88-4, and 88-5 penetrated impacted zones and thus were installed with surface casing to depths varying from 14 to 18 feet. No casing was installed at 88-1 since no significant impacts were observed during drilling.

Geotechnical and environmental boreholes were advanced with a 3¼-inch inside diameter (ID) hollow-stem auger (HSA) [6¼-inch outside diameter (OD)] in conformance with American Society of Testing and Materials (ASTM) standard method 1452. All downhole drilling equipment was steam cleaned between drilling locations. No lubricants were used on downhole drilling or sampling equipment. With the exception of boring 88-5, soil samples were collected every two feet to 15 feet and every five feet thereafter using standard split barrel techniques (ASTM 1586). Boring 88-5 was sampled continuously from 4.5 - 15.0 feet to ascertain the exact thickness of wood waste fill. Auger cuttings were examined during all phases of drilling at all locations. Downhole soil sampling equipment was washed with trisodium phosphate and double rinsed with potable water between subsequent samples.

Three different drilling bits were used at the WWTP site. The 3¼-inch ID HSA and bit was the standard bit used, unless surface casing was installed. Cased boreholes were drilled from the base of surface casing to completion depth with a 2 7/8-inch tri-cone bit. When necessary, a 2¼-inch carbide tipped drag bit was utilized to penetrate large cobbles or boulders.

A representative portion of each split barrel sample was collected and subjected to photoionization detector (PID) headspace screening to evaluate the possible presence of volatile and semivolatile organic compounds such as those which are found in creosote, petroleum fuels, and organic solvents. Screening was performed by immediately transferring approximately two inches of each split barrel sample to a small plastic storage bag, disaggregating the soil sample, and allowing the sample to degas in a warm (i.e. 50° F) location for at least 30 minutes. The bag was then punctured with the PID probe extension, and the highest stable PID reading measured within ten to twenty seconds was recorded. The headspace gas within each bag was analyzed for photoionizable constituent content utilizing a HNu Model GP101 PID outfitted with a 11.7 eV probe calibrated for direct response to benzene.

Soil samples that exhibited strong odors, high PID headspace readings, or which appeared visually impacted were stored in clean two ounce glass soil sample jars for potential laboratory analysis. Two soil samples (S6 from boring 88-2, and auger

cuttings from boring SB-1) were field analyzed for gross polychlorinated biphenyl (PCB) content utilizing a Dexsil PCB screening kit. The Dexsil kit is a qualitative field analysis kit which detects the presence of PCBs and other chlorinated organic compounds to an approximate detection limit of ten parts per million (ppm).

One soil sample was composited from samples collected from borings 88-2 and 88-5 (DB#2/DB#5). This sample was submitted under chain of custody to a contract analytical laboratory approved by the Wisconsin Department of Natural Resources (WDNR). The soil sample underwent analysis for base, neutral, and acid extractable compounds (BNAs) (EPA Method 625). A second soil sample was selected from samples collected from boring 88-4 (DB#4) and was submitted for laboratory analysis of volatile organic compounds (VOCs) (EPA Method 601), polychlorinated biphenyls (PCBs), and selected metals. The results of these analyses are included in Appendix A1.

A portion of each split barrel sample and auger cuttings were collected and texturally described in the field by a Northern Environmental hydrogeologist. Final borehole logs were prepared by a Northern Environmental hydrogeologist in conformance with ASTM 2488. These logs include information on soil type, structural characteristics, consistency, density, lithology, photoionizable constituent content, estimated group symbol, and genetic origin. Copies of these logs can be found in Appendix B1. Borehole logs prepared by the drilling contractor are included in Appendix B2.

Upon completion of soil exploration drilling [(41.0 feet at borings 88-4 and 88-5, and 61.0 feet at borings 88-1, 88-2, and 88-3]) each boring was properly abandoned. All the geotechnical borings penetrated a saturated gravelly clayey sand confined outwash unit at 25 to 30 feet, and, because of strong upward vertical hydraulic gradients, became flowing artesian borings during or soon after drilling. The portion of the borehole below the outwash unit was tremied with cement/bentonite grout. A bentonite plug was then utilized to obstruct the upward flow of ground water. The plug was positioned immediately above the confined outwash unit. Enough cement/bentonite grout was then pumped through the drill stem (tremied) above the plug until the grout had filled the borehole. This abandonment procedure was used on all geotechnical borings. The temporary 6-inch steel casings were not removed after abandonment. However, these casings can be removed at a later date for construction purposes if desired.

3.4.2 Environmental Borings

Three shallow (16.0 feet) environmental borings (SB-1, SB-2, and SB-3) were drilled in the suspected disposal area using hollow stem auger techniques as described in Section 3.4.1. As drilling

progressed, the soils were sampled using standard split barrel techniques (ASTM 1586). Portions of each sample was screened with a PID as described in Section 3.4.1. The depths to top and bottom of wood waste fill were observed and noted on each boring log. Descriptive analysis of the wood waste included: strength and type of odor, color, size of fragments and degree and type of saturation. Soils were analyzed as described in Section 3.4.1. Final borehole logs were prepared by a Northern Environmental hydrogeologist in conformance with ASTM 2488 (Appendix B1). Borehole logs generated by the drilling contractor are included in Appendix B2.

3.5 Ground-Water Monitoring Well Installation

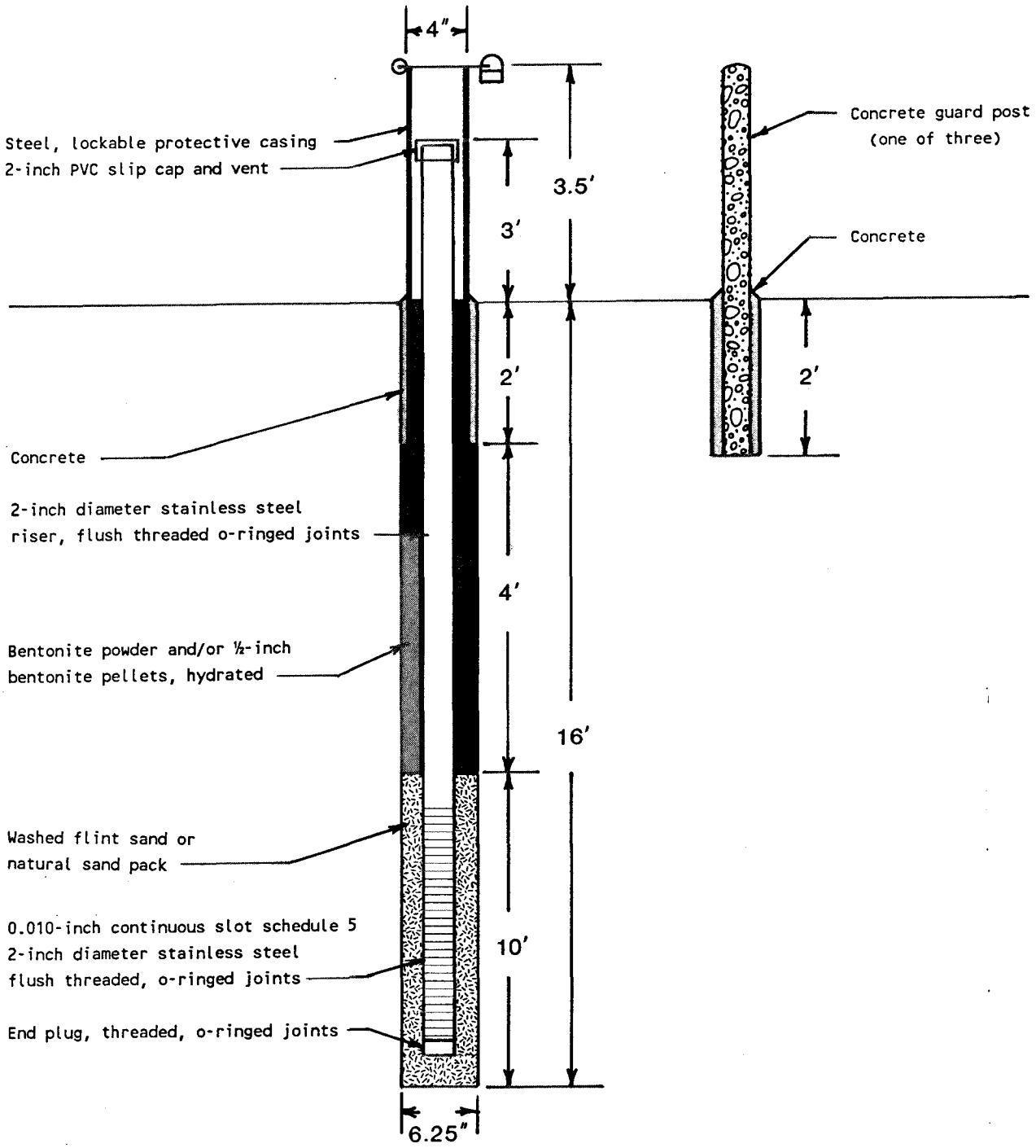
In view of the soil impacts discovered in boring 88-2, the scope of field investigations was broadened to evaluate any ground-water impacts associated with the the identified wood waste. The expanded scope included the installation and water quality sampling of three ground-water quality monitoring wells (MW-1, MW-2, MW-3), which were constructed in borings SB-1, SB-2, and SB-3, respectively.

To evaluate shallow ground-water quality and flow direction, three two-inch diameter stainless steel monitoring wells were installed immediately south of the WWTP (Figure 2). The wells were positioned to provide adequate lateral coverage for water level measurement and therefore provide adequate information to determine ground-water flow direction. Additionally, an attempt was made to locate each well beyond the proposed construction area. Since each well was completed within wood waste strata, none of the wells are considered representative indicators of upgradient ground-water quality.

To maintain borehole integrity during installation, wells were constructed within the 6¼-inch OD hollow stem auger. Auger flights were then removed one at a time. A measuring tape and weight were used to gauge the positions of natural sand pack, artificial sand pack, and bentonite seals.

All ground-water monitoring wells were constructed of two-inch diameter, threaded, flush joint, schedule five stainless steel casing with O-ringed joints. Well screens consisted of one ten foot section of two-inch diameter, 0.010-inch continuous slot, threaded, flush joint stainless steel screen with O-ringed joints. Bottom caps consisted of threaded flush joint stainless steel plugs. Top caps consisted of two-inch diameter PVC slip caps. Figure 3 illustrates typical monitoring well construction. Complete well construction summaries can be found in Appendix C.

The screened interval of each well was positioned to monitor the water table surface and the wood waste zone. In order to allow the presence of any floating product layer to be detected, the top of screen was positioned one-half to one foot above the measured water level on the day of installation. The depth to top of screen for wells MW-1, MW-2, and MW-3 are 4.0, 3.5, and



NOTE: Not to scale

CITY OF ASHLAND
WASTEWATER TREATMENT PLANT

TYPICAL MONITORING WELL

CONSTRUCTION DETAIL

PROJECT: BRA10041 | DATE: 03/03/89

▲ *Northern Environmental Technologies*
Incorporated

FIGURE 3

5.0 feet, respectively. The annular space around all well screens was filled with medium to coarse grained clean flint sand. In well MW-3, the caving of silty fine sand sediments from 10.5 - 15.0 feet produced a natural sandpack for the lower five feet of screen. Flint sand was then added to the remaining screened annulus to one foot above the top of screen. A 1½ to two foot thick bentonite seal was placed above the sandpack to provide an impermeable annular seal. This seal consisted of bentonite pellets for MW-3, powdered bentonite for MW-2, and a layer each of bentonite pellets and bentonite powder for MW-1.

To deter vandalism and prevent damage by vehicles, well protective casings and concrete filled guard posts were installed. Protective casing consisted of a five foot long, four by four inch square steel pipe. The protective casing was installed over the stainless steel riser and pushed two feet into the recently mixed concrete surface seal. A hinged cap fitted with a padlock provides access to the well head for water level measurements and sample recovery. Three guard posts per well were emplaced on a 120 degree radial spacing around the well to protect against vehicle impact. A small concrete pad was constructed and sloped to drain surface water away from the well.

Locations and elevations of all wells were determined after installation. The elevation of all water level reference points, riser pipes, protective casings, and natural ground surface were measured to the nearest 0.01 foot and was referenced to mean sea level datum. The site reference elevation is the elevation of two nails near the base of a power pole immediately south of the Screen and Grit Building at the WWTP (Figure 2). This elevation is equivalent to 605.72 feet above mean sea level (Reference 2).

3.6 Well Development and Ground-Water Sampling

All monitoring wells were developed by removing several saturated casing volumes of ground water. Well development is necessary to remove the effects of drilling and well installation. A centrifugal pump was used to purge each well. New hoses and fittings were used in each well to prevent cross-contamination between wells during development procedures. Purge water was immediately discharged through a garden hose to the sanitary sewer via a WWTP floor drain.

During development, measurements and observations of pH, specific conductance, temperature, odor, floating product occurrence and turbidity were observed and recorded (Appendix D). When three consecutive samples provided stable readings for these parameters, the well was considered developed. It was estimated that 130, 170 and four gallons (approximately 82, 112, and 3.6 saturated casing volumes) of water was removed from wells MW-1, MW-2, and MW-3, respectively. Well MW-3 could not be developed as thoroughly because of the impeded recharge to the well created by fine grained natural sandpack.

During well development, a distinct sewage odor and soapy film were observed in the discharged ground water. To determine if sewage impacts existed, a series of routine wastewater parameters was added to the analytical program. These parameters included: biological oxygen demand (BOD_5), chemical oxygen demand (COD), sulfate, chloride, total non-purgeable organic carbon, and fecal coliform.

Three days after development, the wells were sampled. Static water level measurements were recorded prior to sampling. Three saturated casing volumes were purged from each well immediately before sampling. Three new 1.66 inch diameter stainless steel point source bailers were utilized with one bailer dedicated to each well to prevent sample cross-contamination. The wells were sampled by lowering the bailer well below the water surface. This action ensured that the ground-water analyzed would be indicative of products dissolved in the ground water and would not be influenced by the incorporation of floating product layers. Additionally, each bailer was equipped with a teflon bottom emptying device. The bottom emptying device reduces volatilization that normally occurs while decanting the sample from standard bailers. At the conclusion of sampling, each bailer was decontaminated with a methanol/acetone solution rinsed with distilled water, allowed to air dry for 24 hours, and stored in a new plastic sheath.

Samples collected for metal content analysis were field filtered through a 0.45 micron filter. Field measurements of pH, specific conductance, and temperature were recorded during sampling (Appendix E). Water samples were cooled, packaged and submitted, under chain of custody, for laboratory analysis of the following water quality parameters:

Parameter	Abbreviation	Units
*Biological Oxygen Demand (Five day)	BOD_5	mg/l
*Chemical Oxygen Demand	COD	mg/l
*Sulfate	SO_4	mg/l
*Chloride	Cl	mg/l
*Total Non-Purgeable Organic Carbon	TNPOC	mg/l
Polychlorinated Biphenyls	PCBs	ug/l
Base, Neutral and Acid Extractable Compounds (Semi-volatiles, EPA Method 625)	BNAs	ug/l
Volatile Organic Compounds	VOCs	ug/l
Metals: Arsenic	As	mg/l
Chromium	Cr	mg/l
Copper	Cu	mg/l
Zinc	Zn	mg/l

Note: mg/l = milligrams per liter (parts per million)
ug/l = micrograms per liter (parts per billion)
* = wastewater indicator parameter

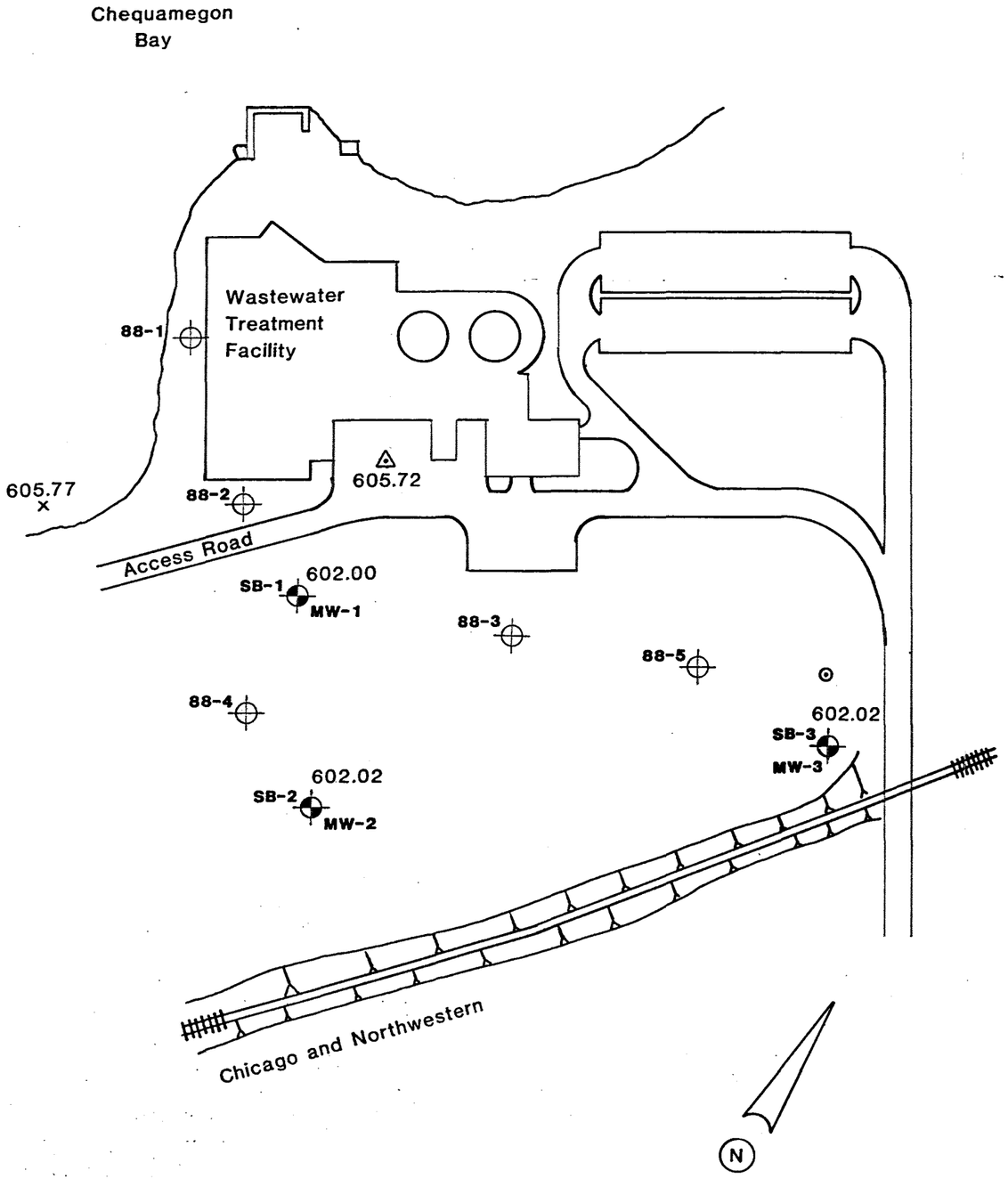
The results of the analyses can be found in Appendix A1.

In addition to the above analyses, fecal coliform content was analyzed by the in-house WWTP laboratory. These lab results are presented in Appendix A2.

3.7 Water Level Measurements and Hydraulic Testing

Water level measurements, referenced to the top of the riser pipe, were made to the nearest 0.01 foot at all monitoring wells. Water level measurements were made with an Olympic water level probe. All water level measurements were converted to site mean sea level datum to allow comparison of water levels. The water level measuring device was carefully rinsed with a methanol/acetone mixture and rinsed with distilled water between subsequent water level measurements. Water level measurement data are shown in Figure 4 and presented in Appendix F.

A series of water level measurements were collected during and after well development to ascertain the hydraulic conductivity of shallow fill materials. The high permeability of these sediments prevented the collection of sufficient data to produce meaningful values of hydraulic conductivity using normal bail recovery test methods and analyses.



LEGEND

- MONITORING WELL
- SOIL BORING
- FLOWING ARTESIAN WELL
- SITE BENCHMARK
- LAKE SUPEPIOR - FROZEN SURFACE

602.02 STATIC WATER LEVEL ELEVATION

0′ 50′ 100′ 150′ 200′

NOTE: Water level information collected 01/22/89 prior to well development

CITY OF ASHLAND
WASTEWATER TREATMENT PLANT

STATIC

GROUND-WATER ELEVATIONS

PROJECT: BRA10041 | DATE: 03/03/89

▲ *Northern Environmental Technologies Incorporated*

FIGURE 4

4.0 PHYSICAL SETTING

4.1 Site History

Prior to the 1920's, the current WWTP facility site was occupied by the Schrader Sawmill. The Sawmill was reported to have manufactured railroad ties and timbers for dock construction. The railroad ties were treated in a creosote pit reportedly located to the south of the present WWTP facility. It has not known whether the creosote pit was operated by the Schrader Sawmill or one of the various railroad companies in the area. Discussions with WWTP employees have also revealed that the Lake Superior Power District may have used the area for disposal of PCB containing transformers. However, no documents were located which confirm or disprove that this type of disposal has ever occurred at this location (Reference 1).

After the close of the sawmill and creosoting operations, (approximately 1920), the site was characterized by a WWTP employee as a lowland swamp which may have prevented the area from being developed for a number of years. In 1951, the original Ashland Wastewater Treatment Plant was constructed on the lowland site. Since the native soil conditions were unsuitable for standard foundation footings, the facility was built on pilings and concrete support structures. In addition, a clay core wall was constructed along the north and west facility boundaries to impede the inflow of lake water into the sewage treatment process equipment. The location and construction details of the clay core wall are shown in Appendix G.

In 1970, a geotechnical investigation was conducted by Lakehead Testing Laboratory, Incorporated for proposed WWTP additions. Two borings, 70-1 and 70-2, were drilled for the purpose of foundation analysis and were located in the present locations of the final sedimentation tanks and the aeration tanks, respectively. Borehole logs generated by the drilling contractor are included in Appendix B3. Additions to the WWTP were completed in 1973. The WWTP facility has remained basically unchanged to the present day (Reference 1).

4.2 Geology

4.2.1 Regional Geology

Ashland County is located within the Superior lowland of the Superior Region of northern Wisconsin (north of latitude 46° and west of longitude 90°). During the Pleistocene Epoch, the entire region was repeatedly glaciated by ice sheets advancing from Canada. Extensive unconsolidated glacial deposits that were left by the retreat of the last ice sheet now cover the Ashland area to an estimated depth of 100 to 150 feet (Reference 3).

The Superior lowland was submerged 9500 - 11500 years ago when widespread lakes stood as much as 500 feet higher than the present Lake Superior. The Superior lowland varies in elevation from 600 to 1080 feet and is characterized by a flat to undulating topography.

The Superior region is covered with glacial material that is represented by two distinct mappable units or formations. These are, from youngest to oldest, the Miller Creek Formation and the Copper Falls Formation. In the Ashland area, the Miller Creek Formation is represented by lake modified glacial sediments. Wave action and deposition during high lake stages produced a subdued topography of low relief. The areal extent of the formation is defined by a low relief, four to 18 mile wide belt that borders the southern shoreline of Lake Superior. Miller Creek till is represented as a reddish unstratified, unsorted sandy silt and clay with scattered pebbles and boulders. Deposition of this Formation occurred between about 11,500 and 9500 years ago (Reference 3).

The older Copper Falls Formation was deposited between 16,000 and 11,500 years ago. The Copper Falls Formation is exposed at the surface south of the Superior lowland and is represented as proglacial stream sediments and sandy till. Stream sediments are characterized by cross-bedded poorly graded sands and gravelly sands. The till is an undifferentiated deposit represented as a reddish brown, unstratified, gravelly, clayey, silty sand. This till is typically overlain by three feet of poorly sorted, gravelly, silty sand. The Copper Falls Formation also underlies the Miller Creek Formation.

The Copper Falls Formation is readily distinguished from the Miller Creek Formation which is somewhat redder and more clayey. Moreover, the Copper Falls Formation contains abundant sand and gravel outwash deposits and stream sediments. Both formations dip or slope gently to the north (Reference 3).

4.2.2 Site Geology

The WWTP site is located on a 500 foot wide terrace between Chequamegon Bay and a retreated shoreline to the south. The terrace was anthropogenically built up over a period of years with clayey fill and wood debris and now lies a few feet above lake level. The fill and sediments on the site have been evaluated and described based on analyses of soil samples collected from eight borings drilled to depths of up to 61 feet.

The entire site is covered with three to 15 feet of silty clay fill and other transported soils. This has been determined from the heterogeneous nature of the material and occurrences of brick rubble and coal cinders. Underlying the clay fill is a layer of wood waste of undetermined lateral extent. The wood waste is composed of saturated shredded wood fibers, chunks, and slabs.

Two immiscible phase liquids were encountered in the wood waste zone. Slightly yellow discolored ground water was observed in the void spaces while a dark green oily creosote-like liquid was detected on and in many of the wood fibers. A strong creosote odor was perceived during sample collection and analysis. The average wood waste fill thickness detected across the site was five feet, with a maximum thickness of 9.5 feet in boring SB-1. A minimal (i.e. less than one inch) thickness of wood waste was encountered at boring 88-1. Contour maps are presented that illustrate the depth to top of wood waste, depth to bottom of wood waste, and thickness of wood waste fill (Figures 5, 6, and 7, respectively).

