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Preliminary Assessment

WPSC MANITOWOC MGP

402 N. 10th Street, Street, Manitowoc, Wisconsin

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Wisconsin Public Service Corporation
Former Manufactured Gas Plant
Property previously owned by Wisconsin Fuel and Light Company
Wisconsin

Revised and resubmitted 9/26/06
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Acronyms

ATSDR	Agency for Toxic Substances and Disease Registry
ASNRI	Area of Special Natural Resources Interest
BETX	Benzene, Ethylbenzene, Toluene, Xylene
CERCLA	Comprehensive Environmental Response, Compensation And Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation And Liability Information System
DHFS	Wisconsin Division of Health and Family Services
DNAPL	Dense Nonaqueous Phase Liquids
MCF	Thousand Cubic Feet
MDL	Method Detection Limit
MGP	Manufactured Gas Plant
NCP	National Oil And Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
PA	Preliminary Assessment
PAH	Polyaromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PVOC	Petroleum Volatile Organic Compounds
RCRA	Resource Conservation And Recovery Act
RI	Remedial Investigation
TCLP	Toxic Characteristic Leaching Procedure
SARA	Superfund Amendments And Reauthorization Act
S/S	Solidification and Stabilization
SAS	Superfund Alternatives Sites
SVOC	Semi-Volatile Organic Compounds
US EPA (EPA)	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
WDNR	Wisconsin Department Of Natural Resources
WPSC	Wisconsin Public Service Corporation

1.0 INTRODUCTION

The Wisconsin Public Service Corporation (WPSC) had been working with the Wisconsin Department of Natural Resources (WDNR) on the investigation and cleanup of seven former manufactured gas plant (MGP) sites since 1986. On March 14, 2005, WPSC wrote a letter to WDNR documenting "our decision to have U.S. EPA take the lead overseeing the remediation of sediment contamination related to our former manufactured gas plant operations," (Attachment 1). This letter was written after a meeting between WPSC and WDNR to discuss transfer of the lead agency oversight to the U.S. Environmental Protection Agency (EPA) and inclusion of the MGP sites in the Superfund Alternatives Sites Program (SAS). The SAS include those sites that EPA has decided meet the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") criteria for listing on the National Priorities List (NPL) and require long term response. WDNR responded to the WPSC letter on June 24, 2005 (Attachment 2).

The seven sites are:

1. Marinette MGP, 1603 Ely Street, Marinette, WI
2. Green Bay MGP, 417 Elm Street, Green Bay, WI
3. Manitowoc MGP, 402 N. 10th Street, Manitowoc, WI
4. Stevens Point MGP, Crosby Avenue north of HWY 10, Stevens Point, WI
5. Two Rivers MGP, 2000 21st Street, Two Rivers, WI
6. Oshkosh MGP 305 Ceape Avenue, Oshkosh, WI
7. Camp Marina, 732 North Water Street, Sheboygan, WI

As a result of this transfer of oversight, the WDNR was tasked to conduct a Preliminary Assessment (PA) at the seven former MGP sites, through a cooperative agreement with EPA under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The PAs will document site conditions based on existing WPSC and WDNR information. The PAs will assist EPA in assessing the threat posed by the site to human health and the environment. This assessment will include a review of extensive state file information, a comprehensive target survey, and a presentation of existing analytical data. These reports will evaluate the most significant pathway of concern, the surface water pathway. As per the May 5, 2006 Administrative Settlement Agreement and Order on Consent, WPSC, its agents, successors and assigns shall conduct a Remedial Investigation (RI) which shall characterize the geology and hydrogeology of the Site, determine the nature and extent of hazardous substances, pollutants or contaminants at or from the Site, and characterize all ecological zones including terrestrial, riparian, wetlands, aquatic/marine, and transitional (reference 56). The RI will assist EPA in completing a full evaluation of all exposure pathways: surface water, ground water, soil exposure, and air.

The WPSC Manitowoc MGP site is a former manufactured gas plant located at 402 N. 10th Street, Manitowoc, Wisconsin now owned by WPSC but previously owned and operated by Wisconsin Fuel and Light Company (WFL). The Site's identification number is WIN 000509949 and it was entered into the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) on April 29, 2005. The CERCLIS Database contains information on hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation. The database includes sites that are on the National Priorities List (NPL) or being considered for the NPL.

2.0 SITE DESCRIPTION

2.1 Location

The WPSC Manitowoc MGP site is located at 402 North10th Street within the City limits of Manitowoc, Manitowoc County, Wisconsin. The site is approximately 4 ½ miles east of Interstate 43 and is reached from Interstate 43 via Highway 42 North exit (also known as Waldo Boulevard, or US 10 East). After traveling east for 3.5 miles, turn right at North 11th Street and continue for nearly 1 mile, where 11th Street veers left, and then right, and becomes 10th Street.

Topographically the site is located in the SE ¼ of the SE ¼ Section 19, T19N, R24E, Latitude 44.0963 N, Longitude 87.6614 W, and 707194, 405172 WTM83/91 [Wisconsin Transverse Mercator, referenced to the North American Datum of 1983, 1991 adjustment]. See Figure 1 for a regional topographic map and Figure 2 for a municipal topographic map.

The site itself is about 1½ acres in size, and is made up of about 8 parcels. There are three general Manufactured Gas Plant (MGP) contamination areas in the vicinity of 402 N. 10th Street. The majority of the site that is contaminated is now owned by Wisconsin Public Service; however, about ¼ of the impacted area, primarily between the existing WPSC building and the Manitowoc River, is on property owned by the City of Manitowoc. A second area of contamination that was also associated with manufactured gas plant operations is at the so-called "Winter Building" (see Figure 3 and photograph at end of this Report). The Winter Building is built on the remnants of a layer of coal tar impacted soil held within the concrete foundation of a former 200 thousand cubic feet (MCF) gas holder (Reference 2).

The third area of contamination is in the sediments of the near shore Manitowoc River. Impacts have been measured to a depth of 13 feet below the river bottom and extending approximately 200 feet downstream (southwesterly) of the site and 100 feet northerly and away from the retaining wall on the northwest corner of the property.

Soils on the property are glacial in origin and consist predominantly of sand with gravel and some silt and clay. Soils on the east side of the property consist primarily of sand and gravel and soils on the west side consist of sand and silt. There is approximately 3-10 feet of fill material at the site. See figures 5 through 10 for cross sections showing the site's stratigraphy (reference 7).

Bedrock is anticipated at 30-40 feet below the site, although no wells or borings have ever penetrated to a depth that encountered bedrock. The bedrock formation below the glacial drift is the Silurian Niagaran Dolomite, a white to gray dolostone with abundant crevices and solution channels (reference 2).

The northwest edge of the WPSC Manitowoc MGP site borders the Manitowoc River where the river forms a large meander in downtown Manitowoc. Approximately 200 feet of sheet piling has been constructed along the shore as this area is the most erosion prone part of the meander. Wisconsin Central Limited, a former railroad property is located to the west and has approximately 200 feet of river frontage near the site. Commercial properties are located to the south across Chicago Street. To the east across North 10th Street is a mixture of commercial and residential properties (see the site photographs at the end of this report). Residential properties are located to the northeast of the site. The WPSC Manitowoc MGP site building itself is now in use by several tenants.

The climate of Manitowoc County is continental and characterized by marked changes in weather common to locations in the interior of large landmasses in the middle latitudes. A small narrow belt adjacent to Lake Michigan that includes the City of Manitowoc area has a modified continental climate where summers tend to be slightly cooler and winters tend to be slighter warmer than the interior land masses. Temperatures can be extreme and spring is often slow in arriving. Days are generally warm and nights are cool. Prevailing winds are from the west, northwest and southwest. Average wind speed is highest in April and November at 13 miles per hour. Average annual precipitation is 30 inches; average seasonal snowfall is 43.8 inches. In winter the average temperature is 20° and in summer 68.8° Fahrenheit. The lowest temperature on record is -33° Fahrenheit (Reference 1).