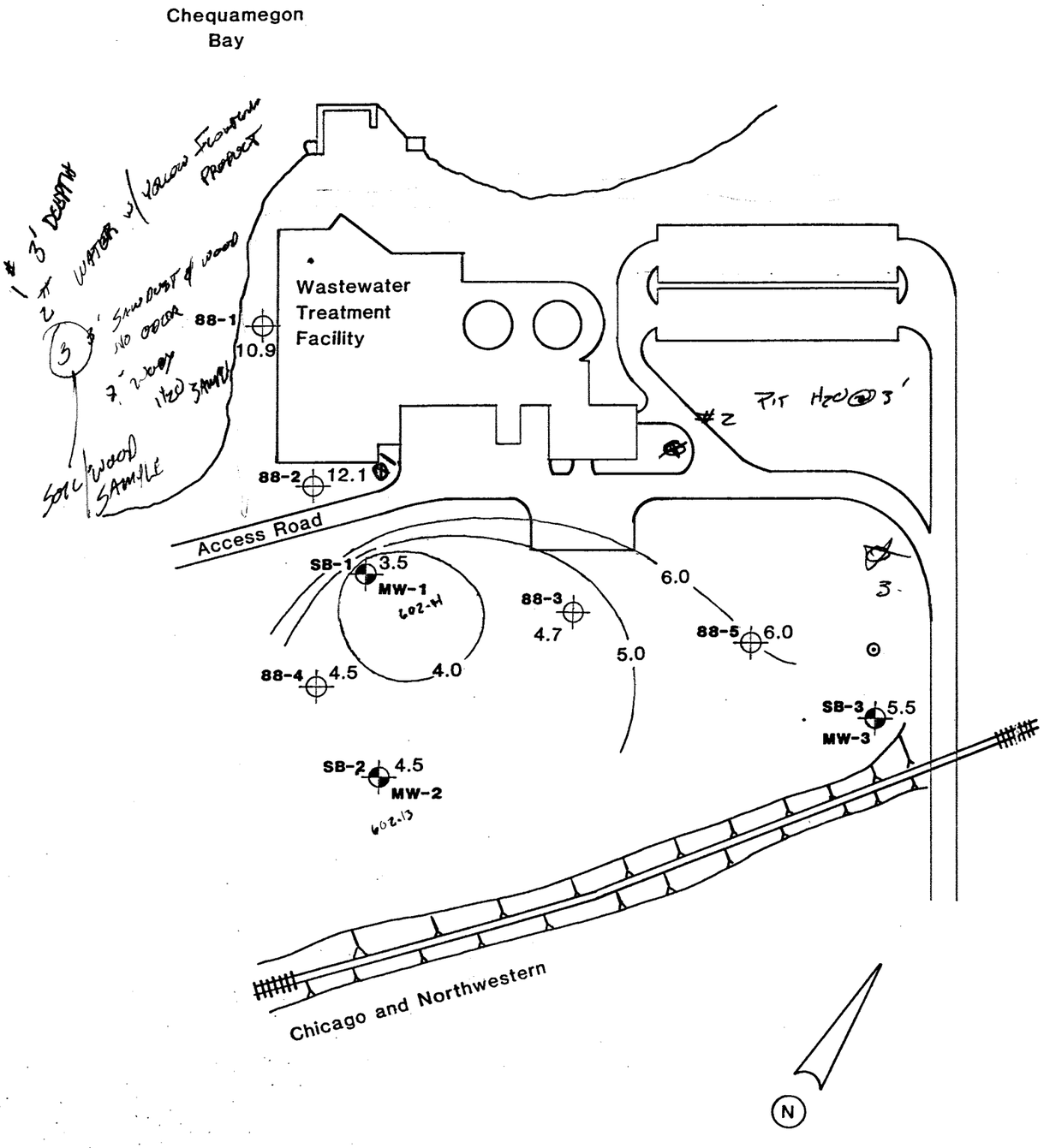
Underlying the wood waste fill are Holocene-age beach deposits and native sediments of the Miller Creek Formation. The Miller Creek Formation on the site consists of a thin discontinuous beach sand unit overlying thick lacustrine clays and glacial till. The upper formational surface is characterized by a thin discontinuous saturated layer of fine to medium, poorly graded sand. This sand unit is zero to five feet thick, and, where present, immediately underlies the wood waste. Below the sand is lake deposited silty clay. The lacustrine unit was observed to be a reddish brown silty clay and sandy silt varying in thickness from nine to 21 feet. Some fine sand seams and a few subrounded pebbles occur throughout this lake deposit.

In borings 88-1, 88-2, and 88-3, the lacustrine silty clay is underlain by a discontinuous non-bedded glacial till of the Miller Creek Formation. It varies from a reddish brown gravelly lean clay with sand to a silty sand. Weathered rounded sandstone pebbles up to 3/4-inch in diameter occur sporadically throughout the till. Till thickness across the site varies from 20 feet in boring 88-1 to no occurrence in borings 88-4 and 88-5.

Evidence suggests that the Copper Falls Formation was encountered in the deep borings (88-1 through 88-5) at depths ranging from 25 feet (88-4) to 55 feet (88-1). This is based on the following observations.

- The color of glacial sediments darkened from red to reddish brown with depth.
- Deeper sediments were relatively coarse grained and stratified.
- The deeper sediments contained considerably less clay.

Texturally, the Copper Falls Formation consists of inter-bedded sequences of sand and gravel outwash deposits and glacial till. The lower five to 30 feet of borings 88-1 and 88-3, respectively, were logged as Copper Falls Formation sediments. Neither bedrock, nor the base of the Copper Falls Formation, were encountered during this investigation. A schematic diagram illustrating the site stratigraphy is presented in Figure 8.



LEGEND

- MONITORING WELL
- SOIL BORING
- FLOWING ARTESIAN WELL
- 4.5 DEPTH TO TOP OF WOOD WASTE CONTOUR LINE (feet)

0' 50' 100' 150' 200'

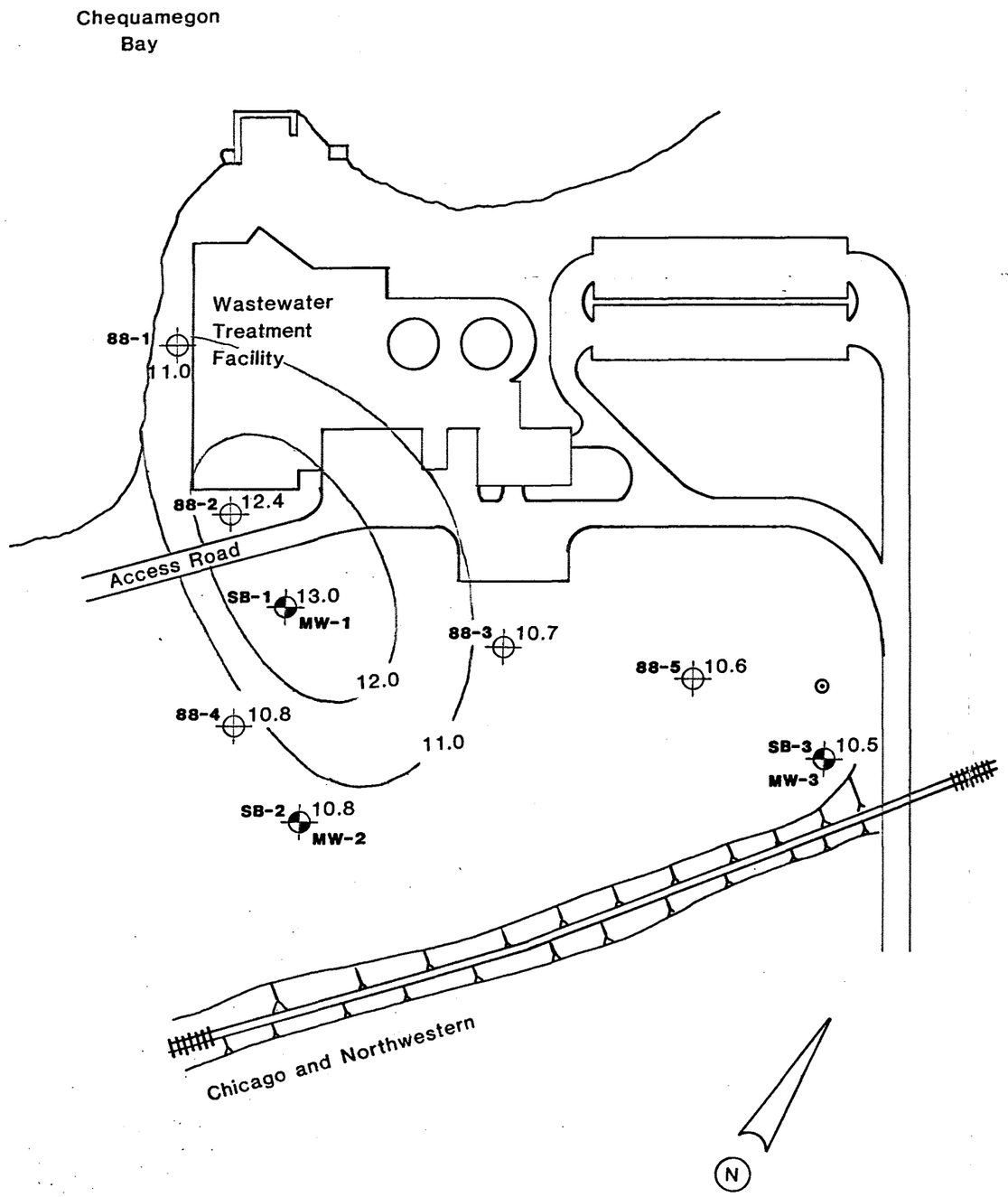
CITY OF ASHLAND
WASTEWATER TREATMENT PLANT

DEPTH TO TOP OF WOOD WASTE

PROJECT: BRA10041 | DATE: 03/03/89

▲ *Northern Environmental Technologies Incorporated*

FIGURE 5



LEGEND

- MONITORING WELL
- SOIL BORING
- FLOWING ARTESIAN WELL
- 10.7 DEPTH TO BOTTOM OF WOOD WASTE CONTOUR LINE (feet)

0' 50' 100' 150' 200'

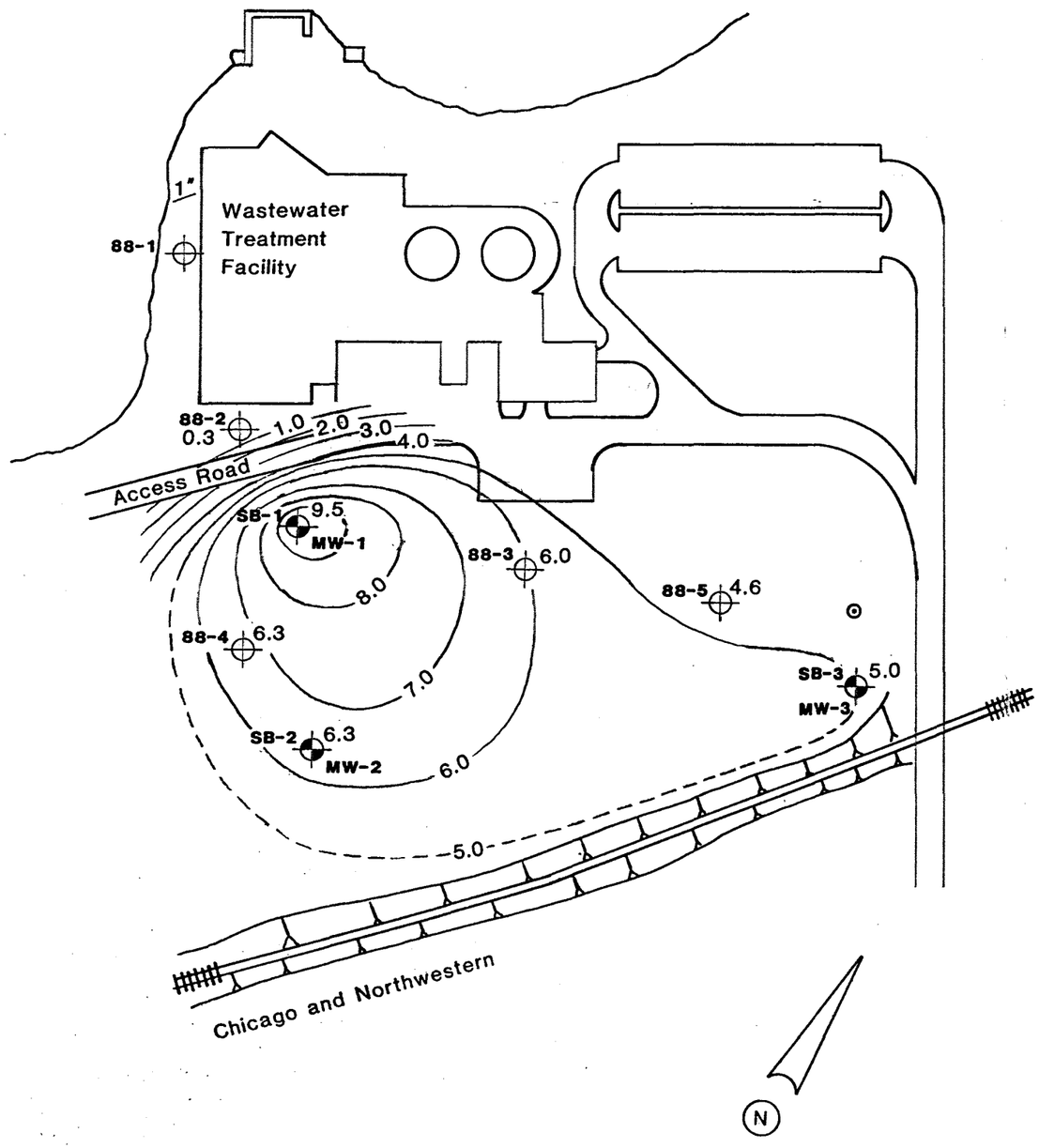
CITY OF ASHLAND
WASTEWATER TREATMENT PLANT

DEPTH TO BOTTOM OF WOOD WASTE

PROJECT: BRA10041 | DATE: 03/03/89

▲ *Northern Environmental Technologies Incorporated*

FIGURE 6



LEGEND

- MONITORING WELL
- SOIL BORING
- FLOWING ARTESIAN WELL
- 5.0 WOOD WASTE THICKNESS CONTOUR LINE (feet)

0' 50' 100' 150' 200'

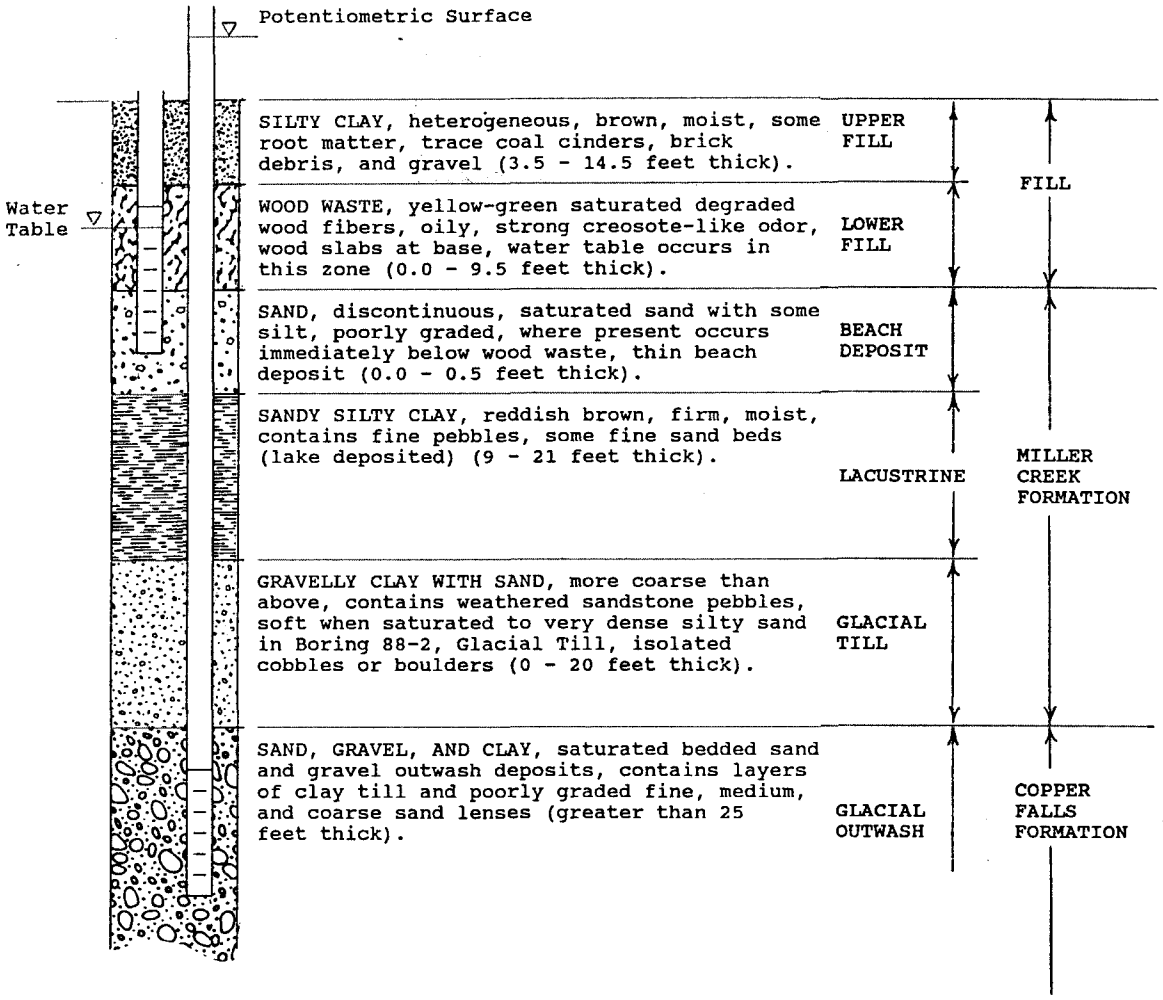
CITY OF ASHLAND
WASTEWATER TREATMENT PLANT

THICKNESS OF WOOD WASTE

PROJECT: BRA10041 | DATE: 03/03/89

▲ *Northern Environmental Technologies Incorporated*

FIGURE 7



CITY OF ASHLAND
WASTEWATER TREATMENT PLANT

SCHEMATIC OF SITE STRATIGRAPHY
AND
VERTICAL HYDRAULIC GRADIENTS

PROJECT: BRA10041 | DATE: 03/03/89

▲ Northern Environmental Technologies
Incorporated

FIGURE 8

4.3 Hydrology

4.3.1 Regional Hydrology

Ground water throughout the Lake Superior basin moves naturally from areas of recharge to lower areas of discharge. The ultimate discharge area of ground water in the basin is Lake Superior, where about 100 cubic feet per second discharges to the lake along the Lake Superior shoreline (Reference 4).

Flowing artesian wells are numerous near Lake Superior on the lake plain and around the Bayfield Peninsula. The artesian head results mainly from the restriction of vertical ground-water movement through the thick confining layers of horizontally bedded lake clay. Static heads of more than 30 feet above the level of Lake Superior have been reported near Chequamegon Bay (Reference 4).

Most ground water in the basin is obtained from one of three aquifers:

1) Glacial sand and gravel,
2) Sandstones, and
3) Lava flows.

Sand and gravel aquifers are limited in storage and are normally discontinuous. The suitability of sand and gravel deposits for water supply purposes is entirely dependent on the size and extent of the coarse permeable unit. Sandstone aquifers are extensive and used primarily as a water supply near the City of Superior, Wisconsin, on the fringes of the Bayfield Peninsula, and in or near the City of Ashland. Lava flows are a source of water supply within the lava outcrop area south of the City of Superior, Wisconsin.

4.3.2 Site Hydrology

4.3.2.1 Surface Water

Precipitation which falls onto the site leaves the ground surface as runoff, infiltration, and/or evaporation. All surface water runoff drains immediately north into Lake Superior. No significant source of surface water run-on was observed. Surface water which infiltrates into the soil, escapes evaporation, and percolates to the water table becomes a component of ground-water recharge.

4.3.2.2 Ground Water

Two distinct hydrostratigraphic units were observed within the upper 60 feet of sediments:

1) A shallow water table system existing in the permeable wood waste fill and underlying fine sand lenses, and

2) A deep confined glacial outwash aquifer.

These flow systems are separated by a thick sequence (15 to 40 feet) of relatively impermeable lake clay and glacial till.

The shallow ground-water table flow system is primarily confined to the wood waste and hydraulically connected sand lenses. Water level elevations within this water table system system are approximately equal to Lake Superior water level. The lake elevation (as measured to the surface of the ice) was actually three feet higher than the static water levels in wells measured on January 22, 1989 (Figure 4). This was probably due primarily to expansion and build up of ice near the Lake Superior shoreline.

The thickness of the permeable portion of the ground-water table flow system varies from a minimum of two feet in boring 88-2 to 12 feet in boring 88-4. The contour map illustrating wood waste thickness (Figure 7) may be used to approximate the configuration of the permeable flow zone. Recharge to this flow system is primarily by precipitation, lake inflow, and underflow seepage from the shoreline embankment to the south. Discharge of ground water from the water table flow system is primarily by seepage into Lake Superior and by evaporation.

The ground-water table was encountered between four to seven feet below the ground surface across the site. This may be assumed to be representative of normal winter conditions. The water table is extremely flat and nearly horizontal because of the close proximity of Lake Superior and the permeable nature of the wood waste fill. Water level measurements from the recently installed ground-water monitoring wells (MW-1, MW-2, and MW-3) indicate a subtle horizontal hydraulic gradient of 0.0001 foot/foot to the north towards Lake Superior (Figure 4). Due to the extremely low gradient, additional water level data is required to confirm the direction and magnitude of this gradient.

Development of the monitoring wells (Section 3.6) indicates that ground water is readily released from storage within the permeable fill. This is evidenced by high short term well yields. Specific capacities [gallons per minute per foot of drawdown, gpm/ft] were calculated for MW-1 and MW-2 and were found to be in excess of 10 and 40 gpm/ft, respectively. However, sustained yields will probably be less due to the depletion of storage of the limited water table flow system. Applying the method of Hvorslev (Reference 5) to the available water level data indicates that hydraulic conductivities of the wood waste fill are as low as 0.0001 centimeters per second (cm/sec) and range to in excess of 0.005 cm/sec.

The confined glacial outwash aquifer is found approximately 25 to 55 feet below ground surface. This aquifer is suspected to occur within the relatively permeable sand, gravel, and cobble outwash deposits and stream sediments of the Copper Falls Formation. The unit thickness could not be determined within the scope of this investigation, but is known to exceed 20 feet. Recharge to the outwash aquifer occurs mainly as vertical leakage through the overlying glacial deposits of the Miller Creek Formation and where it is exposed at the surface to the south of the Superior lowland where the lake clays of the Miller Creek Formation are absent.

A strong upward hydraulic gradient of 1.5 foot/foot was calculated between the water table flow system and the deeper outwash aquifer. This value was calculated by comparing the water level elevation at monitoring well MW-3, and the potentiometric head elevation of the flowing artesian well (Figure 8). The potentiometric or artesian head elevation of the artesian well was calculated to be approximately 624 feet mean sea level datum or 17 feet above ground surface. This elevation was calculated from a hydraulic pressure gauge reading of six pounds per square inch (psi), where one psi equals approximately 2.3 feet of hydraulic head.

5.0 IMPACT INVESTIGATION

5.1 Results of Investigative Activities

5.1.1 Magnetometer Survey

A reconnaissance level magnetometer survey was conducted over the suspected disposal area to assess the presence of buried ferromagnetic objects. Numerous signals were observed which indicated buried ferromagnetic objects throughout the area investigated. The bulk of the signals were due to small, near surface objects. Larger objects were identified in the soil piles south of MW-2 and the immediate area around MW-3. Employees at the WWTP reported to Northern Environmental that the soil piles may contain a few pipes and metal scrap disposed from the treatment plant (Reference 1). No other large anomalous ferromagnetic objects were detected during the magnetometer survey.

5.1.2 Soil Impacts

The results of detailed field investigations and laboratory data indicate that the wood waste fill and soils adjacent to the fill are impacted with a liquid substance resembling creosote (hereafter referred to as creosote). Creosote impacted soils were initially detected during soil boring sample analysis. Impacted samples were generally characterized as oily, dark green, saturated wood chips and fibers.

PID responses were relatively low across the site and within the wood waste zone. However, the PID has a relatively low sensitivity to semivolatile compounds typical of those which constitute creosote. The maximum PID reading on the site (72 ppm) was of sample S3 of the wood waste in boring SB-1 from 4.5 - 6.0 feet (Appendix B1).

Laboratory analysis (Appendix A1) of the composite soil sample DB#2/DB#5 for BNAs strongly suggest that the dominant source of soil impacts is creosote. Soil sample DB#2/DB#5 was composited from boring 88-2 (12.0 - 13.5) and boring 88-5 (0.0 - 10.5 feet). Of the 10 creosote constituents analyzed, nine were detected in DB#2/DB#5 (Table 1). A total of 12 BNA compounds were detected with pyrene [35,000 nanograms per gram (ng/g)], and fluoranthene (15,000 ng/g) detected in the highest concentrations (Table 2). One nanogram per gram (ng/g) is approximately equal to one part per billion (ppb).

Soil sample DB#4 (boring 88-4, 4.5 - 6.0 feet) was laboratory analyzed for PCBs, VOCs, arsenic, chromium, copper, and zinc. No PCBs or VOCs were detected. However, elevated concentrations of arsenic (100 ug/g), chromium (5 ug/g), copper (46.5 ug/g), and zinc (165 ug/g) were discovered. One microgram per gram (ug/g)

TABLE 1 - Comparison of Composition of Creosote and Results of Base/Neutral and Acid Extractable Analyses
Artesian Well, MW-1, MW-2, MW-3, DB2/DB5
City of Ashland, Wastewater Treatment Plant

Component	Percent by Weight of Raw Creosote A	B	C	Analyzed as Part of this Study	Present in Concentration Above Detection Limits: Artesian Well	MW-1	MW-2	MW-3	Composite Soil Sample DB2/DB5
Low Boilers		3.2							
Naphthalene	10.5	6.6	3.0	x		x	x	x	x
2-Methylnaphthalene	4.0	8.5	1.2	x					
1-Methylnaphthalene	2.15	4.1	0.9						
Biphenyl	1.17		0.8						
Dimethylnaphthalene		4.4	2.0						
Acenaphthylene	0.285			x		x	x		x
Acenaphthene	4.83	5.6	9.0	x		x	x	x	x
Dibenzofuran	3.21	3.9	5.0						
Flurorene	3.74	4.2	10.0	x		x	x	x	x
Methylfluorene			3.0						
Phenanthrene	12.0	>11.7	21.0	x		x	x	x	x
Anthracene	1.56		2.0	x		x	x	x	x
Carbazole	3.17		2.0						
Methylphenanthrene			3.0						
Methylanthracene			4.0						
Fluoranthrene	7.32	4.5	10.0	x		x	x	x	x
Pyrene	5.2	3.4	8.5	x		x	x	x	x
Benzofluorene			2.0						
1,2-Benzanthracene/Chrysene	2.6								
Chrysene			3.0	x		x	x	x	x
Total	61.74	60.1	87.7						

Sources of Data

A - Mississippi Forest Products Laboratory and Mississippi University, September, 1983.

B - Hepner, R.D., 1977.

C - American Wood Preserver's Association, 1972.

TABLE 2 - Summary of Laboratory Analysis Results
City of Ashland, Wastewater Treatment Plant

Parameter	Detection Limit Water (ug/l)	Detection Limit Soil (ng/g)	Ground-Water Samples MW-1 (ug/l)	MW-2 (ug/l)	MW-3 (ug/l)	Artesian Well (ug/l)	Composite Soil Sample DB2/DB5 (ng/g)
SEMI-VOLATILES							
Acenaphthene	20	970	330	300	88	ND	4400
Fluorene	20	970	180	150	83	ND	4900
Phenanthrene	20	4800	370	300	170	ND	11000
Anthracene	20	4800	110	320	100	ND	7100
Fluoranthene	20	970	110	140	260	ND	15000
Pyrene	20	970	230	370	790	ND	35000
Benzo(a)anthracene	20	970	59	93	180	ND	10000
Chrysene	20	970	60	93	180	ND	10000
Bis(2-Ethylhexyl)phthalate	20	970	18*	28	58	ND	ND
Benzo(b)fluoranthrene	20	970	53	77	150	ND	8000
Benzo(a)pyrene	20	970	51	79	170	ND	8900
Indeno(1,2,3-cd)pyrene	20	970	22	33	80	ND	3500
Dibenz(a,h)anthracene	20	970	ND	14*	26	ND	1400
Benzo(g,h,i)perylene	20	970	27	45	110	ND	4700
Phenol	20	970	ND	14*	ND	ND	ND
Naphthalene	20	970	150	1800	16*	ND	3300
Acenaphthylene	20	970	38	33	ND	ND	1600
VOLATILES							DB4 (ng/g)
Benzene	5.0	2.0	190	390	51.4	ND	ND
Ethylbenzene	10.0	4.0	ND	190	ND	ND	ND
Toluene	5.0	2.0	27.1	31.7	ND	ND	ND
m- and p-Xylene	10.0	4.0	73.8	130	ND	ND	ND
o-Xylene	10.0	4.0	150	220	ND	ND	ND
METALS							
Arsenic	5	22000	ND	ND	ND	ND	100000
Chromium	9	2000	ND	ND	ND	ND	5000
Copper	5	1000	23	ND	ND	ND	46500
Zinc	3	600	12	4	16	8	16000

ND = Not Detected
* = Estimated Concentration
ug/l = Parts per billion (ppb)
ng/g = Parts per billion (ppb)

is approximately equal to one part per million (ppm). Arsenic, chromium, copper, and zinc are metals commonly used in inorganic wood preservative salts.

Dexsil analysis of of sample S6 from boring 88-2 did not detect any PCBs or other chlorinated compounds above ten ppm. Dexsil analysis of auger cuttings collected during drilling at boring SB-1 detected over 50 ppm of PCBs or other chlorinated organic substance. However, no PCBs were detected in any of the soil samples submitted for laboratory analysis.

The vertical extent of soil impacts appears to be limited to the soils adjacent to the wood waste and the underlying discontinuous thin sand lenses. This is supported by visual inspection and low PID readings on the deeper lacustrine clays and glacial tills. Furthermore, none of the BNAs detected in the wood waste were detected in the artesian well which is completed in the lower confined aquifer.

Impacted soils underlie at least 1.1 acres of WWTP property south of the treatment facility. All the borings, except 88-1, penetrated significant thicknesses of impacted soils and wood waste. Therefore, the total lateral extent of soil impacts could not be fully defined in this investigation. In view of the physiography of the shoreline, it is expected that the wood waste disposal area may exist further to the northeast and southwest, paralleling the shoreline of Chequamegon Bay.

Cleanup guidelines for VOC contaminated soils have been established by the Wisconsin Department of Natural Resources (WDNR) at 10 ppm in Reference 6. This limit represents the practical limit of detection, for VOCs in soils, achievable in field and laboratory analysis. No VOC soil impacts were detected.

5.1.3 Ground-Water Impacts

The water table flow system is impacted with the dissolved constituents of creosote and four priority pollutant VOCs. Table 2 summarizes compounds detected as part of this study. Of the 10 BNA constituents of creosote analyzed, all were detected in ground-water monitoring wells MW-1 and MW-2. Ground water from monitoring well MW-3 contained nine of the BNA constituents of creosote above the detection limit (Table 1). Seventeen BNA compounds were consistently detected in all the monitoring wells which indicated shallow ground-water impacts exist across the site. The compounds detected in the highest concentrations included naphthalene (1800 ug/l) in MW-2 and pyrene (790 ug/l) in MW-3. Of the VOCs analyzed, benzene, ethylbenzene, toluene, and xylene (BETX were detected (Appendix A1). These compounds are typical components of light grade petroleum fuels (e.g. kerosene and diesel). It was common practice to cut creosote with kerosene and/or diesel during the wood preserving process. No

PCBs were detected in ground water collected from any of the wells.

In addition to dissolved impacts, all of the ground-water monitoring wells installed as part of this study appeared to contain a floating immiscible product phase. This immiscible product phase consisted of a yellowish or greenish yellow oily substance. This floating phase was estimated to be no more than one inch thick.

A series of routine wastewater parameters were also analyzed to determine if sewage impacts existed in the water table zone. Sewage impacts were suspected during well development when characteristic sewage odors and soapy films were observed in the pumped ground water. A water sample was collected for fecal coliform analysis from the three monitoring wells and analyzed by the WWTP in-house laboratory. No fecal coliform populations were detected (Appendix A2). COD values were at least one order of magnitude higher than BOD values (Appendix A1). The water sample from MW-3 exhibited a COD value of 1870 mg/l which indicates significant uptake of oxygen by organic and inorganic matter. These data indicate that no noticeable sewage impacts exist within the water table flow system and offer additional supporting evidence that on-site creosote is the source of identified impacts.

The vertical extent of impacted ground-water appears to be confined to the water table system. This is supported by the following observations:

- No soil impacts were observed in deeper soils during visual inspection and PID screening of soil samples collected from the geotechnical borings.
- The relatively impermeable lacustrine clay and glacial till units of the Miller Creek Formation are up to 20 thick and would severely limit vertical migration of contaminants.
- There is a strong upward vertical hydraulic gradient (estimated to be 1.5 feet/feet) between the lower confined outwash aquifer and the water table system. The upward flow of ground water would prevent the downward migration of contaminants.
- No BNAs or other organic parameters were detected in the sample collected from the artesian well.

The lateral extent of ground-water impacts within the water table flow system could not be fully defined given the available information. The lateral extent of ground-water impacts will depend upon the size of the wood waste disposal area, the permeability of the fill material, and the lateral extent of the discontinuous sand lenses that occur at the base of the fill.

Ground-water quality standards are established by the WDNR in Reference 7. Ground-water sample analyses from monitoring wells MW-1, MW-2, and MW-3 were compared with WDNR ground-water quality standards (Table 3). Two parameters exceed the water quality standards. The WDNR enforcement standard (ES) for benzene (0.67 ppb) was exceeded for all wells (MW-1: 190 ppb, MW-2: 39 ppb, and MW-3: 350 ppb). The WDNR preventative action limit (PAL) for xylene (124 ppb) was exceeded in two wells (MW-1: 223.8 ppb and MW-2: 350 ppb). The violation of these indicator parameters have been verbally reported to the WDNR per the requirements of s. NR140.24 and NR140.26 (Reference 8). This report meets the written requirements of these sections of the Wisconsin Administrative Code.

5.2 Migration Potential and Fate

The migration potential of creosote and BETX impacted ground water on and within the water table flow system is expected to be minimal. This is based on the following observations.

- Horizontal hydraulic gradients at the site are extremely low (0.0001 foot/foot).
- Thick, relatively impermeable deposits of lacustrine clay and glacial till underlying the water table flow system coupled with strong upward vertical hydraulic gradient should prevent downward migration of contaminants.
- Although disposal of creosote compounds probably ceased over 50 years ago, significant concentrations of wood preservative compounds remain on the WWTP site.
- The majority of the compounds which compose creosote are not soluble in water.
- The periphery of the wood waste disposal area is most likely "pinched out" between the upper clay fill and the lower lacustrine clays limiting lateral migration of impacted ground water in the relatively permeable wood waste.

A potential migration route exists within underlying sand lenses, whereby contaminants could be transported off site under the low lateral hydraulic gradient. The continuity of the thin sand deposits will have a direct influence on the significance of the potential migration pathway. The most likely fate of impacted ground water is seepage into Lake Superior. This potential has been inadvertently minimized by the construction of a clay core wall. A clay core wall was constructed in 1952 along the north and western borders of the initial treatment plant to impede sub-surface water inflow from Lake Superior to the WWTP area (Appendix G).

TABLE 3 - Comparison of Monitoring Well Water Sample Analysis Results with WDNR Public Health Ground-Water Quality Standards
City of Ashland, Wastewater Treatment Plant

Parameter	WDNR Preventative Action Limit (PAL) (ug/l)	WDNR Enforcement Standard (ES) (ug/l)	Detection Limit (ug/l)	MW-1 (ug/l)	MW-2 (ug/l)	MW-3 (ug/l)	Artesian Well (ug/l)
METALS							
Arsenic	5	50	5.0	ND	ND	ND	ND
Chromium	5	50	9.0	ND	ND	ND	ND
VOLATILES							
Benzene	0.067	0.67	5.0	190+	390+	51.4+	ND
1,2-Dichlorobenzene	125	1250	10.0	ND	ND	ND	ND
1,3-Dichlorobenzene	125	1250	10.0	ND	ND	ND	ND
1,4-Dichlorobenzene	150	750	10.0	ND	ND	ND	ND
1,1-Dichloroethane	85	850	5.0	ND	ND	ND	ND
1,2-Dichloroethane	0.05	0.5	5.0	ND	ND	ND	ND
1,1-Dichloroethylene	0.024	0.24	10.0	ND	ND	ND	ND
1,2-Dichloroethylene	10	100	10.0	ND	ND	ND	ND
Ethylbenzene	272	1360	10.0	ND	190	ND	ND
Tetrachloroethylene	1.0	0.1	5.0	ND	ND	ND	ND
Toluene	68.6	343	5.0	27.1	31.7	ND	ND
1,1,1-Trichloroethane	40	200	5.0	ND	ND	ND	ND
1,1,2-Trichloroethane	0.06	0.6	5.0	ND	ND	ND	ND
Trichloroethylene	1.8	0.18	5.0	ND	ND	ND	ND
Vinyl Chloride	0.015	0.0015	20.0	ND	ND	ND	ND
Trichlorofluoromethane	3500	700	10.0	ND	ND	ND	ND
Xylene	124	620	10.0	223.8*	350*	ND	ND

ND = Not Detected
+ = WDNR Enforcement Standard Exceeded
* = WDNR Preventative Action Limit Exceeded
ug/l = Parts per billion (ppb)

5.3 Environmental and Human Health and Welfare Impacts

There does not appear to be an immediate environmental or public health risk associated with the identified creosote and VOC impacts at the WWTP facility. No residential water supply wells were identified down gradient. Discharge of impacted ground water would probably occur along the Lake Superior shoreline. Dilution of contaminants to background levels would be expected in Lake Superior long before reaching the City of Ashland water intakes.

The most probable route of entry to individuals would be by dermal contact. Should the waste be exposed at the surface (e.g. as during excavation and construction activities), prolonged contact with the skin can cause burns or rashes to develop. When ingested internally, creosote is a suspected carcinogen. To date, there have been no abnormal health effects, complaints, or incidents filed that have been associated with the creosote disposal pit.

6.0 CONCLUSIONS

Nine creosote containing compounds and elevated concentrations of arsenic, chromium, copper, and zinc were detected in soil samples collected from the wood waste layer. Laboratory analysis of samples collected from ground-water quality monitoring wells on the site indicates that dissolved components of creosote exist in the ground water (Table 2). Although, the concentrations of these dissolved components do not appear to currently pose a threat to human health and welfare or the environment, the concentrations of benzene detected exceeds the WDNR Enforcement Standard and the concentration of xylene detected exceeds the WDNR Preventative Action Limit.

7.0 REFERENCES

1) Conversation: J. Dellaport (Northern Environmental) with D. Wasepka (City of Ashland) and other WWTP employees, January 16 through February 8, 1989.

2) Conversation: J. Dellaport (northern Environmental) with M. Siep (Bonestroo, Rosene, Anderlik, & Associates), January 30, 1989.

3) Clayton, Lee, "Pleistocene Geology of the Superior Region, Wisconsin", Geological and Natural History Survey, Information Circular Number 46, 1984.

4) Young, H.L. and Skimner, E.L., "Water Resources of Wisconsin Lake Superior Basin ", U.S. Geological Survey, Hydrologic Investigations Atlas HA-524.

5) Hvorslev, M.J., "Time Log and Soil Permeability in Ground-Water Observations", U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi, Bulletin Number 36, 1951.

6) Letter: P. Didier (WDNR) to District Directors (WDNR), "Practices and Standards for the Management of VOC - Contaminated Soils", April 18, 1989.

7) s. NR 140, Wis. Adm. Code, "Groundwater Quality", October, 1988.

8) Conversation: D. Rautmann (Northern Environmental) with D. Kafura (WDNR), January 24, 1989.

APPENDIX A

RESULTS OF CHEMICAL ANALYSIS

APPENDIX A1

ENVIROSCAN LABORATORY REPORTS

ENVIROSCAN

February 16, 1989

Northern Environmental Technologies
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Project BRA 10041
Ashland Site Assessment

Attached are the analytical results for the samples received January 27, 1989. All analyses were done in accordance with EPA Methods (EPA-600/4-79-020).

If you have any questions about the results, please call.

Sincerely,

ENVIROSCAN, INC.

James R. Salkowski

James R. Salkowski
Manager of Inorganic Laboratories

JRS/ls

303 West Military Road Rothschild, WI 54474 (715) 359-7226

ENVIROSCAN

February 13, 1989

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Ashland Site

Attached are the results of the samples received on January 30, 1989. The analyses were all done in accordance to EPA methods. The soil sample results are reported on a dry weight basis.

The chain of custody documents are also attached.

If you have any questions, please call.

Sincerely,

ENVIROSCAN, INC.

Gary L. Scharrer
Analytical Chemist

GLS/ls

303 West Military Road Rothschild, WI 54474 (715) 359-7226

ANALYTICAL REPORT

ENVIROSCAN ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Ashland Site

P.O. #: BRA 10041
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-13-89
APPROVED BY:

PCB Analysis (ug/l)

Compound	Supply Well	MW-1	MW-2	MW-3	Detection Limit
Aroclor 1016	X	X	X	X	0.2
Aroclor 1221	X	X	X	X	0.2
Aroclor 1232	X	X	X	X	0.2
Aroclor 1242	X	X	X	X	0.2
Aroclor 1248	X	X	X	X	0.2
Aroclor 1254	X	X	X	X	0.2
Aroclor 1260	X	X	X	X	0.2
Analytical No.	12914	12915	12916	12917	

X = Analyzed but not detected

All analyses have been conducted in accordance with the Enviroscan Analytical Services Quality Assurance Program.

ANALYTICAL REPORT

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Ashland Site

P.O. #: BRA 10014
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-13-89
APPROVED BY:

PCB Analysis (ng/g)

Compound	DB-4	Detection Limit*
Aroclor 1016	X	35.0
Aroclor 1221	X	35.0
Aroclor 1232	X	35.0
Aroclor 1242	X	35.0
Aroclor 1248	X	35.0
Aroclor 1254	X	35.0
Aroclor 1260	X	35.0
Analytical No.	12918	

X = Analyzed but not detected

* Calculated on dry weight basis

ANALYTICAL REPORT

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Ashland Site

P.O. #:
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-13-89
APPROVED BY:

EPA 625 Analysis (ug/l)

Compound	Supply Well	MW-1	Detection Limit
Phenol	X	X	20.
bis(2-Chloroethyl)ether	X	X	20.
2-Chlorophenol	X	X	20.
1,3-Dichlorobenzene	X	X	20.
1,4-Dichlorobenzene	X	X	20.
1,2-Dichlorobenzene	X	X	20.
bis(2-Chloroisopropyl)ether	X	X	20.
N-Nitroso-di-n-propylamine	X	X	20.
Hexachloroethane	X	X	20.
Nitrobenzene	X	X	20.
Isophorone	X	X	20.
2-Nitrophenol	X	X	20.
2,4-Dimethylphenol	X	X	20.
bis(2-Chloroethoxy)methane	X	X	20.
2,4-Dichlorophenol	X	X	20.
1,2,4-Trichlorobenzene	X	X	20.
Naphthalene	X	150.	20.
Hexachlorobutadiene	X	X	20.
4-Chloro-3-methylphenol	X	X	20.
2-Methylnaphthalene	X	X	20.
Hexachlorocyclopentadiene	X	X	20.
2,4,6-Trichlorophenol	X	X	20.
2-Chloronaphthalene	X	X	20.
Dimethylphthalate	X	X	20.
Acenaphthylene	X	38.	20.
2,6-Dinitrotoluene	X	X	20.
Benzidine	X	X	100.
Analytical No.	12914	12915	

X = Analyzed but not detected

ANALYTICAL REPORT

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Ashland Site

P.O. #:
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-13-89
APPROVED BY:

EPA 625 Analysis (ug/l)

Compound	Supply Well	MW-1	Detection Limit
Acenaphthene	X	330.	20.
2,4-Dinitrophenol	X	X	100.
4-Nitrophenol	X	X	100.
2,4-Dinitrotoluene	X	X	20.
Diethylphthalate	X	X	20.
4-Chlorophenyl-phenylether	X	X	20.
Fluorene	X	180.	20.
4,6-Dinitro-2-methylphenol	X	X	100.
N-Nitrosodiphenylamine(1)	X	X	20.
4-Bromophenyl-phenylether	X	X	20.
Hexachlorobenzene	X	X	20.
Pentachlorophenol	X	X	100.
Phenanthrene	X	370.	20.
Anthracene	X	110.	20.
Di-n-butylphthalate	4.(J)	X	20.
Fluoranthene	X	110.	20.
Pyrene	X	230.	20.
Butylbenzylphthalate	X	X	20.
3,3'-Dichlorobenzidine	X	X	40.
Benzo(a)anthracene	X	59.	20.
Chrysene	X	60.	20.
bis(2-Ethylhexyl)phthalate	X	18.(J)	20.
Di-n-octylphthalate	X	X	20.
Benzo(b)fluoranthene	X	53.	20.
Benzo(k)fluoranthene	X	X	20.
Benzo(a)pyrene	X	51.	20.
Indeno(1,2,3-cd)pyrene	X	22.	20.
Dibenz(a,h)anthracene	X	X	20.
Benzo(g,h,i)perylene	X	27.	20.
Analytical No.	12914	12915	

X = Analyzed but not detected
J = Estimated Conc.

All analyses have been conducted in accordance with the Enviroscan Analytical Services Quality Assurance Program.

ANALYTICAL REPORT

ENVIROSCAN
ENVIRONMENTAL AND ANALYTICAL SERVICES
WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Ashland Site

P.O. #:
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-13-89
APPROVED BY:

EPA 625 Analysis (ug/l)

Compound	MW-2	MW-3	Detection Limit
12 Phenol	14.(J)	X	20.
bis(2-Chloroethyl)ether	X	X	20.
2-Chlorophenol	X	X	20.
1,3-Dichlorobenzene	X	X	20.
1,4-Dichlorobenzene	X	X	20.
1,2-Dichlorobenzene	X	X	20.
bis(2-Chloroisopropyl)ether	X	X	20.
N-Nitroso-di-n-propylamine	X	X	20.
Hexachloroethane	X	X	20.
Nitrobenzene	X	X	20.
Isophorone	X	X	20.
2-Nitrophenol	X	X	20.
2,4-Dimethylphenol	X	X	20.
bis(2-Chloroethoxy)methane	X	X	20.
2,4-Dichlorophenol	X	X	20.
1,2,4-Trichlorobenzene	X	X	20.
9 Naphthalene	1800.	16.(J)	20.
Hexachlorobutadiene	X	X	20.
4-Chloro-3-methylphenol	X	X	20.
2-Methylnaphthalene	X	X	20.
Hexachlorocyclopentadiene	X	X	20.
2,4,6-Trichlorophenol	X	X	20.
2-Chloronaphthalene	X	X	20.
Dimethylphthalate	X	X	20.
Acenaphthylene	33.	X	20.
2,6-Dinitrotoluene	X	X	20.
Benzidine	X	X	100.
Analytical No.	12916	12917	

X = Analyzed but not detected
J = Estimated Conc.

ANALYTICAL REPORT

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Ashland Site

P.O. #:
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-13-89
APPROVED BY:

EPA 625 Analysis (ug/l)

Compound	MW-2	MW-3	Detection Limit
Acenaphthene	300.	88.	20.
2,4-Dinitrophenol	X	X	100.
4-Nitrophenol	X	X	100.
2,4-Dinitrotoluene	X	X	20.
Diethylphthalate	X	X	20.
4-Chlorophenyl-phenylether	X	X	20.
Fluorene	150.	83.	20.
4,6-Dinitro-2-methylphenol	X	X	100.
N-Nitrosodiphenylamine(1)	X	X	20.
4-Bromophenyl-phenylether	X	X	20.
Hexachlorobenzene	X	X	20.
Pentachlorophenol	X	X	100.
Phenanthrene	300.	170.	20.
Anthracene	320.	100.	20.
Di-n-butylphthalate	X	X	20.
Fluoranthene	140.	260.	20.
Pyrene	370.	790.	20.
Butylbenzylphthalate	X	X	20.
3,3'-Dichlorobenzidine	X	X	40.
Benzo(a)anthracene	93.	180.	20.
Chrysene	92.	180.	20.
bis(2-Ethylhexyl)phthalate	28.	58.	20.
Di-n-octylphthalate	X	X	20.
Benzo(b)fluoranthene	77.	150.	20.
Benzo(k)fluoranthene	X	X	20.
Benzo(a)pyrene	79.	170.	20.
Indeno(1,2,3-cd)pyrene	33.	80.	20.
Dibenz(a,h)anthracene	14.(J)	26.	20.
Benzo(g,h,i)perylene	45.	110.	20.
Analytical No.	12916	12917	

X = Analyzed but not detected
J = Estimated Conc.

All analyses have been conducted in accordance with the Enviroscan Analytical Services Quality Assurance Program.

ANALYTICAL REPORT

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental Technologies
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Ashland Site

P.O. #:
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-24-89
APPROVED BY:

EPA 625 Analysis (ng/g)

Compound	DB-2/DB-5 Composite	Detection Limit*
Phenol	X	970.
bis(2-Chloroethyl)ether	X	970.
2-Chlorophenol	X	970.
1,3-Dichlorobenzene	X	970.
1,4-Dichlorobenzene	X	970.
1,2-Dichlorobenzene	X	970.
bis(2-Chloroisopropyl)ether	X	970.
N-Nitroso-di-n-propylamine	X	970.
Hexachloroethane	X	970.
Nitrobenzene	X	970.
Isophorone	X	970.
2-Nitrophenol	X	970.
2,4-Dimethylphenol	X	970.
bis(2-Chloroethoxy)methane	X	970.
2,4-Dichlorophenol	X	970.
1,2,4-Trichlorobenzene	X	970.
Naphthalene	3300.	970.
Hexachlorobutadiene	X	970.
4-Chloro-3-methylphenol	X	970.
2-Methylnaphthalene	X	970.
Hexachlorocyclopentadiene	X	970.
2,4,6-Trichlorophenol	X	970.
2-Chloronaphthalene	X	970.
Dimethylphthalate	X	970.
Acenaphthylene	X	970.
2,6-Dinitrotoluene	1600.	970.
Benzidine	X	4800.

Analytical No. 12918

X = Analyzed but not detected
* Calculated on dry weight basis

All analyses have been conducted in accordance with the Enviroscan Analytical Services Quality Assurance Program.

ANALYTICAL REPORT

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental Technologies
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Ashland Site

P.O. #:
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-24-89
APPROVED BY:

EPA 625 Analysis (ng/g)

Compound	DB-2/DB-5 Composite	Detection Limit*
Acenaphthene	4400.	970.
2,4-Dinitrophenol	X	4800.
4-Nitrophenol	X	4800.
2,4-Dinitrotoluene	X	970.
Diethylphthalate	X	970.
4-Chlorophenyl-phenylether	X	970.
18 Fluorene	4900.	970.
4,6-Dinitro-2-methylphenol	X	4800.
N-Nitrosodiphenylamine(1)	X	970.
4-Bromophenyl-phenylether	X	970.
Hexachlorobenzene	X	970.
Pentachlorophenol	X	4800.
15 Phenanthrene	11000.	4800.
15 Anthracene	7100.	970.
Di-n-butylphthalate	X	970.
Fluoranthene	15000.	970.
Pyrene	35000.	970.
Butylbenzylphthalate	X	970.
3,3'-Dichlorobenzidine	X	1900.
Benzo(a)anthracene	10000.	970.
Chrysene	10000.	970.
bis(2-Ethylhexyl)phthalate	X	970.
Di-n-octylphthalate	X	970.
Benzo(b)fluoranthene	8000.	970.
Benzo(k)fluoranthene	X	970.
18 Benzo(a)pyrene	8900.	970.
Indeno(1,2,3-cd)pyrene	3500.	970.
Dibenz(a,h)anthracene	1400.	970.
Benzo(g,h,i)perylene	4700.	970.
Analytical No.	12918	

X = Analyzed but not detected
* Calculated on dry weight basis

ANALYTICAL REPORT

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

P.O. #: BRA 10041
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-13-89
APPROVED BY: Judy Lewandowski

VOC Analysis (ug/l)

	Detection Limit	Supply Well
Benzene	0.5	X
Bromoform	2.0	X
Bromomethane	4.0	X
Carbon Tetrachloride	0.5	X
Chlorobenzene	2.0	X
Chloroethane	2.0	X
2-Chloroethylvinyl Ether	5.0	X
Chloroform	0.5	X
Chloromethane	2.0	X
Dibromochloromethane	0.5	X
1,2-Dichlorobenzene	1.0	X
1,3-Dichlorobenzene	1.0	X
1,4-Dichlorobenzene	1.0	X
Dichlorobromomethane	0.5	X
1,1-Dichloroethane	0.5	X
1,2-Dichloroethane	0.5	X
1,1-Dichloroethylene	1.0	X
1,2-Dichloroethylene	1.0	X
Dichloromethane	1.0	X
1,2-Dichloropropane	0.5	X
cis-1,3-Dichloropropene	2.0	X
trans-1,3-Dichloropropene	0.5	X
Ethylbenzene	1.0	X
1,1,2,2-Tetrachloroethane	1.0	X
Tetrachloroethylene	0.5	X
Toluene	0.5	X
1,1,1-Trichloroethane	0.5	X
1,1,2-Trichloroethane	0.5	X
Trichloroethylene	0.5	X
Vinyl Chloride	2.0	X
Trichlorofluoromethane	1.0	X
Dichlorodifluoromethane	2.0	X
m & p-Xylene	1.0	X
o-Xylene	1.0	X
Analytical No.		12914

X = Analyzed but not detected

All analyses have been conducted in accordance with the Enviroscan Analytical Services Quality Assurance Program.