2.2 Operational History

The WPSC Manitowoc MGP site was originally known as the Manitowoc Gas Company and consisted of two gas manufacturing and storage facilities. The main plant at 402 N.10th Street housed the former retorts, condenser, purifiers, water gas plant and gas holders as shown in Figure 3. The other facility was called the Peak Shaving Plant and was located at 820 S 21st Street and housed the former relief holder. The Peak Shaving Plant is located approximately 1 ½ miles (by city streets) to the southwest of the 10th street facility, and across the Manitowoc River. The Peak Shaving Plan is not being evaluated as part of this Preliminary Assessment.

There is no information in the files that discusses specific operational history at this site other than that the facilities were built before 1900. The name of the company was changed to Wisconsin Fuel and Light Company (WFL) by the late 1920's; Wisconsin Public Service Corporation purchased the properties in 2000.

The gas storage facility at the N.10th Street site consisted of a 100 thousand cubic feet (MCF) gas holder at the location of the former WFL building and a 200 MCF gas holder at the site of the "Winter Building" (see Figure 3). The gas holders were dismantled in the 1960s when the WFL building was constructed during 1963 and 1964 and the building on the then Winter property was constructed in 1973. The relief holder on 21st Street was dismantled and demolished in 1947-48 (Reference 2).

Manufactured gas plants were widely used for producing gas from coal for lighting and heating from the mid 1800s to the 1950s. Gas plants manufactured three types of gas:

- Oil gas
- Carbureted water gas
- Coal or coke oven gas

A coal gas plant consisted of large brick ovens, also called retorts, which are partially filled with coal. The ovens were heated, thereby heating the coal and partially vaporizing it which resulted in manufactured gas.

Oil gas is produced in a similar way but the brick was first heated by burning oil. After the proper temperature was reached the flames were extinguished and more oil was sprayed on the coal. The oil vaporized and resulted in the production of oil gas.

During the *carbureted water gas* process, air is blown across a bed of burning coal or coke to heat a brick-filled vessel (also called retorts). The air is replaced with steam when the bricks reach a certain temperature and then oil is sprayed and vaporized on the hot bricks. The resulting product is called carbureted water or blue gas.

Coal or coke oven gas was the most common method of manufacturing gas, particularly in small communities. Large brick ovens that were partially filled with coke were heated causing the coal to vaporize and produce manufactured gas.

On top of the retort, the manufactured gas passed through the hydraulic main where the initial high temperature of the coal gas was lowered. Vapors of heavy tars and other liquids with high boiling points condensed here and were then removed.

Further cooling of the gas to ambient temperatures occurred after it left the hydraulic main and by drawing it through air or water condensers. Naphthalene, a white flaky substance, was sometimes removed by scrubbers before the gas entered the condensers because it tended to clog them. Lower boiling point vapors such as ammonia and light oils were removed by condensation and separation.

A rotary gas pump called an exhauster, drew the gas from the retort through the hydraulic main and condenser, and then forced the gas through the purifying vessels and to the gas holders. The purifying vessels were used to remove a number of impurities from the gas before distributing it for heating applications. Sulfur compounds, carbon dioxide, hydrogen cyanide and ammonia were removed with washers, scrubber and dry purifiers. The dry purifiers used lime or hydrated iron oxide mixed with wood chips layered in a series of trays and sieves that acted as sorbants of contaminants in the gas stream. Gas holders were used to store the purified gas prior to distribution (Reference 2).

While there is no specific file information relative to disposal practices of the WPSC Manitowoc MGP site, there are waste types common to most manufactured gas plants. These include (Reference 3):

- Combined washer-scrubbers When employed, generally post-1895. Enhanced the recovery of tar from gas. Trapped tar held on sorbant and in sump.
- Sumps Condensers, scrubbers and washers, and their combinations had bottom sumps to trap and yield tar and tar sludges. Tar generally removed manually for recovery, reuse or dumping.

Spills and leaks assumed in a generic sense. Tar sludges contained refractory geologic impurities such as quartz and feldspar, entering the system mainly from feedstocks.

- Purifier boxes Gas was passed through "boxes" containing layers of lime, wood chips, oxide of iron (particles) and/or strips of iron as various forms of sorbants, often in conjunction with each other. Trapped some tar, but designed to trap sulfur, cyanide, arsenic and other heavy metals all of which originated in or from the organic gas feedstock materials. Generally employed minimally as a pair of "boxes" in series, with at least a spare pair in parallel.
- Relief holders 1) With coal gas, the oldest of the gas holders, serving as a raw-gas exposure to tar-dropping seal water before clarification/purification. Relief holders of this variety can be expected to have subsurface "tanks" (pits = basins) commonly abandoned and virtually full of unrecovered tar. 2) With oil-enhanced water gas usually necessary (*) presence to buffer gas-pressure variations on blow-run cycles. These holder tanks tend to be less commonly abandoned with large volumes of water-gas tar, unless dumped at time of plant decommissioning.
- Gas holders As many as needed; ever more and larger as the gas business expanded. Generally predicated on the largest holder being equivalent to one day's *make*. Of prime concern are the subsurface tanks most common to pre-1900 varieties. Of several basic design variations. Those pre-1900 have a subsurface water-seal tank likely to have leaked considerable amounts of precipitated and trapped PAHs to the subsurface soil, rock and groundwater, through various fractures related to brick, masonry and/or concrete or composite construction materials. Valve pits commonly exhibit hot-spot concentrations of PAH contamination
- Oil storage tanks Illuminating or enriching oil for non-coal-gas production. Generally petroleum oils susceptible to biodegradation if leaked or spilled; generally no incentive or rationale to remove or cleanup.
- Plant plumbing/piping Below-ground piping, often in trenches or pipe chases. Virtually all process piping was subject to corrosion and release of PAHs, or release through joints and seams. Well known to the gas industry since the 1860s.
- Spend wood chip box A corner or side area of the gas yard where dry chips could be torched and destroyed by fire.
- Plant dump Primary disposal site on the gas yard; broken, fractured, slagged retort bricks; generator lining bricks, all manner of scurf or other carbon-slag wastes, ash, clinker, slag, off-specification tar, tar sludge, lampblack, box wastes, bottles, purifier shelf slats, broken window glass, corroded pipe, scrap iron, wagon and vehicle parts, and broken gas-plant equipment.

2.3 Regulatory and Investigation/Remediation Activities

The earliest report on file at the Department of Natural Resources (WDNR) is a 1988 report prepared by EDI on behalf of Wisconsin Fuel and Light Company (WFL). Five soil borings and five monitoring wells were constructed at the North 10th Street property and 3 soil borings were completed at the 21st Street property. The field work determined that subsurface soils were impacted with coal gasification process related contaminants such as volatile organics, base neutral organics (also known as Polycyclic Aromatic Hydrocarbons or PAH, and inorganic compounds such as metals and cyanide. Coal tar impacted soils were found in the bottom of each of the site's gas holders. Groundwater was also found to be impacted by volatile organics, PAH, and metals (Reference 2).

In 1990, WDNR received complaints from boaters who reported "tar like substance floating to the surface and coating the boats with a sticky substance resembling creosote." Sediment samples collected off-shore 120, 50, and 20 feet from the WFL property and analyzed by the Wisconsin State Lab of Hygiene indicated levels of benzene, ethylbenzene, toluene and PCBs. According to the Laboratory, the gas chromatogram of the sample matched the fingerprint of creosote (Reference 4 and 5).

In June 1991, the Department issued a letter to Wisconsin Fuel and Light requiring the submittal of an "existing conditions report," initiation of groundwater sampling, and submittal of a workplan detailing actions to be taken to investigate the hydrocarbon upwelling in the Manitowoc River (Reference 6). Consequently in the fall of 1991 a workplan was submitted and approved by WDNR.

In January 1992, WFL submitted an Environmental Site Investigation Report to WDNR that described the investigation completed to determine existing site conditions. 22 soil borings were drilled on site and 15 were drilled offshore in the Manitowoc River. Six of the soil borings were converted to permanent groundwater wells, 3 were completed as temporary wells. Five surficial sediment samples were also collected up and downstream of the site. Results of the chemical analysis showed that coal tar impacts from 5 to 27 feet were primarily found in soils near the river and within the footprints of the former gas holders. Sediments in the Manitowoc River were also impacted to a depth of 13 feet below the river bottom and extending approximately 200 feet downstream of the site and 100 feet away from (the retaining wall at) the site. Figures 5 through 10 from the 1992 Report show five cross sections of soils and sediment stratigraphy from north to south and east to west across the site. Figure 4 illustrates the full aerial extent of the coal tar impacted soil and sediments known at the time as determined during this environmental site investigation (Reference 7).