ANALYTICAL REPORT

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

P.O. #: BRA 10014
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-13-89
APPROVED BY: Judy Swanson

VOC Analysis (ug/l)

	Detection Limit	MW-1	MW-2	MW-3
Benzene	5.0	190.	390.	51.4
Bromoform	20.0	X	X	X
Bromomethane	40.0	X	X	X
Carbon Tetrachloride	5.0	X	X	X
Chlorobenzene	20.0	X	X	X
Chloroethane	20.0	X	X	X
2-Chloroethylvinyl Ether	50.0	X	X	X
Chloroform	5.0	X	X	X
Chloromethane	20.0	X	X	X
Dibromochloromethane	5.0	X	X	X
1,2-Dichlorobenzene	10.0	X	X	X
1,3-Dichlorobenzene	10.0	X	X	X
1,4-Dichlorobenzene	10.0	X	X	X
Dichlorobromomethane	5.0	X	X	X
1,1-Dichloroethane	5.0	X	X	X
1,2-Dichloroethane	5.0	X	X	X
1,1-Dichloroethylene	10.0	X	X	X
1,2-Dichloroethylene	10.0	X	X	X
Dichloromethane	10.0	X	X	X
1,2-Dichloropropane	5.0	X	X	X
cis-1,3-Dichloropropene	20.0	X	X	X
trans-1,3-Dichloropropene	5.0	X	X	X
Ethylbenzene	10.0	X	190.	X
1,1,2,2-Tetrachloroethane	10.0	X	X	X
Tetrachloroethylene	5.0	X	X	X
Toluene	5.0	27.1	31.7	X
1,1,1-Trichloroethane	5.0	X	X	X
1,1,2-Trichloroethane	5.0	X	X	X
Trichloroethylene	5.0	X	X	X
Vinyl Chloride	20.0	X	X	X
Trichlorofluoromethane	10.0	X	X	X
Dichlorodifluoromethane	20.0	X	X	X
m & p-Xylene	10.0	73.8	130.	X
o-Xylene	10.0	150.	220.	X
Analytical No.		12915	12916	12917

X = Analyzed but not detected

All analyses have been conducted in accordance with the Enviroscan Analytical Services Quality Assurance Program.

ANALYTICAL REPORT

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental Technologies
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Re: BRA 10041

P.O. #: Project No. BRA 10041
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-14-89
APPROVED BY: Judy Lewandowski

VOC Analysis (ng/g or ppb)

	Detectin Limit	DB-4
Benzene	2.0	X
Bromoform	8.0	X
Bromomethane	16.0	X
Carbon Tetrachloride	2.0	X
Chlorobenzene	8.0	X
Chloroethane	8.0	X
2-Chloroethylvinyl Ether	20.0	X
Chloroform	2.0	X
Chloromethane	8.0	X
Dibromochloromethane	2.0	X
1,2-Dichlorobenzene	4.0	X
1,3-Dichlorobenzene	4.0	X
1,4-Dichlorobenzene	4.0	X
Dichlorobromomethane	2.0	X
1,1-Dichloroethane	2.0	X
1,2-Dichloroethane	2.0	X
1,1-Dichloroethylene	4.0	X
1,2-Dichloroethylene	4.0	X
Dichloromethane	4.0	X
1,2-Dichloropropane	2.0	X
cis-1,3-Dichloropropene	8.0	X
trans-1,3-Dichloropropene	2.0	X
Ethylbenzene	4.0	X
1,1,2,2-Tetrachloroethane	4.0	X
Tetrachloroethylene	2.0	X
Toluene	2.0	X
1,1,1-Trichloroethane	2.0	X
1,1,2-Trichloroethane	2.0	X
Trichloroethylene	2.0	X
Vinyl Chloride	8.0	X
Trichlorofluoromethane	4.0	X
Dichlorodifluoromethane	8.0	X
m-Xylene	4.0	X
o & p-Xylene (as o-Xylene)	4.0	X
Analytical No.		12918

X = Analyzed but not detected

All analyses have been conducted in accordance with the Enviroscan Analytical Services Quality Assurance Program.

ANALYTICAL REPORT

ENVIROSCAN
ENVIRONMENTAL AND ANALYTICAL SERVICES
WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

P.O. #:
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-13-89
APPROVED BY:

Inorganic Analysis (mg/l)

	Supply Well	MW-1	MW-2	MW-3	Detection Limit
Arsenic	X	X	X	X	0.005
Chromium	X	X	X	X	0.009
Copper	X	0.023	X	X	0.005
Zinc	0.008	0.012	0.004	0.016	0.003
Analytical No.	12914	12915	12916	12917	

X = Analyzed but not detected

All analyses have been conducted in accordance with the Enviroscan Analytical Services Quality Assurance Program.

ANALYTICAL REPORT

ENVIROSCAN

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental
W61 N313 Washington Ave.
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

Re: Ashland Site

P.O. #:
SAMPLED BY: Client
DATE REC'D: 1-30-89
REPORT DATE: 2-14-89
APPROVED BY:

Inorganic Analyses (ug/g)*

	DB-4	Detection Limit
Arsenic	100.	22.
Chromium	5.	2.
Copper	46.5	1.
Zinc	165.	0.6
Analytical No.	12918	

* Calculated on the dry weight basis

ANALYTICAL REPORT

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Northern Environmental Technologies
P.O. Box 532
Cedarburg, WI 53012

Attn: John Dellaport

P.O. #: Proj. BRA 10041
SAMPLED BY: Client
DATE REC'D: 1-27-89
REPORT DATE: 2-16-89
APPROVED BY:

Ashland Site Assessment

	Detection Limit	MW-1	MW-2	MW-3
BOD_5, mg/l	6.	14.	14.	42.
COD, mg/l	10.	330.	224.	1870.
SO_4, mg/l	0.3	3.6	5.5	4.6
Cl, mg/l	0.1	54.8	64.6	64.1
NPOC, mg/l	0.1	29.0	25.2	27.1
Analytical No.		12831	12832	12833

X = Analyzed but not detected

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME / CLIENT
BRA10041	ASHLAND SITE ASSESSMENT

SAMPLERS: (Signature) John C. Talbot

SAMPLE NO.	DATE	TIME	COMP	GRAB	SAMPLE LOCATION	NO. OF CONTAINERS	BOD	COD	SO_4^{2-}	Cl^-	T.O.C. (N.P.O.)		REMARKS
~~SUPPLY WELL~~	~~1-25-89~~	~~1000~~		✓	~~ASHLAND W.W.T.P.~~	1	X						NO SAMPLE SUBMITTED
MW-1	"	1300		✓	"	1	X	X	X	X	X		WATER SAMPLE
MW-2	"	1335		✓	"	1	X	X	X	X	X		"
MW-3	"	1015		✓	"	1	X	X	X	X	X		"

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
John C. Talbot	1-26-89 1112 AM				
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED FOR LABORATORY BY: (Signature)	DATE/TIME	REMARKS: 1 OF 2 COOLERS	
		[redacted]	1/27/89 8:55 AM		

ENVIRONMENTAL AND ANALYTICAL SERVICES
ENVIROSCAN
303 West Military Road
Rothschild, WI 54474
(715) 359-7226

Anal # 21 12831-33

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME / CLIENT
BRA10041	ASHLAND SITE ASSESSMENT

SAMPLERS: (Signature) John C. Dillon

SAMPLE NO.	DATE	TIME	COMP	GRAB	SAMPLE LOCATION	NO. OF CONTAINERS	VOC's	B/N/A (EXTRACTABLES)	As, Cr (for), Cu, Zn	PCB's			REMARKS
SUPPLY WELL	1-25-89	1000		✓	ASHLAND W.W.T.P.	5	X	X	X	X			WATER SAMPLES
MW-1	"	1300		✓	"	5	X	X	X	X			"
MW-2	"	1335		✓	"	5	X	X	X	X			"
MW-3	"	1015		✓	"	5	X	X	X	X			"
							4	2	3	1 Priority			
DB-4	1-24-89	0900		✓	"	1	X	X	X	X			SOIL SAMPLE

Separate sample sent direct to RMT

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
John C. Dillon	1-26-89 11:13 AM				
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED FOR LABORATORY BY: (Signature)	DATE/TIME	REMARKS:	
		Beverly Ready	1/30/89 9:55 AM	1 OF 2 COOLERS	

#22-12914 - 12918

ENVIRONMENTAL AND ANALYTICAL SERVICES
ENVIROSCAN
303 West Military Road
Rothschild, WI 54474
(715) 359-7226

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME / CLIENT
BRA10041	ASHLAND WASTEWATER UTILITIES CITY OF ASHLAND

SAMPLERS: (Signature) John C. Dallafior

SAMPLE NO.	DATE	TIME	COMP	GRAB	SAMPLE LOCATION	NO. OF CONTAINERS	Base Neutral Acid Extractables	REMARKS
~~DB#2~~	~~1-30~~							
~~DB#5~~	~~1-30~~							
DB#2	1-17-89	1300	X		SOUTH OF AERATION TANKS	1	X	Please composite both samples and analyze as one sample only. 2 week turn-around as agreed by: Gary Scharber and Dave Schumacher of Enviroscan
DB#5	1-18-89	0925	X		WEST OF ARTESIAN WELL	1	X	
				1				Please bill to Enviroscan under P.O. # BRA10041

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
John C. Dallafior	1-30-89 3:30				
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED FOR LABORATORY BY: (Signature)	DATE/TIME	REMARKS:	

ENVIRONMENTAL AND ANALYTICAL SERVICES
ENVIROSCAN
303 West Military Road
Rothschild, WI 54474
(715) 359-7226

APPENDIX A2

FECAL COLIFORM RESULTS
ASHLAND TREATMENT PLANT LABORATORY

FECAL COLIFORM

ASHLAND WATER UTILITY
ASHLAND, WISCONSIN

BACTERIOLOGICAL EXAMINATION OF WATER

pH of Presumptive Broth 6.8 pH of Confirmed Broth 6.9

Time & Date Sampled	Sampling Point	Collected By:	Time Inoculated	ML. Used	Presumptive 24 hr	Presumptive 48 hr	Confirmed 24 hr	Confirmed 48 hr
1-25-89	MW-1	John Dellaport	1-26-89	10	+		—	
			9:15A	10	+		—	
				10	+		—	
	RACK B to Rack C			10	+		—	
				10	+		—	
				1	—	+	—	
	MPN = 0			1	—	+	—	
				1	—	+	—	
				1	—	+	—	
				1	—	+	—	
	Monitoring			.1	—	+	—	
				.1	—	+	—	
	Wells			.1	—	+	—	
				.1	—	—		
				.1	—	—		

ASHLAND HEALTH DEPT.
WI. LAB. #064

THE PRINTERY, ASHLAND W

FECAL COLIFORM

ASHLAND WATER UTILITY
ASHLAND, WISCONSIN

BACTERIOLOGICAL EXAMINATION OF WATER

pH of Presumptive Broth 6.8 pH of Confirmed Broth 6.9

Time & Date Sampled	Sampling Point	Collected By:	Time Inoculated	ML. Used	Presumptive 24 hr	Presumptive 48 hr	Confirmed 24 hr	Confirmed 48 hr
1-25-89	MW 2	John Dallaport	1-26-89	10	+		—	
			9:20A	10	+		—	
				10	+		—	
	RACK C=D			10	+		—	
				10	+		—	
				1	+		—	
	MPN=0			1	+		—	
				1	+		—	
				1	+		—	
				1	+		—	
				.1	+		—	
				.1	+		—	
				.1	+		—	
				.1	+		—	
				.1	+		—	

ASHLAND HEALTH DEPT.
WI. LAB. #064

THE PRINTERY, ASHLAND.

FECAL COLIFORM

ASHLAND WATER UTILITY
ASHLAND, WISCONSIN

BACTERIOLOGICAL EXAMINATION OF WATER

pH of Presumptive Broth 6.8 pH of Confirmed Broth 6.9

Time & Date Sampled	Sampling Point	Collected By:	Time Inoculated	ML. Used	Presumptive 24 hr	48 hr	Confirmed 24 hr	48 hr
1-25-89	MW-3	John Dellaport	1-26-89	10	+		—	
			9:25A	10	+		—	
	RACK 6 = A			10	+		—	
				10	+		—	
	MPN = 0			10	+		—	
				1	+		—	
				1	+		—	
				1	+		—	
				1	+		—	
				1	+		—	
				.1	+		—	
				.1	+		—	
				.1	+		—	
				.1	+		—	
				.1	+		—	

ASHLAND HEALTH DEPT.
WI. LAB. #064

THE PRINTERY, ASHLAND

APPENDIX B

SOIL EXPLORATION BORING LOGS

APPENDIX B1

BOREHOLE LOGS
NORTHERN ENVIRONMENTAL TECHNOLOGIES, INC., JANUARY 1989

▲ Northern Environmental Technologies
Incorporated

NORTHERN ENVIRONMENTAL TECHNOLOGIES
SOIL EXPLORATION BOREHOLE LOG
ABBREVIATIONS AND SYMBOLS

Column Headings

DEPTH: Depth in feet below natural ground surface.

SAMPLE: Sample identification number.

BLOWS: Number of hammer blows required to drive a standard split barrel sampling device six inches (ASTM 1586).

RECOV: Split barrel sample recovery in inches, maximum recovery is 18 inches (ASTM 1586).

% GAS: Per-cent combustible gas by volume recorded in the uppermost auger flight immediately before sample collection.

PID: Photoionization detector soil headspace reading (ppm).

SYMBOL: Graphic representation of major soil categories and well construction materials as shown below.


Soil Fill


Wood Waste Fill

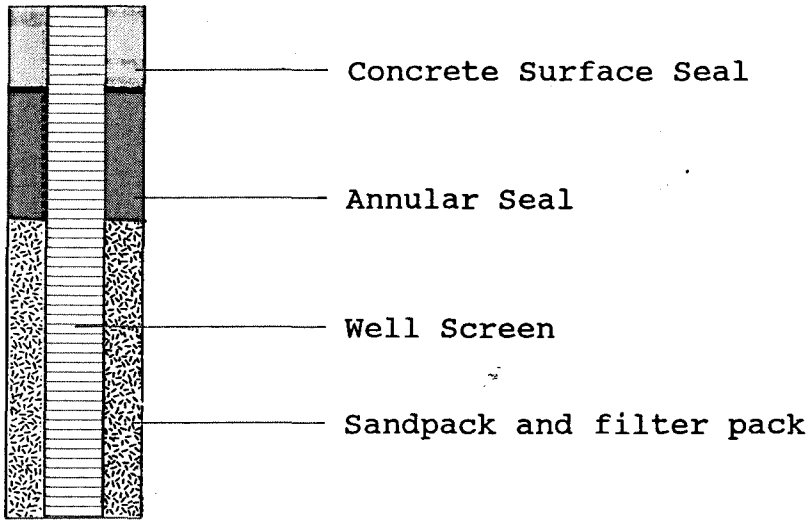

Fine to Coarse Sand, Beach Deposit


Sandy Silty Clay with Gravel, Lacustrine Deposit


Nonbedded Gravelly Clay with Sand and Silty Sand, Till Deposit


Coarse Graded Sand, Gravel and Clay Till, Outwash Deposit

NORTHERN ENVIRONMENTAL TECHNOLOGIES
SOIL EXPLORATION BOREHOLE LOG
ABBREVIATIONS AND SYMBOLS



Miscellaneous Abbreviations

OD:	"Outside diameter".
ID:	"Inside diameter" or "identification".
sd:	"Site Datum".
EOB:	"End of boring".
EA:	"Earth auger".
HSA:	"Hollow stem auger".
ppm:	"Parts per million".
10YR 5/3:	Representative Munsell color notation.
CL, GC, etc.:	Unified soil classification group symbol.

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BOREHOLE LOG

Project : City of Ashland (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: SB1
Logged by : J.C. Dellaport

LOCATION: 60 feet south of aeration tanks GROUND ELEV: 606.50 TOTAL DEPTH: 16.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA 6.25-inch OD FLUID: None		Start / End
		DATE: 01/18/1989 – 01/18/1989	
		TIME: 1430 – 1515	
		COMPLETED AS: MW-1 Monitoring Well	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
0.0							0.0 - 0.5: DARK BROWN SILT LOAM TOPSOIL, some roots and rounded pebbles, slight creosote or napthalene odor (OL, Fill).
0.5	S1				70		
1.0							0.5 - 3.5: HETEROGENEOUS MIXTURE OF ORGANIC DARK BROWN SANDY CLAY AND REDDISH BROWN CLAY, (5YR 4/4), with 1-inch wood fragments, moist, soft, strong creosote like odor (Fill, Wood Waste).
1.5							
2.0		2					
2.5	S2	3	6		6.0		
3.0		5					
3.5							3.5 - 13.0: WOOD WASTE, predominantly degraded wood fibers and chunks with some oily staining on exterior surfaces, some dark brown silty clay. At 7.0 feet, primarily a yellow green stained oily wood fiber mass, extreme creosote odor. Larger wood slabs encountered at 9.5 and 12.0 feet (FIll, Wood Waste).
4.0							
4.5		1					
5.0	S3	3	7		72		
5.5		2					
6.0							
6.5							
7.0		1					
7.5	S4	2	1		20		
8.0		4					
8.5							

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: SB1
Logged by : J.C. Dellaport

LOCATION: 60 feet south of aeration tanks GROUND ELEV: 606.50 TOTAL DEPTH: 16.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA 6.25-inch OD FLUID: None		Start / End
		DATE: 01/18/1989	01/18/1989
		TIME: 1430	1515
		COMPLETED AS: MW-1 Monitoring Well	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
8.5							
9.0							
9.5							
10.0	S5	1	NR				
10.5		1					
11.0							
11.5							
12.0		1					
12.5	S6	1	5		8.0		
13.0		1					
13.5							13.0 - 16.0: SANDY CLAY, reddish brown, soft, some rounded 1/8 to 1/2-inch arkosic sandstone pebbles and some subrounded ¼-inch gabbroic pebbles, moist, medium toughness, (2.5-5YR 3/4) (CL - CH, Reworked Glacial Till, Lacustrine, Miller Creek Formation).
14.0							
14.5		3					NOTE: 1) Wood fragments often became wedged in shoe of split spoon as sampler was driven. This prevented full sample recovery and an exact determination of interval changes (i.e. S5).
15.0	S7	4	16		9.5		2) Static Water Level: 01/18/89 ≈ 5 feet below grade.
15.5		7					3) Monitoring well (MW-1) installed in boring on 01/19/89.
16.0							EOB: 16.0 Feet

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: SB-2
Logged by : J.C. Dellaport

LOCATION: 150 feet SE of monitoring well MW-1
GROUND ELEV: 606.43

TOTAL DEPTH: 16.0 feet

BOREHOLE DIA: 6.25 inch

DRILLER: Twin City Testing
RIG: CME 55

BIT(S): 3.25-inch ID HSA
6.25-inch OD
FLUID: None

	Start	End
DATE:	01/18 1989	01/18 1989
TIME:	1530	1615

COMPLETED AS: MW-2 Monitoring Well

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL
0.0						
	S1				8.1	
0.5						
1.0						
1.5						
2.0		2				
2.5	S2	1	NR		8.9	
3.0		1				
3.5						
4.0						
4.5		2				
5.0	S3	6	3		12	
5.5		7				
6.0						
6.5						
7.0		2				
7.5	S4	5	3		25	
8.0		8				
8.5						

MATERIAL DESCRIPTION AND COMMENTS

0.0 - 4.5: GRAVELLY SILT, organic dark brown (5YR 2.5/1), dry to slightly moist, soft, some wood fragments, rounded pebbles, root fragments (OL, Fill, May be filter cake from Wastewater Treatment Plant).

4.5 - 10.8: WOOD WASTE, moist, greenish black stained wood chips and fibrous fragments, strong creosote like odor, larger wood slabs at base (Fill).

▲ Northern Environmental Technologies
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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: SB-2
Logged by : J.C. Dellaport

LOCATION: 150 feet SE of monitoring well MW-1
GROUND ELEV: 606.43

TOTAL DEPTH: 16.0 feet

BOREHOLE DIA: 6.25 inch

DRILLER: Twin City Testing
RIG: CME 55

BIT(S): 3.25-inch ID HSA
6.25-inch OD
FLUID: None

	Start	End
DATE:	01/18 1989	01/18 1989
TIME:	1530	1615

COMPLETED AS: MW-2 Monitoring Well

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
8.5							
9.0							
9.5		7					
10.0	S5	7	7		21		10.8 - 11.0: SAND, somewhat poorly graded, fine to medium grained, brown (5YR 3/4), moist, soft, subrounded, trace fine gravel (SP, Beach Deposit, Miller Creek Formation).
10.5		11					
11.0							11.0 - 13.5: SILTY SAND, brown (5YR 3/4), fine to medium grained, moist, soft, some rounded pebbles up to ¼-inch, clayey sand layers, fining with depth (SP - SM, Lacustrine, Miller Creek Formation).
11.5							
12.0		4					
12.5	S6	8	12		8.6		
13.0		11					
13.5							13.5 - EOB: SANDY SILT, brown (5YR 3/4), with some fine subrounded pebbles up to ½-inch, firm, dry to slightly moist (ML, Glacial Till, Lacustrine, Miller Creek Formation).
14.0							
14.5		5					
15.0	S7	7	12		9.0		
15.5		13					
16.0							EOB: 16.0 Feet

NOTE: 1) Monitoring Well MW-2 installed in boring on 01/20/89.

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: SB-3
Logged by : J.C. Dellaport

LOCATION: 55 feet SE of artesian well GROUND ELEV: 610.37 TOTAL DEPTH: 16.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA 6.25-inch OD FLUID: None	Start / End DATE: 01/19 1989 / 01/19 1989 TIME: 1308 / 1500 COMPLETED AS: MW-3 Monitoring Well

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
0.0							
	S1				8.0		0.0 - 2.0: GRAVELLY CLAYEY SILT, dark brown to black (2.5YR 3/0), organic, heterogeneous, some fine angular gravel, moist, soft, slight peaty odor (OL, Fill).
0.5							
1.0							
1.5							
2.0		2					
2.5	S2	1	8		5.8		2.0 - 5.5: SILTY SAND AND CLAY, dark brown (5YR 3/1), well graded silty sand with rounded fine pebbles, a 1-inch angular glassy slag chunk, moist, soft. Bottom 12 inches is heterogeneous clay with some rounded pebbles, soft, moist, with 1 inch layer of degraded moist wood chips, no odor (SW - SM, Fill).
3.0		2					
3.5							
4.0							
4.5		1					
5.0	S3	2	8		7.2		
5.5		2					5.5 - 10.5: WOOD WASTE, upper 3 feet fairly dry to moist, dark stained wood chunks and fragments. From 8.5 to 10.5, wood is more moist, strong greenish color, slight petroleum odor, oily sheen on wood surfaces, boulder or cobble at base (Fill).
6.0							
6.5							
7.0		2					
7.5	S4	2			9.6		
8.0		8					
8.5							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: SB-3
Logged by : J.C. Dellaport

LOCATION: 55 feet SE of artesian well
GROUND ELEV: 610.37

TOTAL DEPTH: 16.0 feet

BOREHOLE DIA: 6.25 inch

DRILLER: Twin City Testing
RIG: CME 55

BIT(S): 3.25-inch ID HSA
6.25-inch OD
FLUID: None

	Start	End
DATE:	01/19 1989	01/19 1989
TIME:	1308	1500

COMPLETED AS: MW-3 Monitoring Well

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
8.5							
9.0							
9.5							
10.0							
	S5	*					* Blow Counts S5: 100/12 inches
10.5							10.5 Feet: Boulder or cobble pushed to side.
11.0							10.5 - EOB: SAND, thinly bedded layers of subrounded fine sand, medium sand and clayey coarse to very coarse sand. Each layer is poorly graded, brown (5YR 3/4), moist to saturated, soft (SW, Beach Deposit, Miller Creek Formation).
11.5							
12.0							
		11					
12.5							
	S6	21	14		9.0		
13.0							
		25					
13.5							
14.0							
14.5							
		12					
15.0							
	S7	22	18		8.8		
15.5							
		29					
16.0							EOB: 16.0 Feet
							NOTE: 1) Sand caved into hole and against well screen (10.5 - 15.0 feet) during monitoring well MW-3 installation.

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-1
Logged by : J.C. Dellaport

LOCATION: West of final sedimentation tanks GROUND ELEV: 606.8 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA FLUID: 0.0 - 14.5': None 14.5 - 61.0: Bentonite Slurry		Start / End
		DATE: 01/20 1989 / 01/20 1989	
		TIME: 1200 / 1535	
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
0.0							0.0 - 1.5: GRAVELLY SANDY SILT, Dark brown to black, moist, soft, low plasticity, some 1/2 to 1 inch angular red brick fragments, heterogeneous (5YR 2.5/1) (ML, Fill).
0.5	S1				-		
1.0							
1.5							1.5 - 3.5: GRAVELLY SAND, Brown fine to medium sand with some very coarse grains, a few rounded red arkosic sandstone pebbles up to 1 inch diameter. Some clayey sand layers at base (5 YR 3.5/3) (SP - SC, Fill).
2.0		6					
2.5	S2	3	12		-		
3.0		4					
3.5							3.5 - 11.0: SANDY CLAY, reddish brown and brown, moist, no odor, medium toughness, heterogeneous, trace wood fragments at 7 ft. and 1/4" coal cinders (CL, Fill).
4.0							
4.5		3					
5.0	S3	3	9		-		
5.5		5					
6.0							
6.5							
7.0		1					
7.5	S4	2	4		-		
8.0		2					
8.5							

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-1
Logged by : J.C. Dellaport

LOCATION: West of final sedimentation tanks GROUND ELEV: 606.8 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA FLUID: 0.0 - 14.5': None 14.5 - 61.0: Bentonite Slurry		Start / End
		DATE: 01/20 1989 / 01/20 1989	
		TIME: 1200 / 1535	
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
8.5							
9.0							
9.5		3					
10.0	S5	1	7		-		
10.5		3					
11.0							11.0 - 14.5: HETEROGENEOUS GRAVELLY SILT AND CLAY, one inch layer of dark brown to black (5YR 2.5/1), silt with trace flat ½-inch shale chips and blocky coal fragments, moist, soft. Enclosed within 6 inch layer of reddish brown, soft, moist, fat clay (5YR 3/4), 2 inch wood fragment at base (ML, CH, Fill).
11.5	S6						
12.0							
12.5							
13.0							
13.5							
14.0							
14.5		1					14.5 - 35.5: GRAVELLY SILTY CLAY, reddish brown, soft, moist, no odor, ½-inch rounded dolomite and red elongate sandstone pebbles, trace fine sand, homogeneous, medium toughness and plasticity, (5YR 3/4) (CL, Glacial Till, Lacustrine, Miller Creek Formation).
15.0	S7	5					
15.5		10					
16.0							NOTE: S6, 11.5 - 13.5 feet: Thin wall tube sample, bottom of tube, dark brown to black pebbly clay and wood chips, slight petroleum odor.
16.5							
17.0							

▲ Northern Environmental Technologies
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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-1
Logged by : J.C. Dellaport

LOCATION: West of final sedimentation tanks GROUND ELEV: 606.8 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA FLUID: 0.0 - 14.5': None 14.5 - 61.0: Bentonite Slurry		Start / End
		DATE: 01/20 1989 / 01/20 1989	
		TIME: 1200 / 1535	
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
17.0							
17.5							
18.0							
18.5							
19.0							
19.5		1					
20.0	S8	2	18				
20.5		3					
21.0							
21.5							
22.0							
22.5							
23.0							
23.5							
24.0							
24.5		1					
25.0	S9	3	18				
25.5							

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-1
Logged by : J.C. Dellaport

LOCATION: West of final sedimentation tanks GROUND ELEV: 606.8 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA FLUID: 0.0 - 14.5': None 14.5 - 61.0: Bentonite Slurry		Start / End
		DATE: 01/20 1989 / 01/20 1989	
		TIME: 1200 / 1535	
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
25.5							
	S9	3					
26.0							
26.5							
27.0							
27.5							
28.0							
28.5							
29.0							
29.5							
		1					
30.0							
	S10	3	NR				
30.5							
		3					
31.0							
31.5							
32.0							
32.5							
33.0							
33.5							
34.0							

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-1
Logged by : J.C. Dellaport

LOCATION: West of final sedimentation tanks GROUND ELEV: 606.8 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA FLUID: 0.0 - 14.5': None 14.5 - 61.0: Bentonite Slurry		Start / End
		DATE: 01/20 1989	01/20 1989
		TIME: 1200	1535
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
34.0							
34.5		2					
35.0	S11	2	18				
35.5		5					35.5 - 54.5: GRAVELLY LEAN CLAY WITH SAND, soft to firm, more sand than above, moist, red degraded rounded 1½-inch sandstone pebble (2.5 - 10YR 3/6) and rounded 1-inch green sandstone pebble (CL, Glacial Till, Miller Creek Formation).
36.0							
36.5							
37.0							
37.5							
38.0							
38.5							
39.0							
39.5		12					
40.0	S12	26	18				
40.5		18					
41.0							
41.5							
42.0							
42.5							

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-1
Logged by : J.C. Dellaport

LOCATION: West of final sedimentation tanks GROUND ELEV: 606.8 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA FLUID: 0.0 - 14.5': None 14.5 - 61.0: Bentonite Slurry	Start / End	
		DATE: 01/20 1989 / 01/20 1989	
		TIME: 1200 / 1535	
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
42.5							
43.0							
43.5							
44.0							
44.5		15					
45.0	S13	21	4				
45.5		24					
46.0							
46.5							
47.0							
47.5							
48.0							
48.5							
49.0							
49.5		10					
50.0	S14	16	9		7.4		
50.5		24					
51.0							

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-1
Logged by : J.C. Dellaport

LOCATION: West of final sedimentation tanks GROUND ELEV: 606.8 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA FLUID: 0.0 - 14.5': None 14.5 - 61.0: Bentonite Slurry		Start / End
		DATE: 01/20 1989 / 01/20 1989	
		TIME: 1200 / 1535	
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
51.0							
51.5							
52.0							
52.5							
53.0							
53.5							
54.0							BLOW COUNTS S15: 100/15"
54.5							54.5 - EOB: SAND WITH CLAY AND GRAVEL, well graded, moist, soft, angular to subangular, 3/4-inch gabbroic and sandstone pebbles, 2.5YR 3/4 (SW-SC, Glacial Outwash, Copper Falls Formation).
55.0	S15	*	10		8.9		
55.5							
56.0							
56.5							
57.0							
57.5							
58.0							
58.5							
59.0							
59.5							

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-1
Logged by : J.C. Dellaport

LOCATION: West of final sedimentation tanks GROUND ELEV: 606.8 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 6.25 inch	DRILLER: Twin City Testing RIG: CME 55 BIT(S): 3.25-inch ID HSA FLUID: 0.0 - 14.5': None 14.5 - 61.0: Bentonite Slurry		Start / End
		DATE: 01/20 1989 / 01/20 1989	
		TIME: 1200 / 1535	
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
59.5							
60.0	S16	*	6		7		BLOW COUNTS S16: 100/10"
60.5							
61.0							EOB: 61.0 feet

NOTE:
1) At EOB (61.0 feet), boring was flowing artesian, ~½-gallons per minute flow.
2) Photoionization detector operation faulty. PID values are suspect for this boring.
3) Boring abandoned and sealed on 1/23/89. Set bentonite plug at 20 feet. Tremie grouted cement slurry to surface.

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-2
Logged by : J.C. Dellaport

LOCATION: 15 feet south of aeration tanks
GROUND ELEV: 605.4

TOTAL DEPTH: 61.0 feet
BOREHOLE DIA:
0.0 - 13.5 ft: 6.25 inch
13.5 - 61.0 ft: 2.875 inch

DRILLER:Twin City Testing
RIG: CME 55
BIT(S):
0.0-13.5': 3.25 ID HSA
13.5-61.0': 2.875 Tricone
FLUID: 0.0 - 13.5': None
13.5 - 61.0: Bentonite Slurry

	Start	End
DATE:	01/17 1989	01/25 1989
TIME:	1100	1415

COMPLETED AS: Soil Boring

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
0.0							0.0 - 3.5: CLAYEY SILT, reddish brown (5YR 3/3) slightly moist, soft, some trace sand at top, finer with depth, trace fine gravel, heterogeneous (CL, Fill).
	S1				0.5		
0.5							
1.0							
1.5							
2.0							
		2					
2.5							
	S2	3	11		2.2		
3.0							
		4					
3.5							3.5 - 12.1: CLAY, reddish brown, 5YR 4/4 soft, very moist plastic clay with trace fine gravel, heterogeneous, dark brown organic clay pockets, (5YR 2.5/1) (CL-CH, Fill).
4.0							
4.5							
		1					
5.0							
	S3	2	8		0		
5.5							
		3					
6.0							
6.5							
7.0							
		1					
7.5							
	S4	1	6		1.0		
8.0							
		2					
8.5							

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-2
Logged by : J.C. Dellaport

LOCATION: 15 feet south of aeration tanks GROUND ELEV: 605.4 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 0.0 - 13.5 ft: 6.25 inch 13.5 - 61.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-13.5': 3.25 ID HSA 13.5-61.0': 2.875 Tricone FLUID: 0.0 - 13.5': None 13.5 - 61.0: Bentonite Slurry	Start / End DATE: 01/17 1989 / 01/25 1989 TIME: 1100 / 1415 COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
8.5							S5: 8.5 - 10.5: THIN WALLED TUBE SAMPLE FOR GEOTECHNICAL ANALYSIS
9.0							
9.5							
10.0	S5		12		-		
10.5							
11.0							
11.5							
12.0		1					12.1 - 12.4: WOOD WASTE, greenish - black moist stained wood chips and fragments, strong creosote-like odor, (Fill).
12.5	S6	2	7		11		12.4 - 12.6: SAND, brown stained medium, poorly graded san, creosote-like odor, saturated (SP, near shore, Reworked Glacial Till, Beach Deposit, Miller Creek Formation).
13.0		2					
13.5							12.6 - 16.0: CLAY, reddish brown, (2.5YR 4/4) moist, soft, plastic, with trace fine gravel and sand (CL - CH, Glacial Till, Lacustrine, Miller Creek Formation).
14.0							
14.5		2					
15.0	S7	3	17		10		
15.5		4					NOTE: 16.0 - 61.0 feet logged by Twin City Testing Corporation
16.0							16.0 - 24.5: FAT CLAY WITH SAND, red, moist, medium to stiff, (CH, Possible Fill).
16.5							
17.0							

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-2
Logged by : J.C. Dellaport

LOCATION: 15 feet south of aeration tanks GROUND ELEV: 605.4 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 0.0 - 13.5 ft: 6.25 inch 13.5 - 61.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-13.5': 3.25 ID HSA 13.5-61.0': 2.875 Tricone FLUID: 0.0 - 13.5': None 13.5 - 61.0: Bentonite Slurry	Start DATE: 01/17 1989 TIME: 1100	End 01/25 1989 1415 COMPLETED AS: Soil Boring

DEPTH	SAMPLE	NVAL	RECOV	%GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
17.0							
18.0							
19.0							
20.0	S8	16					
21.0							
22.0							
23.0							
24.0							
25.0	S9	37					24.5 - 26.0: SILTY SAND, with a little gravel, fine-grained, reddish-brown, moist, very dense (SM, Beach Deposit).
26.0							26.0 - 34.0: FAT CLAY WITH SAND, red, moist, rather stiff, trace of gravel (CH, Lacustrine).
27.0							
28.0							
29.0							
30.0	S10	14					
31.0							
32.0							
33.0							
34.0							

▲ Northern Environmental Technologies
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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-2
Logged by : J.C. Dellaport

LOCATION: 15 feet south of aeration tanks
GROUND ELEV: 605.4

TOTAL DEPTH: 61.0 feet
BOREHOLE DIA:
0.0 - 13.5 ft: 6.25 inch
13.5 - 61.0 ft: 2.875 inch

DRILLER:Twin City Testing
RIG: CME 55
BIT(S):
0.0-13.5': 3.25 ID HSA
13.5-61.0': 2.875 Tricone
FLUID: 0.0 - 13.5': None
13.5 - 61.0: Bentonite Slurry

	Start	End
DATE:	01/17 1989	01/25 1989
TIME:	1100	1415

COMPLETED AS: Soil Boring

DEPTH	SAMPLE	N VAL	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
34.0							34.0 - 43.0: SILTY SAND, with a little gravel, reddish-brown, fine-grained, moist, very dense (SM Glacial Till).
35.0	S11	37					
36.0							
37.0							
38.0							
39.0							
40.0	S12	78					
41.0							
42.0							
43.0							43.0 - 56.0: POORLY GRADED SAND WITH SILT, with a little gravel, reddish-brown, fine-grained, water bearing, very dense (SP - SM, Glacial Outwash).
44.0							
45.0	S13	79					
46.0							
47.0							
48.0							
49.0							
50.0	S14	70					
51.0							

▲ Northern Environmental Technologies
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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-2
Logged by : J.C. Dellaport

LOCATION: 15 feet south of aeration tanks GROUND ELEV: 605.4 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 0.0 - 13.5 ft: 6.25 inch 13.5 - 61.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-13.5': 3.25 ID HSA 13.5-61.0': 2.875 Tricone FLUID: 0.0 - 13.5': None 13.5 - 61.0: Bentonite Slurry	Start DATE: 01/17 1989 TIME: 1100	End 01/25 1989 1415
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	N VAL	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
51.0							
52.0							
53.0							
54.0							
55.0							
	S15	80					
56.0							56.0 - 61.0: SILTY SAND, with a little gravel, reddish-brown, fine-grained, moist, very dense (SM, Glacial Till).
57.0							
58.0							
59.0							
60.0							
	S16	62					
61.0							EOB - 61.0 feet

NOTE:
1) Field compressive strength on soil sample S3; 0.25 - 0.3 SQ. FT.
2) Portion of soil sample S6 submitted for laboratory analysis of base/ neutral and acid extractable compounds.
3) Static Water Level: 8 feet below grade 4 hours after drilling to 16.0 feet.
4) Boring was temporarily cased to 13.5 feet (4½" OD steel casing with (1) threaded coupling). Annulus was grouted with a cement bentonite slurry which cured for 24 hours.

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-3
Logged by : J.C. Dellaport

LOCATION: 110 feet SE of vacuum filter building
GROUND ELEV: 606.2

TOTAL DEPTH: 61.0 feet
BOREHOLE DIA:
0.0 - 16.0 ft: 6.25 inch
16.0 - 61.0 ft: 2.875 inch

DRILLER:Twin City Testing
RIG: CME 55
BIT(S):
0.0-14.5': 3.25 ID HSA
14.5'-61.0':2.875 Tricone
FLUID: 0.0 - 16.0': None
16.0 - 61.0: Bentonite Slurry

	Start	End
DATE:	01/19 1989	01/25 1989
TIME:	1045	1130

COMPLETED AS: Soil Boring

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
0.0							
	S1				7		0.0 - 2.0: GRAVELLY SILTY CLAY, heterogeneous medium brown (5YR 3/3) and dark brown (5YR 3/1), moist, soft, some root matter and trace fine coal chips (CL, Topsoil and Fill).
0.5							
1.0							
1.5							
2.0		3					
2.5	S2	9	12		7.4		2.0 - 4.7: GRAVELLY CLAYEY SILT AND PEAT, dark brown (5YR 2.5/1) soft organic silt and reddish brown (2.5YR 4/6) moist clayey silt. Black rooty peat and wood chips at base (6") (ML, Fill).
3.0		4					
3.5							
4.0							
4.5		2					4.7 -10.7: WOOD WASTE, moist greenish-black stained wood chips and fibrous fragments. Mild creosote - like odor. Saturated and water bearing (Fill).
5.0	S3	2	5		11		
5.5		4					
6.0							
6.5							
7.0		4					
7.5	S4	2	5		12		
8.0		4					
8.5							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-3
Logged by : J.C. Dellaport

LOCATION: 110 feet SE of vacuum filter building GROUND ELEV: 606.2 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 0.0 - 16.0 ft: 6.25 inch 16.0 - 61.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-14.5': 3.25 ID HSA 14.5'-61.0':2.875 Tricone FLUID: 0.0 - 16.0': None 16.0 - 61.0: Bentonite Slurry	Start DATE: 01/19 1989 TIME: 1045	End 01/25 1989 1130
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
8.5							
9.0							
9.5		2					
10.0	S5	1	5		14		
10.5		9					10.7 - 29.5: SANDY SILT WITH SAND, reddish brown fine to medium saturated sand layer (3") overlying firm slightly moist reddish brown (2.5YR 3/4) sandy silt. Some rounded weathered mafic pebbles 1/8 - 1/2 inch, trace clay in matrix (SC - ML, Lacustrine, Miller Creek Formation).
11.0							
11.5							
12.0		7					
12.5	S6	8			9.2		
13.0		19					NOTE: Northern Environmental Hydrogeologist observed drilling to 16.0 feet and logged soil samples, collected by driller, to 61.0 feet.
13.5							
14.0							
14.5		20					
15.0	S7	21			8.2		
15.5		26					
16.0							
16.5							
17.0							

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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-3
Logged by : J.C. Dellaport

LOCATION: 110 feet SE of vacuum filter building GROUND ELEV: 606.2 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 0.0 - 16.0 ft: 6.25 inch 16.0 - 61.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-14.5': 3.25 ID HSA 14.5'-61.0':2.875 Tricone FLUID: 0.0 - 16.0': None 16.0 - 61.0: Bentonite Slurry	Start DATE: 01/19 1989 TIME: 1045	End 01/25 1989 1130
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	N VAL	REC OV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
17.0							
17.5							
18.0							
18.5							
19.0							
19.5							
20.0	S8	50					
20.5							
21.0							
21.5							
22.0							
22.5							
23.0							
23.5							
24.0							
24.5							
25.0	S9	48					
25.5							

▲ Northern Environmental Technologies
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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-3
Logged by : J.C. Dellaport

LOCATION: 110 feet SE of vacuum filter building GROUND ELEV: 606.2 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 0.0 - 16.0 ft: 6.25 inch 16.0 - 61.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-14.5': 3.25 ID HSA 14.5'-61.0':2.875 Tricone FLUID: 0.0 - 16.0': None 16.0 - 61.0: Bentonite Slurry	Start DATE: 01/19 1989 TIME: 1045	End 01/25 1989 1130
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	NVAL	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
25.5							
26.0							
26.5							
27.0							
27.5							
28.0							
28.5							
29.0							
29.5							29.5 - 31.0: SAND AND SILTY CLAY, reddish brown (2.5YR 3/4) thinly bedded fine poorly graded sand layers (1/2") alternating with reddish brown silty clay (3"), trace fine gravel, moist, firm (SP - SC, reworked Glacial Till, Miller Creek Formation).
30.0	S10	22					
30.5							
31.0							31.0 - 39.5: COARSE SAND, reddish brown (2.5YR 3/4) well graded fine to very coarse sand, some silt and fine gravel (SW Glacial Outwash, Copper Falls Formation).
31.5							
32.0							
32.5							
33.0							
33.5							
34.0							

▲ Northern Environmental Technologies
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BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-3
Logged by : J.C. Dellaport

LOCATION: 110 feet SE of vacuum filter building GROUND ELEV: 606.2 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 0.0 - 16.0 ft: 6.25 inch 16.0 - 61.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-14.5': 3.25 ID HSA 14.5'-61.0':2.875 Tricone FLUID: 0.0 - 16.0': None 16.0 - 61.0: Bentonite Slurry	Start / End DATE: 01/19 1989 / 01/25 1989 TIME: 1045 / 1130	COMPLETED AS: Soil Boring

DEPTH	SAMPLE	NVAL	RECOV	%GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
34.0							
34.5							
35.0	S11	19					
35.5							
36.0							
36.5							
37.0							
37.5							
38.0							
38.5							
39.0							
39.5							39.5 - 54.5: SANDY SILT AND SILTY SAND, firm reddish brown (2.5YR 3/4) sandy silt with fine angular gravel. Grades into a soft silty sand at 44.5 feet (ML, Glacial Till and Outwash, Copper Falls Formation).
40.0	S12	80					
40.5							
41.0							
41.5							
42.0							
42.5							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-3
Logged by : J.C. Dellaport

LOCATION: 110 feet SE of vacuum filter building GROUND ELEV: 606.2 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 0.0 - 16.0 ft: 6.25 inch 16.0 - 61.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-14.5': 3.25 ID HSA 14.5'-61.0':2.875 Tricone FLUID: 0.0 - 16.0': None 16.0 - 61.0: Bentonite Slurry	Start / End DATE: 01/19 1989 / 01/25 1989 TIME: 1045 / 1130	COMPLETED AS: Soil Boring

DEPTH	SAMPLE	NVAL	RECOV	%GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
42.5							
43.0							
43.5							
44.0							
44.5							
45.0	S13	101					
45.5							
46.0							
46.5							
47.0							
47.5							
48.0							
48.5							
49.0							
49.5							
50.0	S14	59					
50.5							
51.0							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-3
Logged by : J.C. Dellaport

LOCATION: 110 feet SE of vacuum filter building
GROUND ELEV: 606.2

TOTAL DEPTH: 61.0 feet
BOREHOLE DIA:
0.0 - 16.0 ft: 6.25 inch
16.0 - 61.0 ft: 2.875 inch

DRILLER:Twin City Testing
RIG: CME 55
BIT(S):
0.0-14.5': 3.25 ID HSA
14.5'-61.0':2.875 Tricone
FLUID: 0.0 - 16.0': None
16.0 - 61.0: Bentonite Slurry

	Start	End
DATE:	01/19 1989	01/25 1989
TIME:	1045	1130

COMPLETED AS: Soil Boring

DEPTH	SAMPLE	NVAL	RECOV	%GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
51.0							
51.5							
52.0							
52.5							
53.0							
53.5							
54.0							
54.5							54.5 - 59.0: GRAVEL WITH SILT AND SAND, well-graded, reddish brown (2.5YR 3/4), with rounded pebbles up to 1-inch, saturated, soft, with silt and sand (GW - GM, Glacial Outwash, Copper Falls Formation).
55.0	S15	60					
55.5							
56.0							
56.5							
57.0							
57.5							
58.0							
58.5							
59.0							59.0 - EOB: SANDY SILT WITH GRAVEL, firm, reddish brown (2.5YR 3/4), moist with fine angular gravel (ML, Glacial Till, Copper Falls Formation).
59.5							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-3
Logged by : J.C. Dellaport

LOCATION: 110 feet SE of vacuum filter building GROUND ELEV: 606.2 TOTAL DEPTH: 61.0 feet BOREHOLE DIA: 0.0 - 16.0 ft: 6.25 inch 16.0 - 61.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-14.5': 3.25 ID HSA 14.5'-61.0':2.875 Tricone FLUID: 0.0 - 16.0': None 16.0 - 61.0: Bentonite Slurry	Start DATE: 01/19 1989 TIME: 1045	End 01/25 1989 1130
		COMPLETED AS: Soil Boring	

DEPTH	SAMPLE	NVAL	RECOV	%GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
59.5							
60.0	S16	72					
60.5							
61.0							EOB: 61.0 feet

NOTE:
1) Boring was temporarily cased to 16.0 feet (4½" OD steel casing with threaded coupling). Annulus was grouted with cement/bentonite slurry which cured for 24 hours.

2) Boring was flowing artesian at 61.0 feet (1/25/89).

3) 1/-/89: Abandoned Boring.

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-4
Logged by : J.C. Dellaport

LOCATION: 140 feet SE of aeration tanks
GROUND ELEV: 606.5

TOTAL DEPTH: 41.0 feet
BOREHOLE DIA:
0.0 - 17.5 ft: 6.25 inch
17.5 - 41.0 ft: 2.875 inch

DRILLER:Twin City Testing
RIG: CME 55
BIT(S):
0.0-17.5': 3.25 ID HSA
17.5-41.0': 2.875 Tricone
FLUID: 0.0 - 17.5': None
17.5 - 41.0: Bentonite Slurry

	Start	End
DATE:	01/24 1989	01/24 1989
TIME:	0820	1130

COMPLETED AS: Soil Boring

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
0.0							
	S1				15		0.0 - 1.0: GRAVELLY silt, dark brown 5YR 2.5/1 with sand and clay. Saturated, soft, with wood slivers, distinct sewage odor, organic (ML, Fill).
0.5							
1.0							1.0 - 4.5: NOTE: Described from auger cuttings. GRAVELLY SANDY CLAY, heterogeneous dark brown (5YR 2.5/2) and reddish brown (7.5YR 4/6) angular mafic pebbles up to 1/2 inch, organic, some roots, ¼-inch slab fragments moist, soft (CL, Fill).
1.5							
2.0		5					
2.5	S2	2	1		3		
3.0		3					
3.5							
4.0							
4.5		1					4.5 - 10.8: WOOD WASTE, moist wood chunks, slabs and fibrous fragments, tan to dark brown slightly moist, slight creosote - like odor, wood slab at 7.0 feet. Water bearing zone, voids (Fill).
5.0	S3	2	5		-		
5.5		1					
6.0							
6.5							
7.0		26					
7.5	S4	4	5		35		
8.0		5					
8.5							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-4
Logged by : J.C. Dellaport

LOCATION: 140 feet SE of aeration tanks
GROUND ELEV: 606.5

TOTAL DEPTH: 41.0 feet
BOREHOLE DIA:
0.0 - 17.5 ft: 6.25 inch
17.5 - 41.0 ft: 2.875 inch

DRILLER:Twin City Testing
RIG: CME 55
BIT(S):
0.0-17.5': 3.25 ID HSA
17.5-41.0': 2.875 Tricone
FLUID: 0.0 - 17.5': None
17.5 - 41.0: Bentonite Slurry

	Start	End
DATE:	01/24 1989	01/24 1989
TIME:	0820	1130

COMPLETED AS: Soil Boring

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
8.5							
9.0							
9.5		4					
10.0	S5	8	6		10		
10.5		8					10.8 - 16.0: SILTY SAND AND SANDY SILT, medium bedded poorly graded reddish brown (2.5YR 3/4) silty fine sand soft, moist, alternating with poorly graded reddish brown (2.5YR 3/4) moist sandy silt, soft to firm, trace rounded sandstone pebbles up to ½-inch (SP - SM, ML, Beach Deposit, Miller Creek Formation).
11.0							
11.5							
12.0		4					
12.5	S6	6	12		35		
13.0		10					
13.5							
14.0							
14.5		7					
15.0	S7	11	14		5.5		
15.5		19					16.0 - 25.0: SANDY LEAN CLAY, reddish brown, moist very still, trace of gravel (CL, Lacustrine, Miller Creek Formation).
16.0							NOTE: 16.0 - 41.0: Logged by Twin City Testing Corporation
16.5							
17.0							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-4
Logged by : J.C. Dellaport

LOCATION: 140 feet SE of aeration tanks GROUND ELEV: 606.5 TOTAL DEPTH: 41.0 feet BOREHOLE DIA: 0.0 - 17.5 ft: 6.25 inch 17.5 - 41.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-17.5': 3.25 ID HSA 17.5-41.0': 2.875 Tricone FLUID: 0.0 - 17.5': None 17.5 - 41.0: Bentonite Slurry	Start / End DATE: 01/24 1989 / 01/24 1989 TIME: 0820 / 1130	COMPLETED AS: Soil Boring

DEPTH	SAMPLE	NVAL	RECOV	%GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
17.0							
18.0							
19.0							
20.0							
	S8	38					
21.0							
22.0							
23.0							
24.0							
25.0							25.0 - 41.0: POORLY GRADED SAND, with gravel, reddish-brown, fine to coarse grained, water bearing, dense to very dense. Layers of silty sand from 35 feet Artesian flow encountered (Glacial Outwash, Copper Falls Formation).
	S9	17					
26.0							
27.0							
28.0							
29.0							
30.0							
	S10	45					
31.0							
32.0							
33.0							
34.0							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-4
Logged by : J.C. Dellaport

LOCATION: 140 feet SE of aeration tanks
GROUND ELEV: 606.5

TOTAL DEPTH: 41.0 feet
BOREHOLE DIA:
0.0 - 17.5 ft: 6.25 inch
17.5 - 41.0 ft: 2.875 inch

DRILLER:Twin City Testing
RIG: CME 55
BIT(S):
0.0-17.5': 3.25 ID HSA
17.5-41.0': 2.875 Tricone
FLUID: 0.0 - 17.5': None
17.5 - 41.0: Bentonite Slurry

	Start	End
DATE:	01/24 1989	01/24 1989
TIME:	0820	1130

COMPLETED AS: Soil Boring

DEPTH	SAMPLE	NVAL	RECOV	%GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
34.0							
35.0	S11	53					
36.0							
37.0							
38.0							
39.0							
40.0	S12	34					
41.0							EOB 41.0 Feet

NOTE: 1) Boring was logged to 16.0 feet by Northern Environmental Geologist. Boring was completed at 41.0 feet for geotechnical purposes by Twin City Testing Corporation, 01/24/89.