During 1992, WFL conducted treatability testing of in-situ solidification/stabilization options (S/S) in conjunction with completing an overall feasibility study of various solidification and treatment options and an interim remediation plan. The treatability testing concluded that a cement/flyash mixture with added stabilizing agents are effective for solidifying the coal tar impacted media and for reducing the leachability of most organics associated with coal tar. A pilot test conducted in November 1992 consisted of treatment of three overlapping five-foot diameter cylinders in soil and three overlapping cylinders in river sediment. The report submitted to WDNR in March 1993 revealed that most objectives of the pilot test program were achieved. In-situ S/S appeared to be a viable option for the treatment of contaminated soils on site. The S/S method tested in the pilot study immobilized the contaminants in the soil through the injection of a cement-based solidifying agent that is mixed with the impacted media. A MecTool ™ drilling and injection system was used to inject and mix the grout into the contaminated subsurface. The MecTool ™ system involves drilling deep, overlapping cylindrical treatment columns while injecting grout to mix (solidify and stabilize) the impacted soil. The columns were overlapped and allowed to solidify so that no untreated soil remained within the remediation area. Physical strength, durability, permeability, and leachability tests were completed on select solidified samples after treatment was completed (Reference 15). While the MecTool™ system worked well in soils, the pilot test on S/S of the contaminated sediments in the Manitowoc River failed to meet objectives (Reference 10).

In May 1993, WDNR provided approval for development of a full scale work plan for in-situ S/S. Key items pointed by WDNR for a successful implementation included sufficient "clean" soil solidification to act as a cutoff wall, keeping contaminated soil from "discharging" to the Manitowoc River, adequate verification sampling, and long term monitoring and maintenance of the site. A second pilot study to evaluate the solidification/stabilization effectiveness of river sediments was also suggested by WDNR. At this time WDNR also requested that the impacted soils within the former 100 MCF and 200 MCF gas holders be addressed (Reference 12).

In June 1993, WFL submitted a workplan for interim remediation of the on-site soils using in-situ S/S, verification sampling, and installation of wells and monitoring of groundwater (the remedy is described in the following paragraphs). WFL planned to install a monitoring well near the former 100 MCF gas holder and did not intend to further investigate the former 200 MCF gas holder (on

the adjacent "Winter" property (Reference 13). WDNR subsequently provided conditional approval in July 1993 (Reference 11).

Meanwhile, in June and then again in September 1993, WFL provided workplans for performance of a second pilot test for in-situ S/S of sediments in the Manitowoc River. Simultaneously, workplans for Aquatic Toxicity Testing were also submitted in Nov 1992, June and September 1993. The variety of organism and tests to be performed included *Hayalella azteca, Chironomus tentans, Pimephales promelas, Ceriodaphnia dubia,* and *Daphnia magna* being exposed to background, untreated, treated, crushed, crushed and rinsed S/S treated sediments (Reference 14).

The reasons given for the failure of the 1992 sediment pilot test included;

- The upper several feet of sediments did not set into a durable matrix after treatment
- Tool penetration and revolution was based on more coarse grained soils.
- Excess river water was mixed into the sediments with the grout.

The revised workplan included provisions to avoid the failures of the first sediment pilot test. In October 1993, WDNR provided conditional approval of the second pilot test for sediment S/S as well as conditional approval of the aquatic toxicity testing (Reference 17). However, the second sediment pilot test and the aquatic toxicity testing apparently were never completed as no reports or file information was found to indicate the results of any testing.

In October 1993, WFL submitted a report titled "Soil Characterization Sampling," in which they tested five to six soil samples for metals, volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC) using the toxicity characteristic leaching procedure (TCLP). None of the soil samples exhibited a characteristic of hazardous waste that would have precluded the soil from being disposed at a local landfill (Reference 16).

Interim In-situ Soil Solidification/Stabilization Remedy

Prior to implementing the Solidification/Stabilization (S/S) technology, the existing retaining wall anchor system along the Manitowoc River was replaced in July 1992. Existing pavement and the clean top soil were removed to a depth of 4 feet as shown in Figure 11. 4,271 tons of impacted soil was disposed of at a landfill, and new precast concrete anchor beams were installed a further distance from the existing retaining wall.

The S/S remedy of the impacted soils was completed in several phases in 1993 and 1994. A grout mixture of 60% Portland cement, 22% flyash, 9% organically modified clay, and 9% granular activated carbon was simultaneously injected and mixed with the impacted soil using four- and seven-foot diameter MecTool™ augers (see photographs at the end of this report). The overlapping vertical columns extended to depths of 32 to 40 feet.

The remediation effort consisted of four phases covering two construction sessions in 1993 and 1994:

Phase I:	within 16 feet of the retaining wall by the river, primarily to a depth of 32 feet
Phase II:	along 11th street near the west end of the WFL building, 35 to 40 feet
Phase III:	along the west margin of the site between phases I and II, 32 to 35 feet
Phase IV:	remaining area between the WFL building and treatment Phase I area, 12- 40 ft

See Figure 11 for a sketch of all the treatment areas and their respective depths.

Through the use of MecTool™ technology, 6,913 cubic yards of subsurface soils were treated between July and November of 1993. A number of unexpected subsurface obstructions (timbers and debris piles) slowed the cleanup progress and a second mobilization was scheduled in 1994. An additional 6,859 cubic yards of soil were treated between April and July of 1994.

In January 1994, shallow soils were excavated as shown in red on Figure 11 near the southwest corner of the WFL building. These were areas near the building and sewers that could not be treated with the MecTool™. A total of 1,410 cubic yards of coal impacted soils were removed and taken to the Ridgeview Landfill. During the shallow soils work near the loading dock, a steel storage tank containing coal tar was discovered that had been partially solidified during the November 1993 S/S work. The remainder of the tank was solidified during the 1994 S/S work. The excavated soils were backfilled, compacted and tested for remaining contamination. Analytical results of one of the samples indicated that not all contaminated soil was excavated or treated thus additional investigation/remediation was needed in the southwest area of the property.

An attempt was made to core through the phase I stabilized area to collect verification samples, however, the recovered cores were cracked, broken or pulverized, and therefore the core holes were backfilled with grout/cement mixtures (Reference 18).

A workplan with a new verification sampling method was submitted on July 15, 1994 (Reference 19). The verification sampling was conducted in August and consisted of cores collected at 11 locations after the phase II treatment work. The cores were collected with a six inch hollow stem auger and a 5-foot long, 3"diameter split spoon sampling device. Cores were collected from the top five feet of treated soil, from 12-17 feet and 25 to 30 ft of treated soil, and the flank areas of treated soil. The cores were tested for inorganic and organic constituents. Low levels of cadmium, cyanide, copper, lead and zinc were detected in the cores. No VOCs were detected above method detection limits (MDL) with the exception of methylene chloride, a suspected laboratory contaminant. One of the sixteen sample extracts contained naphthalene at 16 ug/L,but no other SVOC were detected above MDL. Physical tests for unconfined compressive strength, permeability and durability tests were also performed (Reference 20).

Eight new monitoring wells were installed as part of the interim site remedy. Two previously constructed wells were abandoned as part of the S/S, thus a total of 12 monitoring wells were available for site monitoring in 1995. The wells are all water table wells with depths to water ranging from 7-22 feet depending on the location of the well with respect to the Manitowoc River and the building which was built on a slope. Results of the groundwater monitoring are discussed in Section 3.1 below.

The March 1995, Interim Environmental Site Closure Report acknowledged that three areas on/near the WFL property were not fully investigated and/or remediated. The report did not address the remaining soils within the footprints of the 100 and 200 MCF gas holders. The three deficient areas described in the report:

- the adjacent property to the west, owned by Wisconsin Central Railroad,
- the property to the south, Chicago and 11th Street, and
- sediments in the Manitowoc River.

Subsurface investigations of adjacent properties

In May 1995 WFL submitted a workplan to investigate adjacent properties. In September 1995, WFL submitted a report discussing the investigation completed on the adjoining Wisconsin Central Limited (WCL) Railroad property, within the right-of-way of 11th street and the sidewalks

on the south side of Chicago Street. Ten soil boring and 4 monitoring wells were constructed and sampled. Figure 12 shows the locations of the boring and wells installed as part of this investigation. The report concluded that the coal tar impacted area on the WCL property is limited to the east side of the property and that the groundwater impacts at well MW14 (previously installed) need further investigation. At MW14, benzene, toluene, xylene and naphthalene in groundwater exceeded Wisconsin's Enforcement Standard. Well MW14 is located near heavily impacted soil and free phase coal was observed to extend beneath the building. (Reference 21)

In November 1995, WFL submitted a workplan and in April 1996, a Report on the Geoprobe investigation regarding the extent of floating, free phase product in monitoring well MW14. After reviewing the results of an electromagnetic metal detection survey, the report identified a probable underground storage tank (UST) that held gasoline located south of the office building and east of MW-14. The Geoprobe report concluded that an additional area of coal tar impacted soil exists south beneath Chicago Street and that further vertical and lateral investigation was needed (Reference 22).

In May 1996, WFL submitted a Workplan and in February 1997 a report on the subsurface investigation of the MW14 and the Chicago Street area. Twelve borings were constructed and sampled in the southwest portion of the site and in Chicago Street. In addition all site monitoring wells were sampled. Figure 13 shows the extent of soil contamination at depth (below the water table) in the southwest area of the property. The Report (Reference 23) concluded that:

- actions should be taken to prevent westward migration of contaminated groundwater off-site,
- a pump test should be conducted to determine the optimum pumping rate to control migration
- additional water table and piezometer wells should be installed around MW-14 to track migration of contaminated groundwater, and
- continued groundwater monitoring of the entire site.

In March 1997, WFL submitted a plan with locations of four deep wells to a depth of 40 feet to be installed near MW-14 (wells 12D, 19T, 20T, 21T) (Reference 24). In August 1997, WFL submitted a report on a groundwater control investigation describing the well installation and a review of the analytical results. The Report concluded that a pumping well should be installed and annual groundwater monitoring of all 18 site wells should be implemented (Reference 25).

Groundwater Control System

In October 1997, WFL submitted a Workplan and in February 1998, a report on the groundwater control system installation and startup. The system installed included a ½ horsepower 20 gpm pump at a depth of 35 feet (open screen between 20-35 feet) in a 6" steel casing. WFL received permits to discharge the pumped water to a nearby City of Manitowoc sanitary sewer. Initial groundwater maps showed that the capture zone of the well was controlling groundwater flow and preventing off-site migration in vicinity of N. 11th Street and Chicago Street. Figure 14 shows the groundwater elevations and a cone of depression near the pumping well measured in April 1998 (Reference 26).

In June 1998, WFL submitted the first of many annual groundwater monitoring reports. The annual monitoring activity included measuring water elevations in 18 wells and collecting groundwater samples from 17 wells. The groundwater samples were analyzed for VOC, SVOC, and total and amenable cyanide. The pumping of production well PW1 continued to control groundwater flow (Reference 27). The second annual monitoring report was submitted in June 1999. An annual report was not submitted for the year 2000.

In June 2001, during a telephone conversation between Annette Weissbach, WDNR, and Connie Lawniczak, Wisconsin Public Service Corporation Manager of Environmental Programs, it was discussed that Wisconsin Fuel and Light (WFL) and Wisconsin Public Service Corporation (WPSC) merged in April 2001 (Reference 28). WPSC had received the 2001 annual report prepared by Horizon Environmental dated May 2001 and it was being reviewed internally. It was eventually submitted to WDNR in September 2001 (Reference 29).

In March 2002, WPSC began having meetings with WDNR to discuss management of all WPSC sites and agreed to provide a proposed plan for conducting additional monitoring and sediment investigation at all former manufactured gas plants located in Wisconsin. With regard to the Manitowoc site, WPSC stated that the plan would also include a follow-up investigation of river sediments (Reference 30). The WPSC Planning update submitted in April 2002, stated that a supplemental assessment of sediments would be conducted in the fall of 2002 (Reference 31).

In September 2002, EPA Great Lakes National Program Office (GLNPO) completed a report on a Survey of sediment contamination on the Manitowoc River conducted in June 2000. EPA collected 11 sediment cores, and 12 surficial ponar samples in the vicinity of the former MGP property and up and downstream of the plant. The Report stated that elevated levels of polycyclic aromatic hydrocarbons (PAH) up to 4,000 parts per million are present in the river sediments. The results were consistent with data collected in 2002. The Report concluded that a more rigorous and precise study be conducted to determine the effects of the contaminated sediment on the river or the estuarine environment. A copy of the report was provided by WDNR to WPSC (Reference 32).

Upon a request for a status update by WDNR in January 2003, WPSC stated in a response letter that the annual report will be submitted in February 2003 along with the plans for a "current conditions sediment assessment" (Reference 33).

In July 2003, WPSC submitted an updated timeline overview and individual site summaries for all WPSC sites in Wisconsin. For the Manitowoc MGP site, WPSC stated the future direction would be continued monitoring and operation of the extraction system. WPSC also stated that dense nonaqueous phase liquid (DNAPL) coal tar removal from one monitoring well (MW-14) was initiated in 2003 and that WPSC performed a sediment survey consisting of Poling and grab samples in May 2003 (Reference 36).

Oil Sheens on Manitowoc River

In August 2003, in response to complaints of oil sheens appearing on the Manitowoc River, a WDNR warden collected surface water samples near the WPSC Manitowoc MGP (Reference 37). The samples were analyzed by the Wisconsin State Lab of Hygiene and reported that the fingerprint most closely resembled coal tar or creosote than diesel or marine fuel.

In October 2003, WDNR issued a letter to WPSC requiring that actions be taken to investigate the degree and extent of the coal tar releases in the Manitowoc River and at a minimum conduct an interim action to address the problem (Reference 38). WPSC responded with a letter report that included Phase I sediment sampling results and plans to monitor surface sheens on the river (Reference 39).

In October 2003, WPSC submitted the results of the Phase I sediment sampling conducted in May 2003. This work activity consisted of evaluating the lateral extent and thickness of surficial soft sediments in the river. Poling was conducted along 8 transects, 6 perpendicular to the

shore, and 2 horizontal to the shore. Grab surface sediment samples were collected and analyzed. Free phase coal tar was found along the WPSC property, 100 feet out into the river, and 350 feet downstream as shown in Figure 15. The Report concluded that elevated levels of PAH, coal particles and tar were detected both in 2000 by US EPA GLNPO and in 2003 by WPSC. Some discrepancies exist particularly in the upstream and downstream sampling. The Report described a Phase II sediment investigation effort that would include:

- an evaluation of the area site history,
- installation of sediment cores to evaluate profiles and to collect samples, and
- determine the vertical and horizontal extent of MGP residuals.

(Reference 39)

The 2001-2003 Operation, Maintenance and Monitoring Status Report was also submitted in October 2003. WPSC had changed to a new consultant and this report summarized groundwater elevation data from 1999 to 2003, groundwater analytical data from 2000 to 2003 and pumping data from 1997 to 2003 (Reference 40). The Report also detailed the amount of free product removal conducted at MW-14. In December 2003, WDNR provided comments on the report and WPSC's consultant provided response comments. In particular, the Report described that the DNAPL coal tar removal from well MW14 had been mentioned in earlier reports. It is believed that the free product plume is about 20x45 feet in area. Six inches to 1 foot of product is generated in well MW14 every few months and is removed and stored on-site for proper disposal (Reference 41).

In August 2004, WPSC provided a letter report detailing 9 months of river oil sheen observations conducted by WPSC personnel at five locations upstream and downstream of the former MGP. Based on the reoccurrence of oil sheens at the site (as opposed to the lack of oil observations at other downstream locations) the letter report concluded that the oil sheens at the site are possibly related to the coal tar residuals in the river sediments. WPSC expressed willingness to discuss placing a buoy or oil boom at the site (Reference 42). A meeting was subsequently held on-site and it was decided that a buoy or other navigation aid was not possible as the river area in front of the WPSC MGP site is a turning basin for large barges that haul cement for a nearby cement producer (Reference 43).