2) Boring was temporarily cased to 17.5 feet (4 1/2" OD steel casing with (2) threaded couplings). Annulus was grouted with a cement/bentonite slurry which cured for 24 hours.

3) 01/24/89: Abandoned boring.

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-5
Logged by : J.C. Dellaport

LOCATION: 90 feet SW of artesian well
GROUND ELEV: 607.1

TOTAL DEPTH: 41.0 feet
BOREHOLE DIA:
0.0 - 18.0 ft: 6.25 inch
18.0 - 41.0 ft: 2.875 inch

DRILLER:Twin City Testing
RIG: CME 55
BIT(S):
0.0-13.5': 3.25 ID HSA
13.5'-41.0':2.875 Tricone
FLUID: 0.0 - 18.0': None
18.0 - 41.0: Bentonite Slurry

	Start	End
DATE:	01/18 1989	01/24 1989
TIME:	0825	1645

COMPLETED AS: Soil Boring

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
0.0							
	S1				5		0.0 - 1.5: SILTY CLAY, brown and reddish brown, heterogeneous, soft, moist, trace sand and some fine gravel, some roots and organic matter, trace fine coal cinders 5YR 3/2, 5YR 4/4 (CL, Fill).
0.5							
1.0							
1.5							
2.0		4					1.5 - 2.9: SAND, fine to medium, poorly graded reddish sand, moist, rounded, trace clay at base, 5YR 3/4 (SP, Fill).
2.5	S2	4	7		4.9		
3.0		3					2.9 - 6.0: PEAT AND WOOD WASTE, black, rooty moist peat overlying greenish-black stained wood fragments, trace clay, strong creosote like odor, up to 2 inch wood chunks, wood is light, fibrous and degraded (Fill).
3.5							
4.0							
4.5		1					
5.0	S3	1	6		14		
5.5		2					
6.0		2					6.0 - 10.6: WOOD WASTE, greenish-black moist stained wood chips and fragments, strong creosote like odor, larger wood slabs with depth (Fill).
6.5	S4	3	7		7		
7.0		4					
7.5		3					
8.0	S5	1	3		35		
8.5							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-5
Logged by : J.C. Dellaport

LOCATION: 90 feet SW of artesian well GROUND ELEV: 607.1 TOTAL DEPTH: 41.0 feet BOREHOLE DIA: 0.0 - 18.0 ft: 6.25 inch 18.0 - 41.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-13.5': 3.25 ID HSA 13.5'-41.0':2.875 Tricone FLUID: 0.0 - 18.0': None 18.0 - 41.0: Bentonite Slurry	Start / End DATE: 01/18 1989 / 01/24 1989 TIME: 0825 / 1645	COMPLETED AS: Soil Boring

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
8.5							
	S5	3					
9.0		5					
9.5							
	S6	5	4		28		
10.0		11					
10.5		3					10.6 - 12.5: SAND, well graded, fine, medium and coarse, reddish brown (5YR 4/3) saturated, subrounded, with some subrounded quartz pebbles up to ¼-inch, trace silt (SW, Beach Deposit, Miller Creek Formation).
11.0							
	S7	10	10		2.2		
11.5		11					
12.0		5					
12.5							12.5 - 26.0: SILT, reddish brown, (5YR 3/3), more dry, firm some very coarse sand and fine angular pebbles, some thin fine - medium sand beds. Grades into a clayey silt with pebbles. Sandy silt at base (ML, Lacustrine, Miller Creek Formation).
	S8	16	10		11		
13.0		19					
13.5		11					
14.0							
	S9	15	14		13		
14.5		25					
15.0							
15.5							
16.0							
16.5							
17.0							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-5
Logged by : J.C. Dellaport

LOCATION: 90 feet SW of artesian well
GROUND ELEV: 607.1

TOTAL DEPTH: 41.0 feet
BOREHOLE DIA:
0.0 - 18.0 ft: 6.25 inch
18.0 - 41.0 ft: 2.875 inch

DRILLER:Twin City Testing
RIG: CME 55
BIT(S):
0.0-13.5': 3.25 ID HSA
13.5'-41.0':2.875 Tricone
FLUID: 0.0 - 18.0': None
18.0 - 41.0: Bentonite Slurry

	Start	End
DATE:	01/18 1989	01/24 1989
TIME:	0825	1645

COMPLETED AS: Soil Boring

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
17.0							
17.5							
18.0							
18.5							
19.0							
19.5		15					
20.0	S10	20	14		4		S10: Unconfined compressive strength greater than 4.5 tons per square foot.
20.5		37					
21.0							
21.5							
22.0							
22.5							
23.0							23.0 - 24.0: SCHIST BOULDER
23.5							
24.0							
24.5							
25.0	S11	*	4		4		* Blow counts S11: 100/10"
25.5							

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-5
Logged by : J.C. Dellaport

LOCATION: 90 feet SW of artesian well
GROUND ELEV: 607.1

TOTAL DEPTH: 41.0 feet
BOREHOLE DIA:
0.0 - 18.0 ft: 6.25 inch
18.0 - 41.0 ft: 2.875 inch

DRILLER:Twin City Testing
RIG: CME 55
BIT(S):
0.0-13.5': 3.25 ID HSA
13.5'-41.0':2.875 Tricone
FLUID: 0.0 - 18.0': None
18.0 - 41.0: Bentonite Slurry

	Start	End
DATE:	01/18 1989	01/24 1989
TIME:	0825	1645

COMPLETED AS: Soil Boring

DEPTH	SAMPLE	BLOWS	RECOV	% GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
25.5							25.2 - 26.0: SCHIST BOULDER
26.0							26.0 - EOB: SAND, brown (5YR 3/4) fine, poorly graded, rounded sand, saturated, with rounded quartz and angular gabbroic pebbles up to 1/2 inch. 1-inch rounded red sandstone pebble. Sequence coarsens with depth to a well graded sand. Lower 10 feet contains more sandstone and gabbroic pebbles up to 1-inch (Glacial Outwash, Copper Falls Formation).
26.5							
27.0							
27.5							
28.0							
28.5							
29.0							
29.5		11					
30.0	S12	19	17		4.2		
30.5		27					
31.0							
31.5							
32.0							
32.5							
33.0							
33.5							
34.0							

▲ Northern Environmental Technologies
Incorporated

BOREHOLE LOG

Project : City of Ashland, (BRA10041)
Location: Ashland, Wisconsin

Borehole ID: 88-5
Logged by : J.C. Dellaport

LOCATION: 90 feet SW of artesian well GROUND ELEV: 607.1 TOTAL DEPTH: 41.0 feet BOREHOLE DIA: 0.0 - 18.0 ft: 6.25 inch 18.0 - 41.0 ft: 2.875 inch	DRILLER:Twin City Testing RIG: CME 55 BIT(S): 0.0-13.5': 3.25 ID HSA 13.5'-41.0':2.875 Tricone FLUID: 0.0 - 18.0': None 18.0 - 41.0: Bentonite Slurry	Start / End DATE: 01/18 1989 / 01/24 1989 TIME: 0825 / 1645	COMPLETED AS: Soil Boring

DEPTH	SAMPLE	NVAL	RECOV	%GAS	PID	SYMBOL	MATERIAL DESCRIPTION AND COMMENTS
34.0							
34.5							
35.0	S13	*					
35.5							
36.0							
36.5							
37.0							
37.5							
38.0							
38.5							
39.0							
39.5							
40.0	S14	66					
40.5							
41.0							

* Blow Counts S13: 100/15"

NOTE: 1) A soil sample of auger cuttings (0.0 - 10.5 feet) was submitted for laboratory analysis of base/neutral and acid extractable compounds.
2) Split spoon sampled continuously: 4.5 - 15.0 feet.
3) Static water level: ≈5 feet below grade, 01/23/89.
4) 01/23/89: Boring was temporarily cased to 18.0 feet (4.5 inch OD steel casing with threaded coupling). Annulus was grouted with a cement/bentonite slurry which cured for 24 hours.
5) Boulders encountered at 23.0 and 25.2 feet. Penetrated with a 2.25 inch carbide tipped drag bit.
6) EOB: 41.0 feet; boring was flowing artesian, ≈ 1.8 gallon per minute (gpm) flow rate.
7) 01/24/89: Boring abandoned and sealed. Bentonite plug set at 23.0 feet and cement/bentonite/mud grout tremied to surface.

EOB: 41.0 Feet

APPENDIX B2

BOREHOLE LOGS
TWIN CITY TESTING CORPORATION, JANUARY 1989

twin city testing
corporation
formerly operated as Lakehead Testing Laboratory
226 NORTH CENTRAL AVENUE
P.O. BOX 7166
DULUTH, MN 55807
PHONE 218/628-2295

February 6, 1989

John C Dellaport, Hydrogeologist
Northern Environmental Technologies, Inc
P O Box 532
Cedarburg, WI 53012

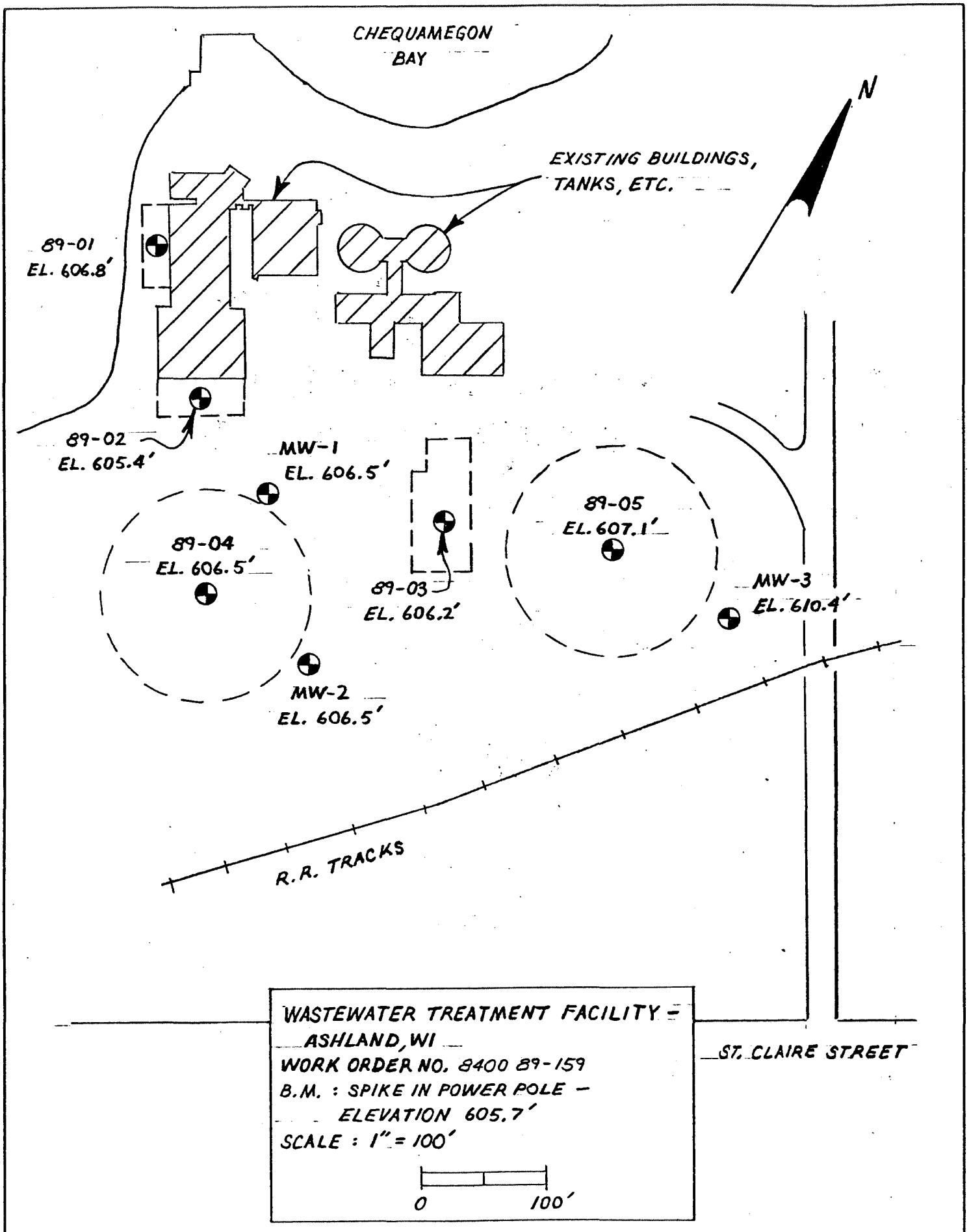
Mr Dellaport,

Enclosed please find photocopies of report logs, driller's boring logs and site plan for the Wastewater Treatment Facility in Ashland, WI, per your request. Please feel free to contact us should you desire additional information.

Sincerely,

Robert W. Kaspszak

Robert W Kaspszak
Earth Scientist


CHEQUAMEGON BAY
N
EXISTING BUILDINGS, TANKS, ETC.
89-01
EL. 606.8'
89-02
EL. 605.4'
MW-1
EL. 606.5'
89-04
EL. 606.5'
89-03
EL. 606.2'
89-05
EL. 607.1'
MW-3
EL. 610.4'
MW-2
EL. 606.5'
R.R. TRACKS
ST. CLAIRE STREET
WASTEWATER TREATMENT FACILITY -
ASHLAND, WI
WORK ORDER NO. 8400 89-159
B.M. : SPIKE IN POWER POLE -
ELEVATION 605.7'
SCALE : 1" = 100'
0
100'

LOG OF TEST BORING

JOB NO. 8400 89-159 VERTICAL SCALE 1" = 4' BORING NO. 89-01

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 100.8')	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LAB TESTS W	LAB TESTS D	LAB TESTS LL/PL	LAB TESTS Qu
1½	CLAYEY SAND, BLACK, FINE GRAINED, MOIST, W/ORGANICS, RUBBLE. (SC)				1	FA				
	SANDY LEAN CLAY, REDDISH-BROWN, MOIST, MEDIUM TO SOFT, TRACE OF ORGANICS. TRACE OF WOOD @ 10'.		7	▼	2	SB				
		FILL	8		3	SB				
			6		4	SB				
			4		5	SB				
	(CL)				6	ST				
14	POORLY GRADED SAND W/SILT, BROWN, FINE GRAINED, WATERBEARING, MEDIUM DENSE. (SP-SM)	BEACH DEPOSIT	15		7	SB				
16	SANDY FAT CLAY, RED, MOIST, MEDIUM. TRACE OF GRAVEL.									
			5		8	SB	42		65/20	
		LACUSTRINE	6		9	SB				
			6		10	SB				
	(CH)									
35	LOG CONTINUED									

LOG OF TEST BORING

JOB NO. 8400 89-159 VERTICAL SCALE 1" = 4' BORING NO. 89-01

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	L.L. / P.L.	Qu
35	SANDY FAT CLAY (CONT.) (CH)	LACUSTRINE	7		11	SB				
37	SILTY SAND, REDDISH-BROWN, FINE GRAINED, MOIST, VERY DENSE. W/TRACES OF GRAVEL, COBBLES. LAYERS OF WATERBEARING SAND.		44		12	SB				
	ARTESIAN CONDITION OCCURRED AFTER LEAVING SITE. PLUGGED W/ BENTONITE.	GLACIAL TILL	54		13	SB				
			40		14	SB				
			72		15	SB				
	(SM)		100/8		16	SB				
61	END OF BORING									

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
1/20	1:00	15'	14½'	14½'	to	9'
1/20	3:30	61'	14½'	61'	to	1'
1/23	10:30	61'	14½'	40'	to	ARTESIAN
1/23	11:15	61'	NONE	19'	to	4'

START 1-20-89 COMPLETE 1-20-89

METHOD @ 3:30

3¼" HSA TO 14½'

DM TO 59½'

CREW CHIEF J. TUURA

SE-2 (77-8) 4

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400 89-159 VERTICAL SCALE 1" = 4' BORING NO. 89-02

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 99.4')	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LAB TESTS W	D	LL/PL	Qu
	CLAYEY SAND, BLACK, FINE GRAINED, MOIST, W/PEAT, ORGANICS. (SC)				1	FA				
4	SILTY SAND, BROWN, FINE GRAINED, REDDISH-BROWN, AND FAT CLAY W/SAND, REDDISH-BROWN, MOIST, MEDIUM. TRACE OF ORGANICS. (SM) (CH)		7		2	SB				
4.5	FAT CLAY W/SAND, RED, MOIST, MEDIUM TO SOFT. TRACE OF ORGANICS.	FILL	5		3	SB				
	WOOD CHIPS W/OILY CREOSOTE SMELL, 12.1 TO 12.4'.		3	▼	4	SB				
	SAND, BROWN, FINE TO MEDIUM GRAINED, MOIST, W/OILY CREOSOTE SMELL 12.4 TO 12.6'.				5	3T				
	(CH)									
12.6	FAT CLAY W/SAND, RED, MOIST, MEDIUM TO STIFF.		4		6	SB				
	SAMPLE NO. 6: TRACE OF BRIGHT ORANGE SUBSTANCE; CREOSOTE SMELL. TRACES OF GRAVEL, SILT. LENSES OF WATERBEARING SAND.	POSSIBLE FILL	7		7	SB				
	(CH)		16		8	SB				MA
24.5	SILTY SAND, W/A LITTLE GRAVEL, FINE GRAINED, REDDISH-BROWN, MOIST, VERY DENSE. (SM)	BEACH DEPOSIT	37		9	SB				
26	FAT CLAY W/SAND, RED, MOIST, RATHER STIFF, TRACE OF GRAVEL.	LACUSTRINE								
	(CH)		14		10	SB				
34	LOG CONTINUED									

LOG OF TEST BORING

JOB NO. 8400 89-155 VERTICAL SCALE 1" = 4' BORING NO. 89-02

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL / PL	Qu
34	SILTY SAND, W/A LITTLE GRAVEL, REDDISH-BROWN, FINE GRAINED, MOIST, VERY DENSE. (SM)	GLACIAL TILL	37		11	SB				
			78		12	SB				
43	POORLY GRADED SAND W/ SILT, W/ A LITTLE GRAVEL, REDDISH-BROWN, FINE GRAINED, WATERBEARING, VERY DENSE. (SP-SM)	GLACIAL OUTWASH	79		13	SB				
			70		14	SB				
			80		15	SB				
56	SILTY SAND, W/A LITTLE GRAVEL, REDDISH-BROWN, FINE GRAINED, MOIST, VERY DENSE. (SM)	GLACIAL TILL	62		16	SB				
61	END OF BORING									

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
1/17	2:00	15'	13½'	13½'	to	10½'
1/17	4:30	15'	NONE	12'	to	9'
					to	
					to	

START 1-17-89 COMPLETE 1-17-89

METHOD @ 2:15

3¼" HSA TO 13½'

CREW CHIEF J. TUURA

SE-2 (77-B) 4

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400 89-159 VERTICAL SCALE 1" = 4' BORING NO. 89-03

PROJECT WASTEWATER TREATMENT PLANT – ASHLAND, WI.

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 100.2')	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL/PL	Qu
0.5	0 – 0.5' DARK BROWN ORGANIC TOPSOIL. SANDY SILTY CLAY, BROWN TO BLACK, MOIST, RATHER STIFF TO MEDIUM. W/ PEAT, BLACK. CINDERS. (CH) (PT)	FILL	11	▼	1	FA				
					2	SB				
5.5	WOOD CHIPS AND SLABS. CREOSOTE SMELL. TRACES OF SAND. WATERBEARING,		6		3	SB				
			6		4	SB				
10	POORLY GRADED SAND, BROWN, FINE GRAINED, WATERBEARING, MEDIUM DENSE. (SP)	BEACH DEPOSIT	10		5	SB				
12	CLAYEY SAND W/GRAVEL, REDDISH-BROWN, FINE GRAINED, MOIST, DENSE. (SC)		27		6	SB			19/11	
14	SANDY LEAN CLAY, REDDISH-BROWN, MOIST, VERY STIFF TO STIFF. TRACE OF GRAVEL. A FEW COBBLES.		48		7	SB				
			50		8	SB				MA
		LACUSTRINE								
			48		9	SB				
			22		10	SB				
	(CL)									
34	LOG CONTINUED									

LOG OF TEST BORING

JOB NO. 8400 89-159 VERTICAL SCALE 1" = 4' BORING NO. 89-03

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL/PL	Qu
34	POORLY GRADED SAND W/SILT, W/ A LITTLE GRAVEL, FINE TO MEDIUM GRAINED, REDDISH-BROWN, WATERBEARING, DENSE. ARTESIAN FLOW WHEN LAYER ENCOUNTERED (SP-SM)	GLACIAL OUTWASH	19		11	SB				
39	SILTY SAND, W/A LITTLE GRAVEL, FINE GRAINED, REDDISH-BROWN, MOIST, VERY DENSE. WITH LAYERS OF POORLY GRADED SAND, REDDISH-BROWN, FINE TO MEDIUM GRAINED, WATERBEARING, VERY DENSE.		80		12	SB				
		GLACIAL OUTWASH / GLACIAL TILL	101		13					
			59		14					
			60		15					
			72		16					
61	END OF BORING									

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
1/19	12:00		NONE	13'	to	7'
1/19	4:30		NONE	7'	to	4'
1/25	11:30	61'	16'	59½'	to	ARTESIAN
					to	

START 1-19-89 COMPLETE 1-25-89

METHOD @ 11:30

3¼" HSA TO 14½'

4" CASING TO 16', DM TO 59½'

CREW CHIEF J. TUURA

LOG OF TEST BORING

JOB NO. 8400 89-159 VERTICAL SCALE 1" = 4' BORING NO. 89-04

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 102.4')	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LAB TESTS W	LAB TESTS D	LAB TESTS LL/PL	LAB TESTS Qu
	SILTY SAND, W/A LITTLE GRAVEL, BLACK, FINE GRAINED, MOIST TO WET, LOOSE. W/ CINDERS, ORGANICS. (SM)				1	FA				
			5		2	SB				
4.5	WOOD CHIPS AND SLABS, SAMPLE NO. 5 : CREOSOTE SMELL.	FILL	3		3	NSR				
			7		4	NSR				
			16		5	SB				
11	SILTY SAND, REDDISH-BROWN, FINE TO MEDIUM GRAINED, WATERBEARING, DENSE. TRACE OF ORGANICS. SLIGHT CREOSOTE SMELL. (SM)	BEACH DEPOSIT	16		6	SB				MA
14	SANDY LEAN CLAY, REDDISH-BROWN, MOIST, VERY STIFF ~~TO STIFF~~. TRACE OF GRAVEL. (CL)	LACUSTRINE	30		7	SB				
			38		8	SB				
25	POORLY GRADED SAND, W/GRAVEL, REDDISH-BROWN, FINE TO COARSE GRAINED, WATER-BEARING, DENSE TO VERY DENSE. LAYERS OF SILTY SAND FROM 35'. ARTESIAN FLOW ENCOUNTERED.	GLACIAL OUTWASH	17		9	SB				
			45		10	SB				
35	LOG CONTINUED		53		11	SB				

LOG OF TEST BORING

JOB NO. 8400 89-159 VERTICAL SCALE 1" = 4' BORING NO 89-04

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL/PL	Qu
37	POORLY GRADED SAND W/GRAVEL (CONT.)	GLACIAL OUTWASH	34		12	SB				
41	END OF BORING									

WATER LEVEL MEASUREMENTS

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

START 1-24-89 COMPLETE

METHOD @

3¼" HSA TO 14½'

4" CASING TO 17½', DM TO 39½'

CREW CHIEF J. TUURA

SE-2 (77-B) .4

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400 89-159 VERTICAL SCALE 1" = 4' BORING NO. 89-05