In November 2004, WDNR provided to WPSC a draft Public Health Consultation Report prepared by the Wisconsin Division of Health and Family Services (DHFS) under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). WDNR requested that DHFS prepare the report. The report (Reference 46) concluded that due to the continued upwelling of coal tar at the site:

- there is a need to take an interim action at the site
- the hydrocarbon sheen is a potential health hazard
- the hazard from the release of the coal tar to the river's surface will continue as long as the contaminant mass remains.

As a result, WDNR requested of WPSC to implement an interim action to remedy the oil sheen and place signage at the site (Reference 51). WPSC agreed to place signs on the railing starting in Spring 2005 and to "experiment" with ways of installing booms to the sheet pile rather than out in the river. Refer to the photographs at end of this Report for pictures of the signs and the booms) (Reference 45).

In November 2004, WPSC also submitted the annual monitoring report covering the period September 2003 through August 2004 (Reference 44). In January 2005, one of the issues WDNR commented on was the decreased performance of the extraction well. WPSC

subsequently shock chlorinated (for bacterial fouling) and flushed the well and increased the frequency of maintenance visits (Reference 45).

In March 2005, WPSC requested that the Manitowoc MGP and 5 other sites in Wisconsin be evaluated by EPA for inclusion in U.S. EPA's Superfund Alternatives Sites Program (Attachment 1). In June 2005, WDNR responded in support of the transfer (Attachment 2).

Once the oversight lead was transferred to EPA, negotiations began and WPSC signed on to an Administrative Settlement Agreement and Order on Consent (reference 56). As part of EPA's negotiations with WPSC, a "no contest" letter was requested. In that letter, dated November 30, 2005, WPSC Director of Environmental Services stated:

> "This letter confirms the U.S. EPA and WDNR may use the existing data obtained by WPSC in its work at these sites and that WPSC supports the validity of the data and will not contest it." (Reference 57)

In October 2005, WPSC submitted the annual monitoring report covering the period September 2004 to August 2005 to both US EPA and WDNR. The report recommends continued annual monitoring of site wells, continued free product removal from MW14, and possible carbon vessels replacement. Since 1996, approximately 120 pounds each of Total BTEX and naphthalene have been extracted from the site using extraction well PW-1. The report also recommends the discussion of alternatives to continued groundwater extraction and possible supplemental corrective actions in the well MW14 area. The report did not discuss remediation of the sediment contamination in the Manitowoc River (Reference 47).

3.0 PATHWAY AND ENVIRONMENTAL HAZARD ASSESSMENT

The historic groundwater, soil and sediment data collected by WPSC was designed to screen the media for contamination and later for soil excavation and/or monitoring purposes. This historic data is being used to evaluate these sites under the Superfund Site Assessment process in this PA report. Since this data was not collected with this process in mind, background samples were chosen from the data available. The available data was reviewed with respect to location, media, comparability, and the ability to differentiate their contribution from the site under investigation. The selected background was used to make the observed release determination and attribution of contaminants from the site to the surface water pathway.

3.1 Groundwater

Hydrogeologic setting

Groundwater at the site varies at depths of 5 to 22 feet due to the sloping nature of the land toward the Manitowoc River and the varying amounts of fill added to the property. Historically, 3 to10 feet of fill were added north of and under the building. In areas where soil solidification and stabilization (S/S) was completed, groundwater flow has been altered. In addition, an active groundwater extraction well has changed the flow patterns since 1997. Prior to the S/S, groundwater flowed radially from a localized groundwater mound located near the northwestern corner of North 10th and Chicago to the north, south, and west as indicated in Figure 16.

After the S/S in 1993-1994 and the startup of the groundwater extraction well (PW-1) in 1997, the groundwater flow regime changed with flow directed primarily toward the northwest and the pumping well as indicated in Figure 17.

The local aquifer at the site consists of approximately 10 feet of fine sand with a trace of silt overlying approximately 20 feet of fine to medium grained sand with a trace of silt. A few discontinuous thin clay layers are present. Dolomitic bedrock is expected at about 40-50 feet.

During a 1997 site investigation, the average hydraulic conductivity for the coal tar impacted 30 foot sand and gravel aquifer at the site was estimated at 53 feet per day with an estimated flow velocity at about 0.355 feet/day (130 feet/year) (Reference 25).

The groundwater extraction system has been operating nearly continuously at an overall rate of 10 gallons per minute since November1997. Between startup and August 2005, over 41 million gallons of groundwater have been extracted, filtered, treated via carbon absorption, and discharged to the Manitowoc Wastewater Treatment Plant. Between startup and August 2005, cumulatively 124.3 pounds of BTEX and 117.7 pounds of naphthalene were removed from groundwater at the site. During the most recent reporting period, between September 2004 and August 2005, 9.4 pounds of BTEX and 4.5 pounds of naphthalene were removed (Reference 47).

Targets

Manitowoc Public Utilities supplies drinking water to the residents of the City of Manitowoc and several annexed areas. The majority of drinking water is obtained from surface water from Lake Michigan, however two shoreline radial collector wells, located south of the city, supply limited amounts of water to the microfiltration plant and for emergency uses. The water supplies for the Cities of Manitowoc and Two Rivers are discussed in more detail in the surface water section below.

The site is located in the heart of the City of Manitowoc and groundwater within the city is not used for drinking water purposes. The City of Two Rivers and the City of Manitowoc obtain their municipal water supplies from Lake Michigan, although Manitowoc does have two shore collector wells that are located on the shore of Lake Michigan south of the City of Manitowoc. The WPSC Two Rivers MGP site is located one mile upstream of Lake Michigan on the West Twin River and approximately seven and twelve miles north of the two City of Manitowoc collector wells in use.

Two of the City of Manitowoc radial collector wells are used to supplement the surface water microfiltration plant and for emergency use. Collector 'A' has poor water quality and is pumped to the distribution system only when necessary. Collector 'C' has typically been used to supplement the microfiltration plant each month. Collector B was taken off line and is no longer used (Reference 34).

In other areas of the state, away from the lakeshore, most large industrial and municipal wells draw use groundwater exclusively for drinking water purposes from the deeper Cambrian Sandstone aquifers. Private drinking water wells tend to draw water from the Silurian dolomite, however in some areas where sand and gravel Quaternary deposits are thick and abundant; some residents obtain drinking water from shallow wells. Based on our WDNR data base there are approximately 1389 private wells located within a 4-mile radius of the site. These wells are not located in a downgradient location from the site and therefore are not considered to be

threatened by contaminants leaving the site. Therefore, the groundwater pathway is not a primary pathway of concern.

Analytical summary

Groundwater at the site is impacted by low levels of VOC, PAH, cyanide, and metals. Table 1 below summarizes the highest concentrations of contaminants measured in monitoring wells at the site. The highest concentrations were measured in well MW14 that appears to be located in an area of free product. Since 2002, Well MW 14 is no longer analyzed for specific compounds but rather only the depth and volume of free product measured or extracted is recorded. See Table A for summary tables of all groundwater samples collected at the site.

Table 1 Highest concentration of select contaminants measured in groundwater

Contaminant (Known)	Concentration in ug/L, monitoring well location
Acenaphthylene	45,000 @ MW14**
Anthracene	13,000 @ MW14
Naphthalene	540,000 @ MW14
Benzo(a) Pyrene	8,600 @MW14
Fluoranthene	28,000 @ MW14
Fluorene	18,000 @ MW14
Total PAHs	896,300 @ MW14
Benzene	4,600 @ES2*
Benzene	2,600 @ MW13
Total BTEX	13,500 @MW13
Total Cyanide	2,100 @ ES2
WAD Cyanide (weak acid dissociable)	0.026 @ MW21T

**Sample location ES-2 became location of permanent well MW-14*
*** measured in March 2001, well is no longer sampled due to presence of free product*

Potential groundwater impacts from any upgradient contamination sites were reviewed. The WDNR Bureau of Remediation and Redevelopment RR Sites Map on Figure 20 shows one site potentially upgradient (southeast) of the WPSC Manitowoc GP site. A review of the file indicated this was a low priority underground storage tank site with minimal soil contamination. WFL had installed and sampled several monitoring wells that could be considered upgradient wells including MW1(east), MW5 (east) and MW8 (north). However, all these wells did show some level of MGP type contamination as seen in other areas of the site. It should be noted that the initial intent of the monitoring well installation at the site was not to establish background concentration but to determine extent of contamination on and near the property.

3.2 Surface Water

Hydrologic Setting

The WPSC Manitowoc MGP site lies directly on the Manitowoc River approximately 1 mile upstream of the Lake Michigan Shoreline. Free phase coal tar was found in sediments along the WPSC property, 100 feet out into the river and 350 feet downstream. The river immediately at the site is used as a turning basin for barge traffic on the river and varies in depth from about 12 feet at the retaining at the site to 20 feet in the middle of the dredged channel.

The river bottom near the site generally consists of organic material interspersed with sandy silt. Sediments in close proximity to the site are comprised of sandy silt, organic material, and gravel. Coal fragments have been found as far out as 75 feet from shore. Accumulations of zebra mussel shells are found on the retaining wall (Reference 39).

The Manitowoc River is considered an Area of Special Natural Resources Interest (ASNRI). See http://www.pro-studios.com/dnr/waters.php?action=data&id=3506 for more specific details. However, the Manitowoc River and this portion of Lake Michigan are not considered part of the Critical areas identified under the Clean Lakes Program (Section 314 of the Clean Water Act) nor is it an area identified under the Coastal Zone Management Act.

The Manitowoc River watershed is one of the largest watersheds along the Lake Michigan shore of Northeast Wisconsin, The Manitowoc River Watershed covers approximately 542 square miles draining parts of four counties See Figure 1 for an overview of the regional setting of the Manitowoc River.

The watershed can be divided into four main sub-watersheds, Lower Manitowoc River, North Branch of the Manitowoc River, South Branch of the Manitowoc River and the Branch River Bedrock in the basin is generally dolomite limestone that varies in depth from exposed to greater than 300 feet. Areas in the Branch River sub-watershed also may have karst features that include sinkholes and fracture zones. Within 2 miles of the Manitowoc City Limits, the river flows on bedrock. Near the WPSC Manitowoc site, Bedrock is anticipated to be located about 20-30 below the depth of the river.

Agriculture is the predominant land use within the entire Manitowoc River watershed,. The majority of soils are reddish brown clays in the north and east, loams in the south-east and mineral (sandy) soils in the central part of the basin. Of the 346,472 acres in the basin, 215,917 acres (62.3%) are classified as agricultural, with woodlands the next most common land use at 15.8%. The percent land use that is in agriculture ranges from 56% in the Lower Manitowoc River sub-watershed to a high of 70% in the Branch River sub-watershed (Reference 49).

Targets

The population currently consuming surface water (municipal water) within 15 miles of the site is approximately 48,000. Both the City of Two Rivers and the City of Manitowoc surface water intakes lie within 15 miles of the WPSC Two Rivers MGP site. In addition, the City of Manitowoc will begin supplying several towns and villages surrounding the City of Green Bay in Brown County with drinking water via a 35-mile pipeline. The target population will then increase by approximately 50,000.

City of Two Rivers

The surface water intake for the City of Two Rivers (2004 pop. 12,599) is located several thousand feet offshore in Lake Michigan approximately 6 ½ miles northeast of the WPSC Manitowoc MGP site.

The average water demand for the City of Two Rivers is approximately 1.5 million gallons per day (mgd) and the water treatment facility has a capacity of 4 mgd. The maximum demand of 2.5 mgd occurs during the summer and the minimum demand of 1.1 mgd occurs during the winter. Chlorination is applied at the intake to control zebra mussels. Alum is mixed into the raw water at the plant to aid in removing larger particles through flocculation and sedimentation. After settling out the larger contaminants, the water is filtered through dual media filter beds to remove smaller contaminants. The water is chlorinated prior to distribution (reference 55).

City of Manitowoc

The surface water intake for the City of Manitowoc (2004 pop. 34,612) is located several thousand feet offshore in Lake Michigan and approximately 2 miles southeast of the WPSC Manitowoc MGP site. The average water demand for the City of Manitowoc is approximately 9 million gallons per day (mgd) and the waterworks facility has a capacity of 18 mgd (Reference 35). Within the next year, the City of Manitowoc will begin supplying and selling drinking water to several suburban communities in Brown County, the next county to the northwest. A 35 mile pipeline from the city of Manitowoc to Brown County is currently under construction. This will increased the target population by approximately 50,000.

The City of Manitowoc water supply system is operated by the Manitowoc Public Utilities (MPU). The water supply system is composed of 1 raw water intake, a shore well, 3 low lift pumps delivering raw water to the microfiltration plant, 2 clearwells, 3 highlift pumps delivering water to the distribution system, 2 radial collectors, 2 booster stations, about 170 miles of water main, 2 elevated storage tanks, one ground storage reservoir, and 3 pressure zones.

One main intake supplies water from Lake Michigan to the shore well. This intake was installed in 1970. It is 48 inches in diameter, approximately 9250 feet long, located in 35 feet of water. There are also 2 additional intakes supplying water to the power plant that can be utilized if needed. The shore well and pumping station is located on the shore of Lake Michigan directly east of the microfiltration plant and MPU.

The water supply system has 2 radial collector wells used to supplement the microfiltration plant and for emergency use. Collector 'A' has poor water quality and is pumped to the distribution system only when necessary. Collector 'C' has typically been used to supplement the microfiltration plant each month. Collector B was taken off line and is no longer used (Reference 34).

After the water enters the treatment facility it undergoes treatment prior to distribution. Treatment included passage through a 500-micron screen to remove larger particles and contaminants. Following initial filtration, the water is passed through a 0.2 micron filter to remove remaining contaminants. Lastly, the twice filtered water is chlorinated to destroy microbial contaminants (Reference 35).

<u>Fisheries</u>

Fyke net surveys conducted in the early 1980's by WDNR Fisheries Biologists reported a diverse community of fish captured in the lower Manitowoc River. The captured species were a mix of Lake Michigan and riverine species dominated by bullhead, rainbow trout, white sucker, trout-perch and carp.

A survey conducted in 2005-2006 by WDNR Fisheries Biologist Steve Hogler, netted the following species in the Lower Manitowoc River Sub watershed:

> American brook lamprey, Central mudminnow, Northern pike, Largescale stoneroller, Common carp, Hornyhead chub, Golden shiner, Common shiner, Rosyface shiner, Sand shiner, Northern redbelly dace, Southern redbelly dace, Bluntnose minnow, Fathead minnow, Blacknose dace, Longnose dace, Creek chub, White sucker, Black bullhead, Yellow bullhead, Brown Bullhead, Channel catfish, Stonecat, Brook stickleback, Rock bass, Green sunfish, Pumpkinseed, Bluegill, Smallmouth bass, Largemouth bass, Johnny darter, Blackside darter, Mottled sculpin.

There is limited fishing conducted in the immediate vicinity of the WPSC Manitowoc MGP site. Under advisement of WDNR and the Wisconsin Department of Health and Family Services, , WPSC has posted signs warning anglers of the presence of contamination in sediments near the site (see photographs at the end of this report.)

There are no commercial fishers that use the Manitowoc River for fishing, but some do set trap nets for whitefish fairly close to the harbors in Lake Michigan. Anglers mostly catch and keep their fish. Anglers fish in the river, harbors or just off shore for a variety of species of fish including trout, salmon, smallmouth bass, northern pike, yellow perch, bullhead, carp, catfish, panfish, etc. (reference 52).

The important salmon and trout fisheries in Lake Michigan include chinook salmon, coho salmon, steelhead, lake trout, brown trout and brook trout. The important nearshore fisheries include bullheads, largemouth bass, northern pike, lake sturgeon and yellow perch.

There are fish consumption advisories for polychlorinated biphenyls (PCB) and mercury for Lake Michigan and it's tributaries for coho salmon, chinook salmon, chubs, brown trout, lake trout, rainbow trout, smelt, yellow perch, and Whitefish. These advisories vary by size and quantity consumed but generally the recommendation is to limit eating no more than 1 meal per month of the smaller fish or 1 meal per 2 months of the larger fish (reference 54).