PROJECT WASTEWATER TREATMENT PLANT – ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 101.1')	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL/PL	Qu
1	SAND, GRAVEL, CLAY, DARK BROWN.	FILL			1	FA				
	POORLY GRADED SAND W/SILT, REDDISH-BROWN, FINE GRAINED, MOIST, LOOSE. (SP-SM)		7		2	SB				
2.9	PEAT, BLACK, MOIST, W/SAND, ROOTS. (PT)									
4.5	WOOD, ROTTEN WOOD, ORGANICS. CREOSOTE SMELL.		3		3	SB				
			7		4	FA				
			4		5	FA				
			16		6	FA				
10.5	SILTY SAND, REDDISH-BROWN, FINE GRAINED, WATERBEARING, DENSE. (SM)	BEACH DEPOSIT	21		7	SB				
12	SANDY LEAN CLAY, REDDISH-BROWN, MOIST, VERY DENSE. TRACE OF GRAVEL. A FEW COBBLES.	LACUSTRINE	35		8	SB				MA
			41		9	SB				
			57		10	SB				
23	BOULDER, 23-24'. CLAYEY GRAVEL, REDDISH-BROWN, WET, VERY DENSE, 24.5-25.2'. BOULDER, 25.2-26.1'. (GC)	GLACIAL TILL	100/2		11	SB				
26.1	SILTY SAND, REDDISH-BROWN, FINE TO MEDIUM GRAINED, WATERBEARING, VERY DENSE. TRACE OF GRAVEL. A FEW COBBLES. ARTESIAN FLOW ENCOUNTERED AT 40'	GLACIAL OUTWASH	46		12	SB				
35	LOG CONTINUED		107		13	SB				

twin city testing corporation

SE-3 (77-B)-4

LOG OF TEST BORING

JOB NO. 8400 89-159 VERTICAL SCALE 1" = 4' BORING NO. 89-05

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION ____)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL/PL	Qu
37	SILTY SAND (CONT.)	GLACIAL OUTWASH								
			66		14	SB				
41	END OF BORING									

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
1/24	4:10	41'	18'	33'	to	ARTESIAN
					to	
					to	
					to	

START 1-18-89 COMPLETE 1-24-89

METHOD @ 4:10

3 1/4" HSA TO 13 1/2'

4" CASING TO 18', DH TO 39 1/2'

CREW CHIEF J. TUURA

SE-2 (77-B) 4

twin city testing corporation

LOG OF TEST BORING

JOB NO. 8400 89-159 VERTICAL SCALE 1" = 3' BORING NO. MW-1

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 100.5')	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL / P.L	Qu
0	SILTY SAND W/A LITTLE GRAVEL, FINE TO MEDIUM GRAINED, BROWN, MOIST W/ORGANICS. (SM)				1	FA				
2	WOOD CHIPS AND SLABS, DECAYED WOOD, SLIGHT TRACES OF GRAVEL, MOIST TO WET, CREOSOTE SMELL.	FILL	8		2	SB				
			4		3	SB				
			6		4	NSR				
			2		5	SB				
11.5	SANDY FAT CLAY, REDDISH-BROWN, MOIST, SOFT TO RATHER STIFF. TRACES OF GRAVEL AND SILTY SAND. MONITORING WELL PLACED @ 14'. (CH)	LACUSTRINE	4	▼	6	SB				
			11		7	SB				
16	END OF BORING									

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
1/18	2:50	8½	7'	7'	to	6'
1/18	3:15	16'	14½'	16'	to	13'
					to	
					to	

START 1-18-89 COMPLETE 1-18-89 @ 3:15

METHOD 3¼" HSA TO 14½'

CREW CHIEF J. TUURA

twin city testing corporation

SE-12 (77-8)-3

LOG OF TEST BORING

JOB NO. 8400 89-155 VERTICAL SCALE 1" = 3' BORING NO. MW-2

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 100.5')	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL / P.L.	Qu
	SAND AND GRAVEL W/ORGANICS, DARK BROWN (TOPSOIL) TO 0.5'									
	SANDY SILT W/A LITTLE GRAVEL, DARK BROWN TO BLACK, MOIST, VERY LOOSE. W/ CINDERS, ORGANICS. (ML)		3		1	FA				
					2	SB				
4.5	WOOD CHIPS AND SLABS, DECAYED WOOD, W/SAND AND GRAVEL, WATERBEARING CREOSOTE SMELL.	FILL	13		3	SB				
			13		4	SB				
10.5	POORLY GRADED SAND W/SILT, FINE GRAINED, BROWN, WATERBEARING, DENSE. (SP-SM)	BEACH DEPOSIT	18		5	SB				
11.5	CLAYEY SAND, W/ A LITTLE GRAVEL, REDDISH-BROWN, FINE GRAINED, MOIST, DENSE. TRACES OF SILT. MONITORING WELL PLACED AT 13.4'. (SC)	LACUSTRINE	24	▼	6	SB				
			20		7	SB				
16	END OF BORING									

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
1/18	4:25	16'	14½	14½'	to	12'
					to	
					to	
					to	

START 1-18-89 COMPLETE 1-18-89 @ 4:20

METHOD 3¼" HSA TO 14½'

CREW CHIEF J. TUURA

twin city testing corporation

SE-12 (77-B)-3

LOG OF TEST BORING

JOB NO. 8900 89-155 VERTICAL SCALE 1" = 3' BORING NO. MW-3

PROJECT WASTEWATER TREATMENT PLANT - ASHLAND, WI

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION 104.4')	GEOLOGIC ORIGIN	N	WL	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	D	LL / P.L	Qu
	DARK BROWN ORGANIC TOPSOIL TO 0.5' SILTY SAND, DARK BROWN TO BLACK, FINE TO MEDIUM GRAINED, MOIST, VERY LOOSE. W/CINDERS. (SM)		3		1	SB				
4.5	FAT CLAY W/ SAND, REDDISH-BROWN, MOIST, VERY SOFT. (CH)	FILL	4		2	SB				
7	WOOD SLABS AND CHIPS, DECAYED WOOD, BLACK, WATERBEARING. CREOSOTE SMELL.		10	▼	3	SB				
10	POORLY GRADED SAND W/SILT, REDDISH-BROWN, FINE TO MEDIUM GRAINED, WATERBEARING, VERY DENSE. MONITORING WELL INSTALLED AT 15' (SP-SM)	BEACH DEPOSIT	BOUNCE		4	SB				
			46		5	SB				
			51		6	SB				
16	END OF BORING									

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
1/19	3:15	16'	NONE	15'	to	7.5'
					to	
					to	
					to	

START 1-19-89 COMPLETE 1-19-89

METHOD 3 1/4" HSA TO 14 1/2' @ 2:45

CREW CHIEF J. TOURA

twin city testing corporation

SE-12 (77-B)-3

APPENDIX B3

BOREHOLE LOGS
LAKEHEAD TESTING LABORATORIES, INC., OCTOBER 1970

LAKEHEAD TESTING LABORATORY, INC.

TESTS • INSPECTIONS

P.O. Box 1001
325 NORTH CENTRAL AVENUE
DULUTH, MINNESOTA 55807

November 10, 1971

LEO H. EBERT, P. E.
MANAGER

Crowley and Hansen
14 East Jackson Blvd.
Chicago, Illinois 60604

Re: Soil Investigation
Proposed Sewage Treatment Plant Additions &
Proposed Elevated Water Storage Tank
Ashland, Wisconsin
T#/66459

Gentlemen:

We have conducted a soil investigation for the proposed Sewage Treatment Plant additions and a soil investigation and foundation analysis for the proposed Elevated Water Storage Tank. We are transmitting two copies of our report. Additional copies are being sent as noted below.

Under separate cover we are sending representative samples of the soil to your architects for their personal inspection. About 50% of the remaining soil samples will be held at this office for two months and will then be discarded unless we are retained to hold them for a longer period of time.

As part of our professional services, we have on our staff formation and soils engineers and engineering geologists available for consultation. As the work of the project develops, they will be available to you to discuss the specific problems as they arise or aid you in your evaluation.

Very truly yours

LAKEHEAD TESTING LABORATORY,

Leo H. Ebert, P. E.

CC: Ashland Water Utility
Attention: Mr. Snow

LHE/lkt

LOG OF TEST BORING

BORING NO. 70-1 VERTICAL SCALE 1" = 2'

PROJECT PROPOSED SEWAGE TREATMENT PLANT ADDITION, ASHLAND, WISCONSIN

DEPTH IN FEET	DESCRIPTION OF MATERIAL	N	WL	SAMPLE NO.	SAMPLE TYPE	COORDINATE UNITS W	D	LL PL	Qu
	ELEVATION 604.6'								
0	TOPSOIL - 5 FILL - clayey silt, sand, wood, roots, organic matter, black, moist			1	SS				
4		5	▼	2	SS				
	FILL - PRIMARILY DECAYED WOOD - water bearing	10		3	SS				
		13		4	SS				
10½		5		5	SS				
	SAND - dark brown, fine grained, moist, loose, water-bearing (SP-SM)	6		6	SS				
13½									
	FAT CLAY - reddish brown, medium to rather stiff, traces of sand, gravel and above 20 feet, wood (CH)	3		7	SS				
				8	ST				
		10		9	SS				
24									
	(log continued next sheet)								

LOG OF TEST BORING

BORING NO. 70-1 (con't) VERTICAL SCALE 1" = 3'

PROJECT [illegible] WATER TREATMENT PLANT ADDITION, ASHLAND, WISCONSIN

DEPTH IN FEET	DESCRIPTION OF MATERIAL	n	WL	SAMPLE NO	SAMPLE TYPE	LABORATORY TESTS W	D	qu
	SURFACE ELEVATION (log con't)							
28	SANDY CLAY - brown, rather stiff to stiff, some sand and little gravel (CL)	11		10	SS			
		31		11	SS			
36		48		12	SS			
	(end of boring)							
	* cave in at 3.3'							

WATER LEVEL MEASUREMENTS

Temp. Aug. DEPTH CASING 4½'

D.H. B.C.R. 3.3'

A.C.R. @ C. 2.2' to cave in at 8.8'

25 hr AC 2.0'@ -- A.C. --

LAKEHEAD TESTING LABORATORY, INC.

START 10-6-70 COMPLETE 10-6-70

METHOD 3¼ HSA to 31½'

CREW CHIEF J. Brooks JOB NO. TP 661.59

LOG OF TEST BORING

BORING NO. 70-2 VERTICAL SCALE 1" = 5'

PROJECT/PROPOSED SEWAGE TREATMENT PLANT ADDITION, ASHLAND, WISCONSIN

DEPTH IN FEET	DESCRIPTION OF MATERIAL	N	SAMPLE NO.	SAMPLE TYPE	LABORATORY TESTS W	LL	PI	Qu
	ELEV. SURFACE ELEVATION 681.8							
0	MISCELLANEOUS FILL - sand, silt, gravel, cinders, roots, black, water bearing							
		9	1	SS				
3	PEAT - black, water bearing (PT)	7	2	SS				
7		15	3	SS				
	FILL - PRIMARILY DECAYED WOOD - water bearing	9	4	SS				
14		4	5	SS				
	FAT CLAY - reddish brown, medium to stiff, traces of sand, gravel and above 16 feet, wood (CH)	6	6	SS				
		19	7	SS				
		11	8	SS				
27		29	9	SS				

(log continued on next sheet)

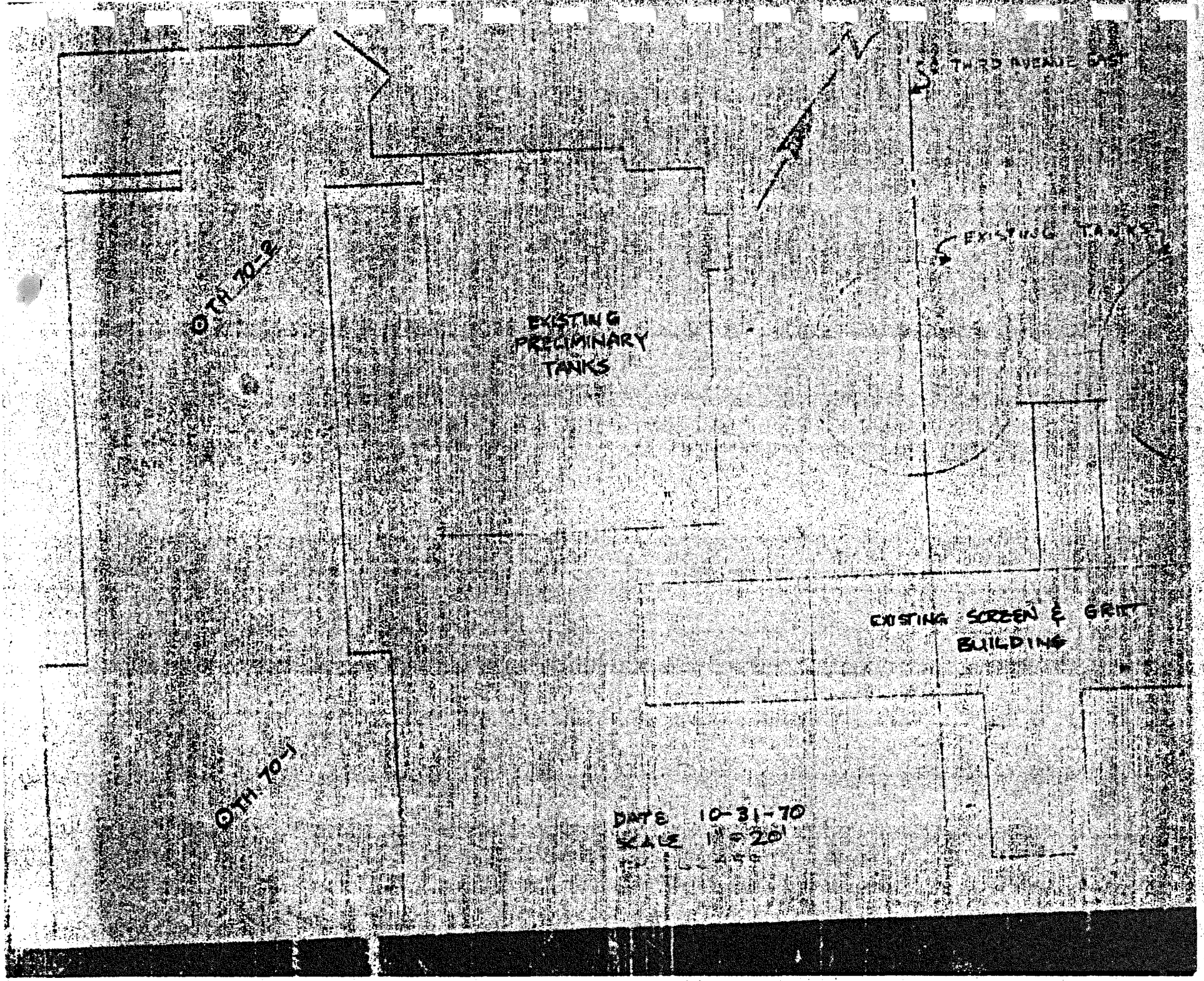
LOG OF TEST BORING

BORING NO. 70-2 (con't) VERTICAL SCALE 1" = 3'

PROJECT [illegible] SEWAGE TREATMENT PLANT ADDITIONS, ASHLAND, WISCONSIN

DEPTH IN FEET	DESCRIPTION OF MATERIAL SURFACE ELEVATION (log con't)	N	WL	SAMPLE NO.	SAMPLE TYPE	W	D	LL PL	Qu
27	SANDY CLAY - brown, stiff to very stiff, a few lenses of sand, a trace of gravel (CL)								
		45		10	SS				
		27		11	SS				
		16		12	SS				
	* cave in at 6.8'								
		36		13	SS				
51		38		14	SS				
	(end of boring)								

WATER LEVEL MEASUREMENTS		LAKEHEAD TESTING LABORATORY, INC.	START 10-6-70	COMPLETE 10-7-70
W.L. 4.0'	DEPTH CASING 4½'		METHOD 3½ HSA to 49½'	
D.B.	B.C.R. 1.0'			
A.C.R. or O.C. 2.6' to cave, 1½ at 10.8'				
5½ hrs. 2.4'*	— A.C. --		CREW CHIEF J. Hoppe	JOB NO. TP 6459


THIRD AVENUE EAST
EXISTING TANKS
EXISTING PRELIMINARY TANKS
EXISTING SCREEN & GRIT BUILDING
DATE 10-31-70
SCALE 1" = 20'

APPENDIX F

WATER LEVEL DATA

▲ Northern Environmental Technologies
Incorporated

WATER LEVEL DATA

Project : City of Ashland (BRA10041)
Location : Ashland, Wisconsin
Personnel: J. Dellaport

Well Number : MW-1
Well Location :
Riser Elevation : 609.42
Ground Elevation: 606.50

DATE 1989	TIME	MEASURING DEVICE	DEPTH (ft below top of riser)	WATER LEVEL		COMMENTS
				Depth (ft below grade)	Elevation (ft msl)	
1/20	1130	OWLP	7.42	4.50	602.00	predevelop
1/21	1530	OWLP	7.38	4.46	602.04	predevelop
1/22	1219	OWLP	7.32	4.40	602.10	predevelop
1/23	1055	OWLP	7.36	4.44	602.06	after dev.
1/25	1230	OWLP	7.28	4.36	602.14	after dev.

NOTE: MEASURING DEVICE = OWLP: Olympic Water Level Probe
Tape: Steel or Fiberglass Measuring Tape

▲ Northern Environmental Technologies
Incorporated

WATER LEVEL DATA

Project : City of Ashland (BRA10041)
Location : Ashland, Wisconsin
Personnel: J. Dellaport

Well Number : MW-2
Well Location :
Riser Elevation : 609.32
Ground Elevation: 606.43

DATE 1989	TIME	MEASURING DEVICE	DEPTH (ft below top of riser)	WATER LEVEL		COMMENTS
				Depth (ft below grade)	Elevation (ft msl)	
1/20	1046	OWLP	7.30	4.41	602.02	predevelop
1/21	1530	OWLP	7.25	4.36	602.07	predevelop
1/22	1035	OWLP	7.20	4.31	602.12	predevelop
1/23	1055	OWLP	7.26	4.37	602.06	after dev.
1/25	1347	OWLP	7.19	4.30	602.13	after dev.

NOTE: MEASURING DEVICE = OWLP: Olympic Water Level Probe
Tape: Steel or Fiberglass Measuring Tape

▲ Northern Environmental Technologies
Incorporated

WATER LEVEL DATA

Project : City of Ashland (BRA10041)
Location : Ashland, Wisconsin
Personnel: J. Dellaport

Well Number : MW-3
Well Location :
Riser Elevation : 613.26
Ground Elevation: 610.37

DATE 1989	TIME	MEASURING DEVICE	DEPTH (ft below top of riser)	WATER LEVEL		COMMENTS
				Depth (ft below grade)	Elevation (ft msl)	
1/20	1613	OWLP	11.24	8.35	602.02	predevelop
1/21	1530	OWLP	11.26	8.37	602.00	predevelop
1/22	0852	OWLP	11.20	8.31	602.06	predevelop
1/23	1055	OWLP	11.32	8.43	601.94	after dev.
1/25	0950	OWLP	11.12	8.23	602.14	after dev.

NOTE: MEASURING DEVICE = OWLP: Olympic Water Level Probe
Tape: Steel or Fiberglass Measuring Tape

APPENDIX C

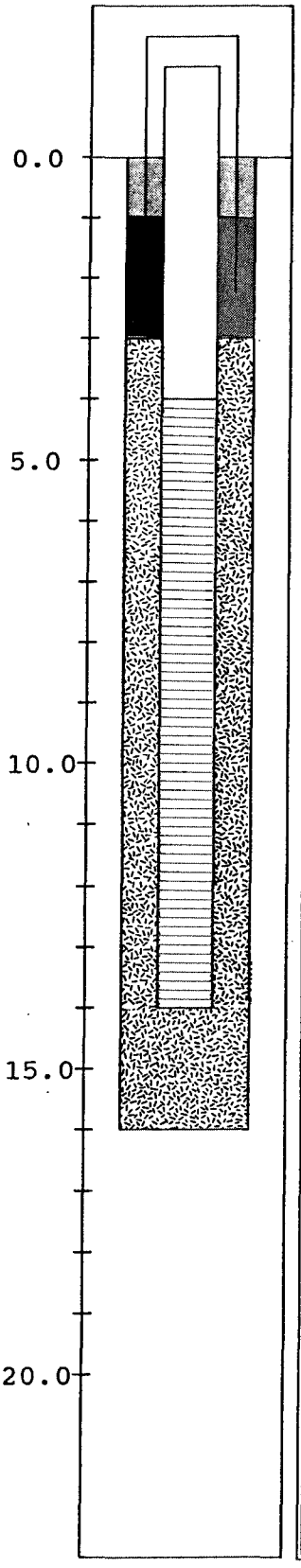
MONITORING WELL CONSTRUCTION SUMMARIES

▲ Northern Environmental Technologies
Incorporated

MONITORING WELL CONSTRUCTION SUMMARY

Project : City of Ashland (BRA10041)
Location: Ashland, Wisconsin
Survey Coordinates:

Borehole ID #: SB-1
Well ID # : MW-1
Supervised By: J.C. Dellaport



DRILLING SUMMARY:

Total Depth: 16.0 feet
Borehole Diameter: 6.25 inches

Driller: Twin City Testing
Crew Chief: Jamie Tuura
Helper 1: Dan Sundberg
Helper 2: -
Drill Rig: CME 55
Drill Bit(s): 3.25 ID HSA

Drilling Fluid: none
Surface Casing: none
Protective Casing: 4 by 4-inch square casing (5 foot)

ELEVATIONS:

Ground Level: 606.50 feet above mean sea level
Top of Protective Casing: 609.50 feet
Top of Riser: 609.42 feet

WELL DEVELOPMENT:

See well development summary for details.

CONSTRUCTION TIME LOG:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling: 6.25 inch OD HSA	01/18/89	1430	01/18/89	1515
Geophysical Logging:	-	-	-	-
Casing: C1/S1	01/19/89	1630	01/19/89	1700
C2	01/20/89	1050	01/20/89	1130
C3	-	-	-	-
Filter/Seal:	01/19/89	1700	01/19/89	1720
Cementing:	01/20/89	1050	01/20/89	1130
Development:	01/22/89	1225	01/22/89	1251

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MONITORING WELL CONSTRUCTION SUMMARY

Project : City of Ashland (BRA10041)
Location: Ashland, Wisconsin
Survey Coordinates:

Borehole ID #: SB-1
Well ID # : MW-1
Supervised By: J.C. Dellaport

WELL DESIGN AND SPECIFICATIONS:

Basis: Geologic Log

Casing String(s):

Depth (feet)	Casing String
+3.0 - 4.0	C1
4.0 - 14.0	S1
+3.0 - 2.0	C2

C = Casing
S = Screen

Casing: C1: Two inch diameter, threaded flush joint, stainless steel, 7 foot length, O-ring joints ("Romac 4").

C2: Four inch square, 5 foot length, primer gray steel casing with hinged cap.

Screen: S1: Two inch diameter, threaded flush joint, stainless steel, 0.010 inch continuous slot, 10 foot section, O-ring joints.

Filter Pack: Medium-Coarse Rounded Flint Sand: 3.0 - 14.0 feet

Annular Seal: ½-inch Bentonite Tablets: 2.0 - 3.0 feet
Dry Bentonite Powder: 1.0 - 2.0 feet
Backfill: None

Surface Seal: Concrete [portland cement, sand, dry bentonite powder, (10:1:0.5)]: 0.3 - 1.0 feet

Other: Two inch vented PVC riser slip cap.
Concrete guard posts.

COMMENTS:

Permanent ground-water quality monitoring well.
The bentonite pellets were hydrated with one gallon of distilled water 24 hours prior to installation of the surface seal to ensure that the cement mix would not migrate past the annular seal and into the sand pack.

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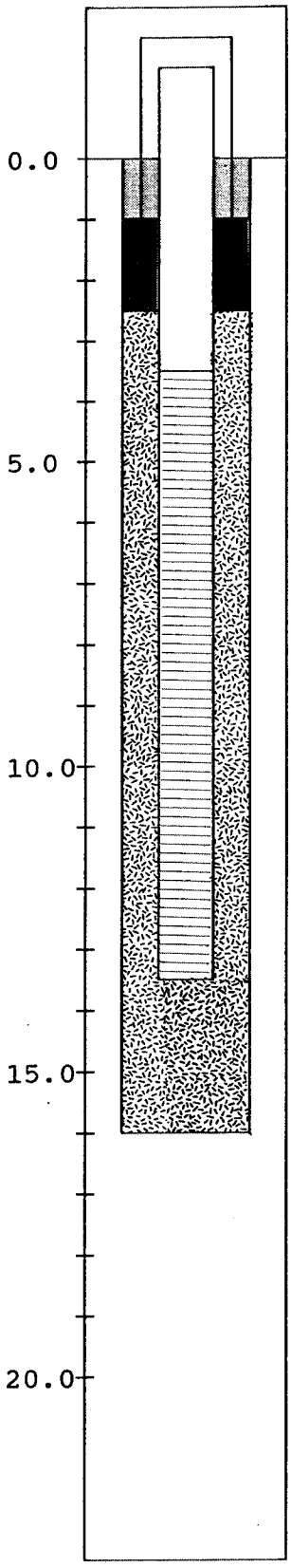
MONITORING WELL CONSTRUCTION SUMMARY

Project : City of Ashland (BRA10041)
Location: Ashland, Wisconsin
Survey Coordinates:

Borehole ID #: SB-2
Well ID # : MW-2
Supervised By: J.C. Dellaport



DRILLING SUMMARY:

Total Depth: 16.0 feet
Borehole Diameter: 6.25 inches

Driller: Twin City Testing
Crew Chief: Jamie Tuura
Helper 1: Dan Sundberg
Helper 2: -
Drill Rig: CME 55
Drill Bit(s): 3.25 ID HSA

Drilling Fluid: none
Surface Casing: none
Protective Casing: 4 by 4-inch square casing (5 foot)

ELEVATIONS:

Ground Level: 606.43 feet above mean sea level
Top of Protective Casing: 609.32 feet
Top of Riser: 609.32 feet

WELL DEVELOPMENT:

See well development summary for details.

CONSTRUCTION TIME LOG:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling: 6.25 inch OD HSA	01/18/89	1530	01/18/89	1615
Geophysical Logging:	-	-	-	-
Casing: C1/S1	01/20/89	0910	01/20/89	0930
C2	01/20/89	1000	01/20/89	1030
C3	-	-	-	-
Filter/Seal:	01/20/89	0930	01/20/89	1000
Cementing:	01/20/89	1000	01/20/89	1030
Development:	01/22/89	1052	01/22/89	1154

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MONITORING WELL CONSTRUCTION SUMMARY

Project : City of Ashland (BRA10041)
Location: Ashland, Wisconsin
Survey Coordinates:

Borehole ID #: SB-2
Well ID # : MW-2
Supervised By: J.C. Dellaport

WELL DESIGN AND SPECIFICATIONS:

Basis: Geologic Log

Casing String(s):

Depth (feet)	Casing String
+3.0 - 3.5	C1
3.5 - 13.5	S1
+3.0 - 2.0	C2

C = Casing
S = Screen

Casing: C1: Two inch diameter, threaded flush joint, stainless steel, 6.5 foot length, O-ring joints ("Romac 4").

C2: Four inch square, 5 foot length, primer gray steel casing with hinged cap.

Screen: S1: Two inch diameter, threaded flush joint, stainless steel, 0.010 inch continuous slot, 10 foot section, o-ring joints.

Filter Pack: Medium-coarse Rounded Flint Sand: 2.5 - 13.5 feet

Annular Seal: Dry Bentonite powder: 1.0 - 2.5 feet

Backfill: None

Surface Seal: Concrete [portland cement, sand, dry bentonite powder, (10:1:0.5)]: +0.3 - 1.0 feet

Other: Two inch vented PVC riser slip cap.
Concrete guard posts.

COMMENTS:

Permanent ground-water quality monitoring well.
Used bentonite powder rather than tablets as annular seal to facilitate the installation of the protective casing to 2 feet below ground surface.

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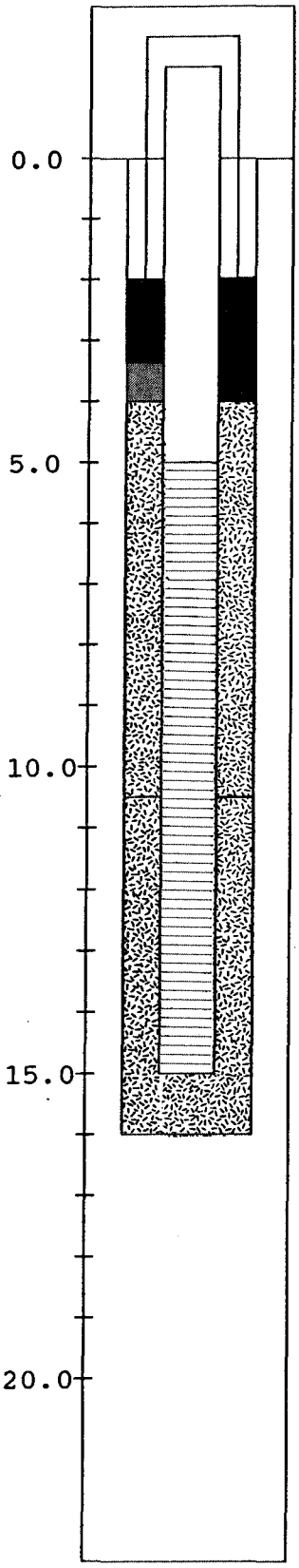
MONITORING WELL CONSTRUCTION SUMMARY

Project : City of Ashland (BRA10041)
Location: Ashland, Wisconsin
Survey Coordinates:

Borehole ID #: SB-3
Well ID # : MW-3
Supervised By: J.C. Dellaport



DRILLING SUMMARY:

Total Depth: 16.0 feet
Borehole Diameter: 6.25 inches

Driller: Twin City Testing
Crew Chief: Jamie Tuura
Helper 1: Dan Sundberg
Helper 2: -
Drill Rig: CME 55
Drill Bit(s): 3.25 ID HSA

Drilling Fluid: none
Surface Casing: none
Protective Casing: 4 by 4-inch square casing (5 foot)

ELEVATIONS:

Ground Level: 610.37 feet above mean sea level
Top of Protective Casing: 613.22 feet
Top of Riser: 613.26 feet

WELL DEVELOPMENT:

See well development summary for details.

CONSTRUCTION TIME LOG:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling: 6.25 inch OD HSA	01/19/89	1308	01/19/89	1530
Geophysical Logging:	-	-	-	-
Casing: C1/S1	01/19/89	1530	01/19/89	1605
C2	01/20/89	1600	01/20/89	1613
C3	-	-	-	-
Filter/Seal:	01/19/89	1605	01/19/89	1620
Cementing:	01/20/89	1600	01/20/89	1613
Development:	01/22/89	0930	01/22/89	0944

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MONITORING WELL CONSTRUCTION SUMMARY

Project : City of Ashland (BRA10041)
Location: Ashland, Wisconsin
Survey Coordinates:

Borehole ID #: SB-3
Well ID # : MW3
Supervised By: J.C. Dellaport

WELL DESIGN AND SPECIFICATIONS:

Basis: Geologic Log

Casing String(s):

Depth (feet)	Casing String
+3.0 - 5.0	C1
5.0 - 15.0	S1
+3.0 - 2.0	C2

C = Casing
S = Screen

Casing: C1: Two inch diameter, threaded flush joint, stainless steel, 8 foot length, O-ring joints ("Romac 4").

C2: Four inch square, 5 foot length, primer gray steel casing with hinged cap.

Screen: S1: Two inch diameter, threaded flush joint, stainless steel, 0.010 inch continuous slot, 10 foot section, O-ring joints.

Filter Pack: Medium-Coarse Rounded Flint Sand: 4.0 - 10.5 feet
Natural Sand Pack: 10.5 - 15.0 feet

Annular Seal: ½-inch Bentonite Tablets: 2.0 - 4.0 feet
One Gallon Distilled Water

Backfill: None

Surface Seal: Concrete [portland cement, sand, dry bentonite powder, (10:1:0.5)]: 0.3 - 2.0 feet

Other: Two inch vented PVC riser slip cap.
Concrete guard posts.

COMMENTS:

Permanent ground-water quality monitoring well.
Hole was augered with a 3.25-inch ID HSA (6.25 OD) to 16 feet. Well casing and screen was installed to 15 feet through auger. As auger was removed, caving of sand occured which provided a natural sand pack from 10.5 to 15.0 feet. Coarse filter sand was added to complete the sand pack from 4.0 to 10.5 feet. Well leans slightly to the north. Driller was unable to orient tower to vertical since drilling site was sloped to north.

APPENDIX D

WELL DEVELOPMENT SUMMARIES

▲ **Northern Environmental Technologies**
Incorporated

WELL DEVELOPMENT SUMMARY

Project : City of Ashland (BRA10041)
Location : Ashland, Wisconsin
Personnel: D.A. Rautmann, J.C. Dellaport

Well Number : MW-1
Well Location :
Riser Elevation : 609.42
Ground Elevation: 606.50

DATE 1989	TIME	METHOD	VOL gal	FINAL APPEAR	TEMP °C	pH su	CONDUCT µmho/cm	HNu ppm	COMMENTS
1/22	1225	C Pump	0						start pump
				2					yellowish
									soapy film
				4					oil sheen
1/22	1226		5	4					*
1/22	1229		15	3					
1/22	1230		20	3					
1/22	1231		25	3					
1/22	1232		30	3					
1/22	1234				12	6.3	540		sample 1
1/22	1239				10	6.6	530		sample 2
1/22	1244				10	6.8	530		sample 3
1/22	1250		~130						stop pump

METHOD = PVC Bail: PVC Point source or or standard bailer
SS Bail : Stainless steel point source or standard bailer
B Pump : Bladder pump
C Pump : Centrifugal pump with PVC hoses
PC Pump : Peristaltic pump
PI Pump : Submerged piston pump
PR Pump : Purge pump
CONDUCT = Specific Conductance (µmho/cm) at ambient temperature

APPEARANCE:

1 = Clear
2 = Slightly Cloudy
3 = Cloudy
4 = Very Cloudy
5 = Cloudy - Muddy
6 = Muddy
7 = Very Muddy

* full throttle on pump

▲ **Northern Environmental Technologies**
Incorporated

WELL DEVELOPMENT SUMMARY

Project : City of Ashland (BRA10041)
Location : Ashland, Wisconsin
Personnel: D.A. Rautmann, J.C. Dellaport

Well Number : MW-2
Well Location :
Riser Elevation : 609.32
Ground Elevation: 606.43

DATE 1989	TIME	METHOD	VOL gal	FINAL APPEAR	TEMP °C	pH su	CONDUCT µmho/cm	HNu ppm	COMMENTS
1/22	1052	C Pump	0	7					start pump
1/22	1054		2.5	7					w.l.= 7.2
1/22	1056		5	7					w.l.= 7.27
1/22	1058		10	6					stop pump
1/22	1117		0						start pump
1/22	1119		0	3					discharge
1/22	1120		5	3					*
1/22	1121		10	3					**
1/22	1122		15	3					***
1/22	1127		50	2					
1/22	1140			1	10	5.7	660		
1/22	1141			1	12	5.5	680		
1/22	1144			1	10	5.5	620		
1/22	1152								stop pump
1/22	1152		~170						w.l.= 7.32

METHOD = PVC Bail: PVC Point source or or standard bailer
SS Bail : Stainless steel point source or standard bailer
B Pump : Bladder pump
C Pump : Centrifugal pump with PVC hoses
PC Pump : Peristaltic pump
PI Pump : Submerged piston pump
PR Pump : Purge pump
CONDUCT = Specific Conductance (µmho/cm) at ambient temperature

APPEARANCE:

1 = Clear
2 = Slightly Cloudy
3 = Cloudy
4 = Very Cloudy
5 = Cloudy - Muddy
6 = Muddy
7 = Very Muddy

* slight sewage odor ** light brown to yellow *** oily soap bubbles

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Incorporated

WELL DEVELOPMENT SUMMARY

Project : City of Ashland (BRA10041)
Location : Ashland, Wisconsin
Personnel: D.A. Rautmann, J.C. Dellaport

Well Number : MW-3
Well Location :
Riser Elevation : 613.26
Ground Elevation: 610.37

DATE 1989	TIME	METHOD	VOL gal	FINAL APPEAR	TEMP °C	pH su	CONDUCT µmho/cm	HNu ppm	COMMENTS
1/22	0930	C Pump		7					start pump
1/22	0942		3	7					pumped dry
									stop pump
1/22	0943			7					
1/22	1025		4	7					
1/22	1029			7					
				NOTE: Due to natural sandpack from 10.5 - 15.0 feet, MW-3 must be developed first with a bailer.					

METHOD = PVC Bail: PVC Point source or or standard bailer
SS Bail : Stainless steel point source or standard bailer
B Pump : Bladder pump
C Pump : Centrifugal pump with PVC hoses
PC Pump : Peristaltic pump
PI Pump : Submerged piston pump
PR Pump : Purge pump
CONDUCT = Specific Conductance (µmho/cm) at ambient temperature

APPEARANCE:

1 = Clear
2 = Slightly Cloudy
3 = Cloudy
4 = Very Cloudy
5 = Cloudy - Muddy
6 = Muddy
7 = Very Muddy

APPENDIX E

FIELD WATER QUALITY SAMPLING AND ANALYSIS

▲ Northern Environmental Technologies
Incorporated

FIELD WATER QUALITY SAMPLING AND ANALYSIS

Project : City of Ashland (BRA10041) Personnel : J. C. Dellaport
Location : Wastewater Treatment Plant, Ashland, Wisconsin

GENERAL: Ground-Water Monitoring Well Sampling					
Location:	MW-1	MW-2	MW-3	Artesian	
Water Source:	SS Well	SS Well	SS Well	SS Well	
Date:	01/25/89	01/25/89	01/25/89	01/25/89	
Time:	1300	1335	1015	1000	
SAMPLING CONDITIONS:					
Sampling Method:	SS Bail	SS Bail	SS Bail	SS Bail	
Sampling Depth: (Feet)	7	7	11	unknown	
Well Depth: (Feet)	14.0	13.5	15.0	unknown	
Static Water Level: (Feet below measurement point)	7.28	7.19	11.12	+17 feet	
Final Purge Volume: (Gal)	3.0	3.0	3.0	flowing	
FIELD MEASURMENTS AND ANALYSIS:					
Temperature: (°C)	7.5	5.5	9	7	
Specific Conductance: (μmho/cm) at __°C:	590	680	870	265	
Corrected to 25°C:	800	950	1150	360	
pH: *	9.1	9.0	8.9	6.7	
HNu: (ppm)	-	-	-	-	-

Sampling Instruments:
Temperature: Red Alcohol Thermometer
Conductivity: Nester MHo Pen
pH: Nester pH Pen
PID: HNu Model PI101

SAMPLES COLLECTED AND TREATED:					
PCBs, BNAs, VOCs, Metals	X	X	X	X	
Wastewater Parameters	X	X	X	X	
Laboratory: Enviroscan Date:	01/26/89	01/26/89	01/26/89	01/26/89	
Sampled/Analyzed By:	JCD	JCD	JCD	JCD	

APPENDIX G

CONSTRUCTION DRAWINGS SHOWING CLAY WALL DETAIL

CHEQUAMEGON BAY

Existing Concrete Wall

Existing Concrete Base

Existing Brick & Concrete Foundation

Existing 30" Sewer

℄ New Tanks

60'-0"

8'-0"

℄ Existing Tanks

Rip-Rap Shore Line

New Fence

El. 605

2:1

Approximate Location of Existing Clay Core Wall

NEW CHLORINE CONTACT TANK

W.P.

Existing Fence

NEW FINAL SEDIMENTATION TANKS

Top of Berm El. 609.0

El. 609.0

EXISTING PRELIMINARY SEDIMENTATION TANKS

EXISTING SLUDGE TANK No. 1

EXISTING SLUDGE TANK No. 2

DIGESTION TANKS

EXISTING TUNNEL

EXISTING SLUDGE DRYING BEDS

Existing Road

New Sidewalk

NEW ENCLOSED WALKWAY

NEW CONTROL BUILDING

Existing Fence (To Be Relocated)

EXISTING SCREEN & GRIT BUILDING — 6' Addition to Existing Boiler Room

Existing M.H.

NEW AERATION TANKS No. 1, No. 2, No. 3, No. 4

EXISTING CHLORINE YARD

NEW VACUUM FILTER BUILDING

New Road

New 15' Road

15' R.

Existing Fence & Gate

Existing Fence (Relocated)

New Road to meet existing road

40'-0"

NEW PARKING AREA

80'-0"

135'

Extend 12" C.M.P

New 18' Road

Existing Road

239' From ℄ of Water St.

℄ Screen & Grit Building

SECTION A

℄ NEW FINAL SEDIMENTATION TANKS AND AERATION TANKS

℄ EXISTING PRELIMINARY SEDIMENTATION TANKS

60'-0"

Approximate Existing Shore-Line at Final Tanks

Existing Rip-Rap & Concrete Highway Debris along Shoreline

Lake Level El. 603.±

30'±

23'-6"

23'-6"

El. 611.00

NEW FINAL SEDIMENTATION TANKS

El. 599.00 to El. 598.50

Existing Grade El. 605±

El. 609.±

El. 605.±

El. 612.25±

El. 603.25 to El. 602.75

El. 590.8±

Approximate Clay Line

New Select Backfill

Existing Timber Piles

Approximate Location of Existing Clay Core Wall

Temporary Steel Sheet Piling - See notes on Sheet 17

SECTION B

Approximate Existing Shore-Line at Aeration Tanks

Existing Rip-Rap & Concrete Highway Debris along Shoreline

Lake Level El. 603.±

20'±

34'-3"

34'-3"

25'-9"

El. 611.00

NEW AERATION TANKS

PIPE GALLERY

TANKS

Existing Grade El. 605.00±

El. 605.00±

El. 595.75

El. 594.00±

New Select Backfill

Approximate Clay Line

Approximate Location of Existing Clay Core Wall

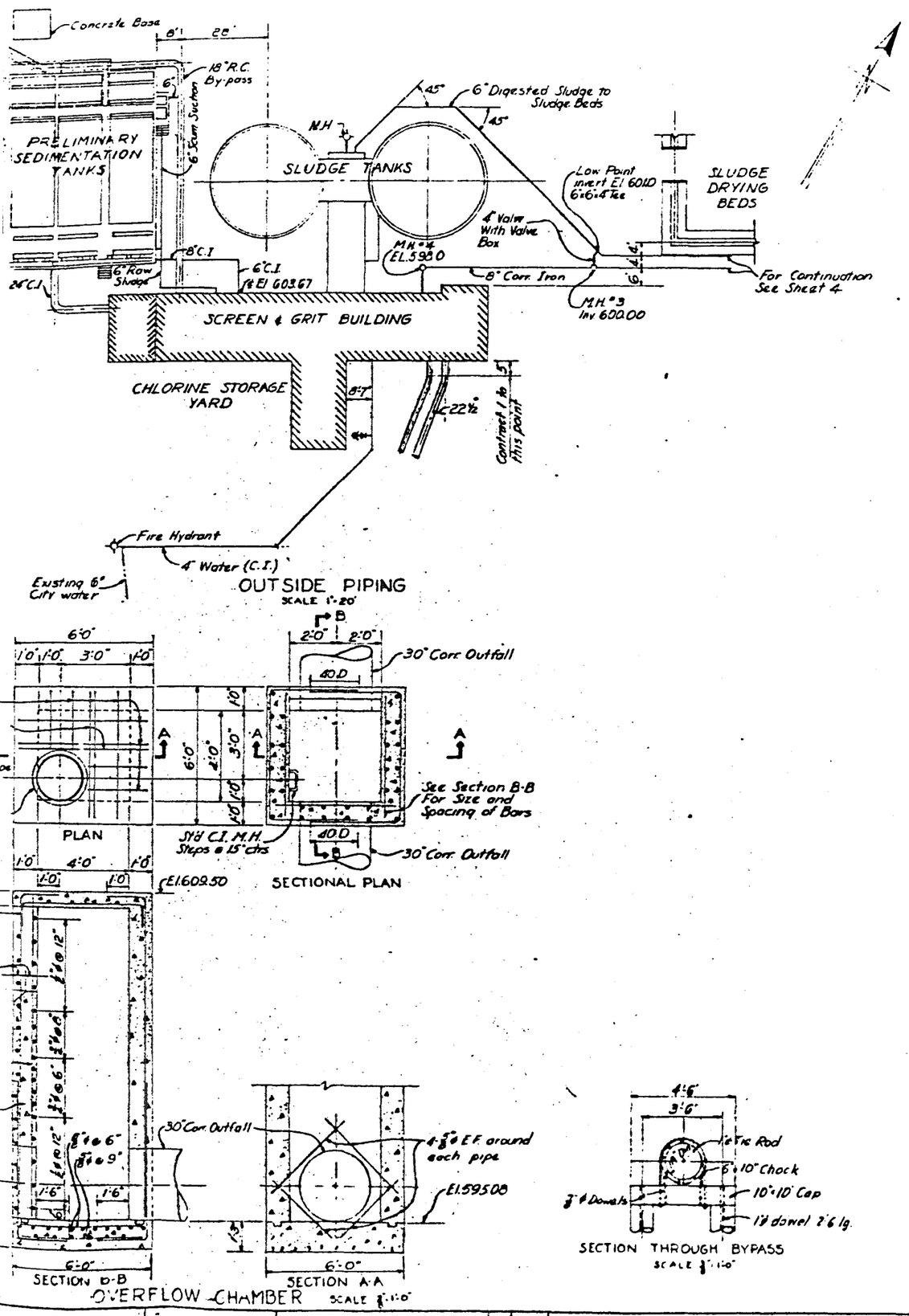
Existing Road

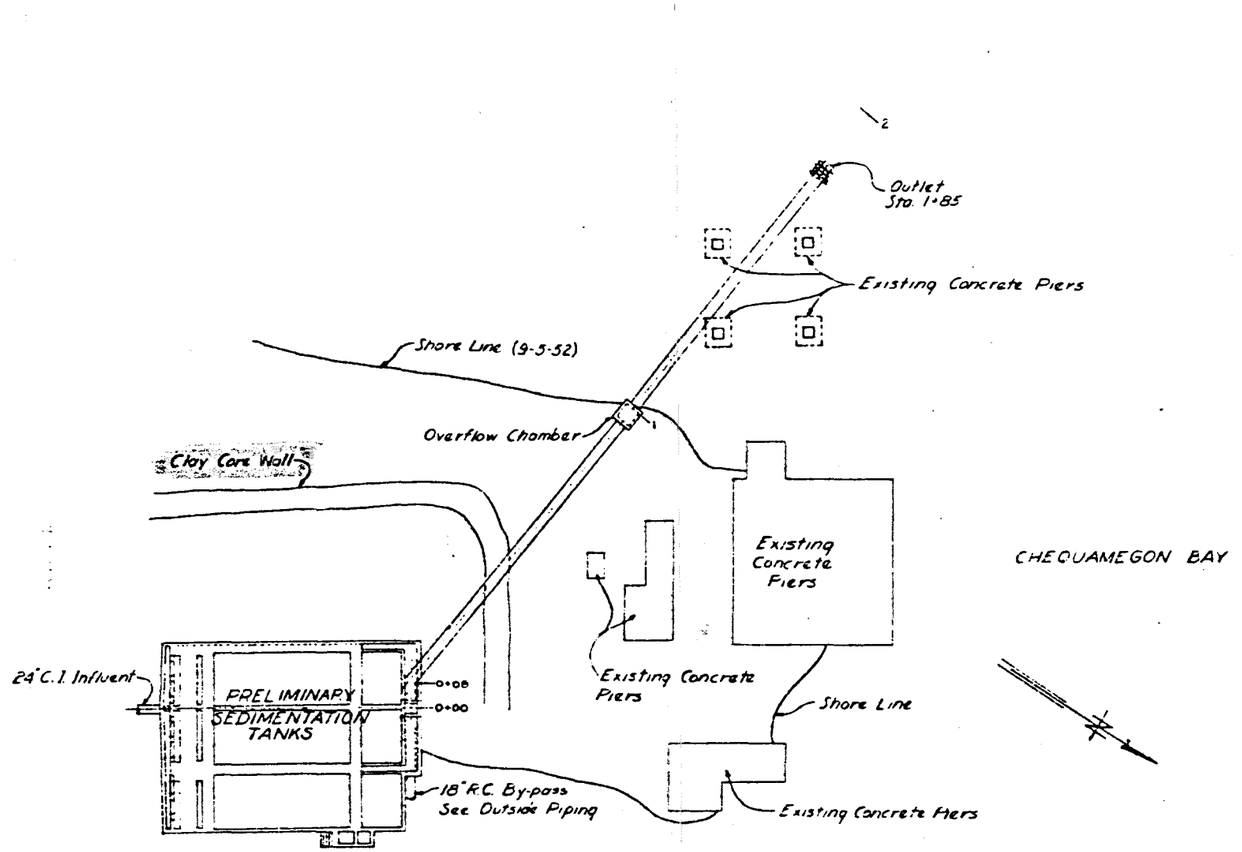
Note:
Section numbers throughout these Plans are either letter, number or fractional. If fractional: ½ Numera. represents section number: Denomin. represents sheet number on which section appears or was taken.

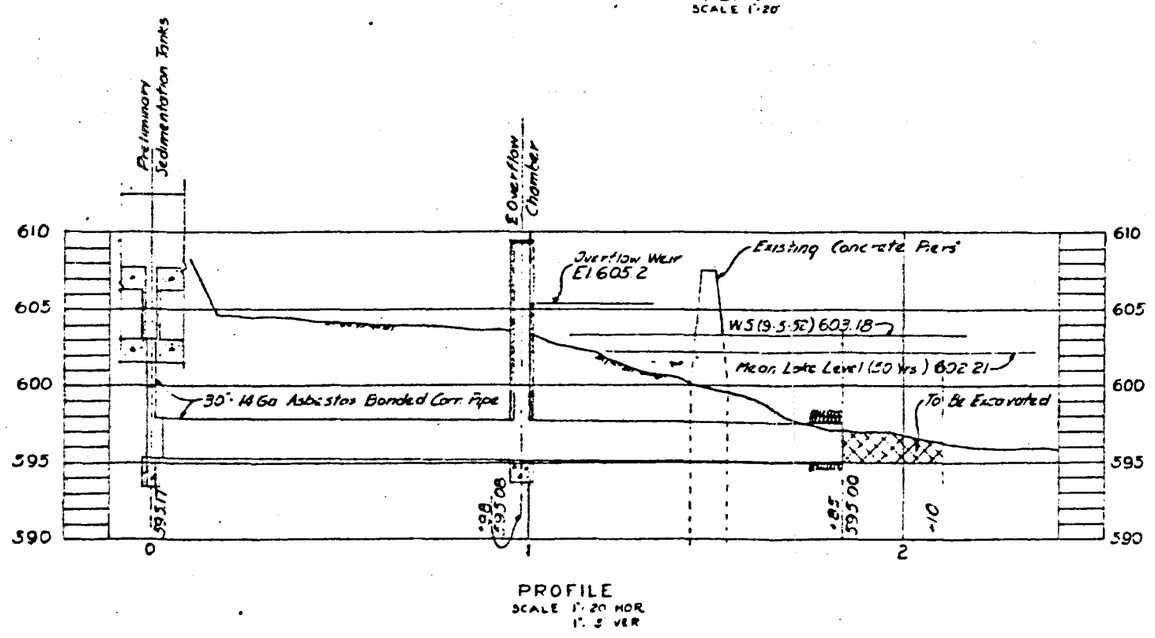
1971

1" = 40'

EY AND HANSEN ENGINEERS	DESIGNED CDT-RN	APPROVED		SCALE	ASHLAND, WISCONSIN SEWAGE TREATMENT PLANT ADDITIONS	STRUCTURES AND EQUIPMENT	PROJ. NO. SHEET 2 OF 41







1952 RECORD DRAWING