Wetlands

There are no wetlands on or adjacent to the WPSC Manitowoc MGP property; however there are a few significant wetlands within several miles of the site described below. These wetlands near the Lake Michigan coast provide rich habitat for plants and animals and greatly influence the larger ecosystem processes of the Great Lakes Ecosystem. As transition zones between land and water, coastal wetlands are often rich in species diversity and provide critical habitat for migratory and nesting birds, spawning fish, and rare plants. However, various types of development and recreation continue to impact coastal wetlands and limit their capacities to perform important ecosystem functions (reference 53).

A data compilation and assessment of Lake Michigan coastal wetland was initiated by the WDNR Bureau of Endangered Resources between 1999 and 2001 and continues today. It identified 5 major wetlands within 15 miles of the WPSC Manitowoc MGP site. They are described in the paragraphs below.

Little Manitowoc River

The closest wetland to the WPSC Manitowoc MGP site is the Little Manitowoc River wetlands located just north of the City of Manitowoc stretching from the river mouth upstream to County Highway Q. It is located approximately 2 ½ miles north of the WPSC Manitowoc MGP site (see Figure 19a). Similar to other coastal wetlands in the area, the site lies upon a clayey till plain. Wetland plant communities bordering the river include a small sedge meadow and a disturbed, open emergent marsh. Due to its proximity to Manitowoc, this site has suffered direct and secondary impacts of neighboring development and land-uses.

The estuarine sedge meadow's size and composition fluctuates depending upon both river flow and Lake Michigan water levels. It is still dominated by native sedges and grasses but remains vulnerable to infestation by reed canary grass and other invasive species. The disturbed emergent marsh is dominated by the invasive reed canary grass and cattails with other weedy species including nettles and burdock. A sizable block (approximately 80 acres) of hardwood forest is present in the northernmost portion of the site.

The Little Manitowoc River is a small tributary of Lake Michigan with a bottom of gravel and rubble. Smelt and suckers spawn here. Rainbow trout may spawn here if sufficient flow is present and appropriate habitat has not been degraded by siltation.

Woodland Dunes

Woodland Dunes is located just northeast of the City of Manitowoc and 5 miles north of the WPSC Manitowoc MGP site (see Figure 19b). It is a privately owned nature preserve and comprises a 1200 acre forested tract containing parallel sandy ridges representing former glacial lakes levels that lie 10-20 feet above Lake Michigan's present surface. The forested ridges support hardwoods, scattered hemlock, pine and aspen. Small elm, cedar, and lowland brush are present in the swales. This is an important stopping place for many migratory birds, and the site supports several rare plants and animals. Maintained trails and boardwalks provide access to a variety of habitats and facilitate local educational use and nature interpretation. Woodland Dunes was recently designated an Important Bird Area (IBA) by the Wisconsin Bird Conservation Initiative. This designation recognizes places that are important to the continued survival of bird species, either migrant or resident.

West Twin River Marsh

The West Twin River Marsh is privately owned and one of the larger river marshes (roughly 80 acres) along Lake Michigan. The wetland borders the West Twin River west of the City of Two Rivers and is located 8 miles northeast of the WPSC Manitowoc MGP site (see Figure 19b). Dominant plants are sedges and cattails with patches of willow and dogwood. Some infringements by the city and local farmers are taking place including dumping, filling, and draining of the river wetlands. This marsh is an excellent stopover for many species of birds. Timber on the north edge has been completely cut, and grazing continues to be a significant land use.

Point Beach State Forest

This is a 1,800 acre area owned by the state and located just north of the City of Two Rivers and 9 miles northeast of the WPSC Manitowoc MGP site (see Figure 19c). It includes two State Natural Areas, Point Beach Ridges and Wilderness Ridges. The state forest borders the Lake Michigan shore for six miles and is between 1/2 and 1 3/4 miles wide. It features many examples of Great Lakes coastal communities including some that are extensive and of high quality. These communities include Great Lakes beach and dune, interdunal wetland, forested ridge and swale, northern and southern sedge meadows, white cedar swamp and hardwood swamp.

The two most important community groups are the forested ridge and swale complex and the Great Lakes beach and dune. The ridges support several upland forest communities, with drier pine-oak-birch types near Lake Michigan, and mesic hemlock-hardwood forests farther inland. The swales vary from being forested with white cedar and tamarack to shrubby with alder dominant, to emergent marsh or northern sedge meadow communities. A large, mostly forested wetland lies west of the ridge and swale area and is drained by Molash Creek, a slow, hard, warm water stream. Quality and composition of the wetland is variable with areas of second growth black ash, green ash, trembling aspen, and white cedar; and black ash, tamarack, and white cedar swamp with alder, dogwood, cattail, and reed canary grass. There is also an area of higher quality white cedar-dominated swamp on the east side of the wetland. The lower section of Molash Creek flows southward out of the swamp, through a disturbed, open, green ash, alder, and reed canary grass wetland, and then eastward to the lake through high quality alder thicket and southern sedge meadow.

Rahr Memorial School Forest

The interior portion of this school forest is located just north of Point Beach State Forest, along the Lake Michigan shoreline (see Figure 19d). Privately owned cottages separate the state park from this property. This forest preserves a small portion of the same coastal wetland landscape as the park and includes hardwood swamp, shrub carr, and a 1/4-mile stretch of undeveloped Great Lakes beach. The upland vegetation includes northern dry mesic forest, as well as sandy old fields. The Great Lakes endemic beach plant, seaside spurge, has been seen here as recently as the mid 1990's.

Point Creek

This wetland is located approximately 10 ½ miles south of the WPSC Manitowoc MGP site and is a combination of private lands and a sizable parcel known as "Kingfisher Farms," owned by the UW-Green Bay. It includes several small patches of "coastal canyon" wetlands (see Figure 18c). These coastal canyons feature bluff face seeps and gullies that were formed by the down cutting of their clay soils as Point Creek drained to Lake Michigan after the lake levels of Glacial Lake Nipissing dropped over 60 feet. The creek is clear, shallow, low gradient, and firm bottomed (gravel and sand). The stream has been used by rainbow trout and smelt as a spawning site.

The remaining vegetation on this site includes white cedar swamp, rich maple-basswood forest with a diverse groundlayer, and conifer-dominated forests that line most of the steep, narrow stream corridor. A narrow sand beach is present along the shoreline with localized development of dune and beach vegetation in low water years. Several rare plants and animals are known from this site. This block of forest is within a landscape that has been almost entirely converted to agricultural and residential uses. It provides important habitat for both migratory and resident species of animals and a number of plants that require specialized habitats (reference 53).

Endangered Resources Survey

As part of the preparation of a preliminary assessment report for the Manitowoc WSPC Manufactured Gas Site, a search for endangered resources was performed with the WDNR's National Heritage Inventory (NHI) Portal. The search covered a 2- mile distance from the site as well as 15 miles downstream.

The search indicated, there are three state threatened species, greater redhorse, seaside crowfoot, and sticky false-asphodel that may potentially be affected by activities associated with remediation of sediments on the Manitowoc River and associated uplands.

Species of special concern to the State include: dragon wormwood, Indian cucumber root, Northern yellow lady's slipper, and slender bog arrowgrass. In addition, there is one federally threatened species, the bald eagle, and three state threatened species, red-shoulder hawk, greater redhorse and Ellipse mussel associated with the Manitowoc River. There are two state natural areas within the 15-mile distance of the site, housing 7 rare plant communities, 15 rare plant species and 9 rare animals. See Figures 18a-d and 19a-e for topographic maps of the southern and northern 15-mile segments of Lake Michigan Shoreline. Locational information regarding these species is confidential to protect the species from disturbance or collection (Reference 50).

The remediation project area will need on-site verification to confirm the presence or absence of species habitat or individual species listed above, prior to any remedial activities to prevent or minimize habitat disturbance or species "takings".

The surface water pathway is considered the primary pathway of concern at the site. The hydraulic connection between surface water and the groundwater contamination at the site has been disrupted to some degree due the influence of the pumping well and the retaining wall along the river. A portion of the contaminated groundwater that could be discharging to the Manitowoc River is being extracted and treated as described on Page 12.

Analytical summary

Sediments at the site are impacted by high levels of VOC, PAH, cyanide, and metals. Table 2 below summarizes the highest concentrations of contaminants measured in sediments at the site. See Table B for summary tables of all sediment samples collected at the site.

Table 2 Highest concentration of select contaminants measured in sediments

Contaminant (Known)	Concentration in ug/kg, boring location, depth in feet
Acenaphthylene	690,000 @ SB22 0-2'
Anthracene	500,000 @ SB22 0-2'
Naphthalene	2,700,000 @ SD-3 0-1.2'
Benzo(a) Pyrene	330,000 @ SB22 0-2'
Fluoranthene	33,000 @ MW-03C 1.5-3.5'
Fluorene	16,000 @ MW-03C 1.5-3.5'
Total PAHs	10,890,000 @SB28 0-2'
Benzene	32,000,000 @SB22 0-2'
Total BTEX	112,000,000 @ SB22 0-2'
Total Cyanide	23 @ SB22 0-2'
Lead	516 @SB26 4-6'

3.3 Soil Exposure and Air

Stratigraphic setting

Soils on the WPSC Manitowoc MGP site are glacial in origin and consist predominantly of sand with gravel and some silt and clay. Soils on the east side of the property consist primarily of sand and gravel and soils on the west side consist of sand and silt. There is approximately 3-10 feet of fill material at the site.

Targets

There were no coal tar impacted soils within 2 feet of the ground surface and the majority of the site is paved therefore direct contact concerns with respect to soil or air exposures are not being evaluated for this preliminary assessment.

Analytical summary

Soils at the site are impacted by high levels of VOC, PAH, cyanide, and metals. Table 3 below summarizes the highest concentrations of contaminants measured in soils at the site. In 1993 and 1994 an extensive remediation effort was conducted at the site and a majority of the coal tar impacted soil at the site was solidified and stabilized. Through the use of MecTool ™ technology, 6,913 cubic yards of subsurface soils were treated between July and November of 1993 and 6,859 cubic yards of soil were treated between April and July of 1994. The MecTool ™ system involves using augers to drill deep, overlapping cylindrical treatment columns while injecting grout to mix (solidify and stabilize) the impacted soil. A few areas of contaminated soil remain

and they are described in Table 4 of Section 4.0. See Table C in the back of this report for summary tables of all soil samples collected at the site.

Table 3 Highest concentration of select contaminants measured in soil

Contaminant (Known)	Concentration in ug/kg, Sample location, depth in feet
Acenaphthylene	280,000 @SB3 16-17'[(a)]
Anthracene	220,000 @SB3 16-17'
Naphthalene	1,700,000 @SB-1 4-6' [(b)] 3,200,000 @SB58 13-14' [(c)] 1,300,000 @SB96-6 33-335' [(d)]
Benzo(a) Pyrene	110,000 @ SB-3 16-17'
Fluoranthene	3,700,000 @ SB-3 16-17'
Fluorene	250,000 @ SB-3 16-17'
Total PAHs	174,000 @SB8 4-6'
Benzene	10,000 @ SB96-6 33-35' [(d)]
Total BTEX	238,000 @ SB8 4-6' 167,000 @ SB19 5.5-7.5' [(f)]
Total Cyanide	1,600 @ SB14 6-8'
Lead	110 mg/kg @ SB1 7-7.5' 175 mg/kg @ TB1 13-15"
Grease & Oil	5,340 mg/kg @ SB8 4-6'

(a) *Sample location SB3 was near the 100 MCF gas holder (on-site but outside of in-situ treatment area)*
(b) *Sample location SB1 was at the Winter building (offsite, outside of in-situ remedy area)*
(c) *Soil was solidified near SB58 to 40 ft depth*
(d) *Sample SB96-6 collected in Chicago St below water table, soil was not excavated from within the roadway*
(e) *Sample location ES-2 became location of permanent well MW-14*
(f) *Sample location SB19 was located in Chicago Street, outside of excavated area*

4.0 SUMMARY AND CONCLUSION

The WPSC Manitowoc MGP site was purchased by Wisconsin Public Service Corporation (WPSC) in 2000. Annual monitoring of site wells, and continued operation/maintenance of the pump and treat system has continued since WPSC purchased the property.

It was originally known as the Manitowoc Gas Company, however, in the late 1920's the name of the company was changed to Wisconsin Fuel and Light The main MGP at 402 N. 10th Street housed the former retorts, condenser, purifiers, water gas plant and gas holders. Another MGP facility, located at 820 S. 21st Street, was called the Peak Shaving Plant and housed the former relief holder. The Peak Shaving Plant is not being evaluated in this Preliminary Assessment.

Site investigations in 1988 and 1992 revealed substantial soil and sediment contamination at the site. In 1993 and 1994, an interim remedy was implemented by the Wisconsin Fuel and Light Company that solidified and stabilized (S/S) over 13,000 cubic yards of soil. An initial pilot study to evaluate the use of S/S for sediment cleanup failed and thus contaminated sediments remain exposed in the Manitowoc River. These contaminated sediments appear to be the source of

ongoing releases of coal tar contamination as evidenced by the appearance of multi-colored sheens on the water surface near the site. The footprints of the two former gas holders on and off the site likely contain a substantial quantity of coal tar contaminated soil that has not been remediated to date.

Groundwater movement is mostly being controlled by a single pumping well at the west side of the property. It was installed to prevent contaminated groundwater from moving off-site. Since 1997, several hundred pounds of BTEX and naphthalene contaminated groundwater in the shallow aquifer at the site has been extracted and treated. An area of free product contamination remains near the southwest corner of the building. Product is routinely pumped from monitoring well MW14 located in this vicinity. Coal tar contamination was observed to extend beneath the building in this area and was not exposed to the S/S remedy.

Pathways and Targets

The surface water pathway is considered the primary pathway of concern at the site. As indicated above, there are contaminated sediments in the Manitowoc River that continues to discharge to surface as observed by ongoing oil sheens on the water surface near the site.

Potential surface water targets include 48,000 residents and soon an additional 50,000 residents that consume surface water withdrawn from intakes in Lake Michigan that are within 7 miles of the site. Additional potential surface water targets include sensitive environments such as wetlands, fisheries, and natural areas, several of which of within 15 miles of the site. Furthermore, there are numerous sensitive species, federally endangered or threatened species, and eight state endangered or threatened species within 15 miles of the site.

The groundwater pathway is a secondary pathway due to the presence of free product and an estimated groundwater plume of 25x45 feet at monitoring well MW14. However, the impact to any drinking water supplies is likely minimal to nonexistent as contaminated water at the site is being extracted and treated at the Manitowoc Wastewater Treatment plant, the MGP contaminants are not very mobile and the City of Manitowoc collector wells are at a long distance from the source area.

Soil and air pathways are considered minimal to nonexistent. There is minimal direct exposure to contaminants in the upper two feet of soil. The site is mostly paved and the majority of the contaminants are not very volatile.

Table 4 below provides an overview of areas at the site that, according to the WDNR, need further attention during the upcoming Remedial Investigation/Feasibility Study.

Table 4

Areas needing further attention

Location/depth	Comment	Contaminant	Concentration ug/kg (unless otherwise noted)
Peak Shaving Plant	May need to open a new Wisconsin Environmental Repair Case (ERP) to		

	ascertain that no additional coal tar contamination remains at this auxiliary MGP location. Currently this plant is not included in this SAS		
Sample location SB1 Winter Building 200 MCF Gas Holder SB1 7 to 7.5 feet	Coal tar contaminated layer within gas holder foundation has not been fully investigated or remediated	Total BTEX Naphthalene Fluoranthene Phenanthrene Pyrene Lead Zinc Cyanide	25.4 mg/kg 1,700,000 11,000 12,000 9,400 490 mg/kg 110 mg/kg 40 mg/kg ?
Sample location SB3 Underneath the WFL building 100 MCF Gas holder 16-17.5 ft	Coal tar contaminated layer within gas holder foundation has not been fully investigated or remediated (sample collected below water table)	Naphthalene Acenaphthylene Anthracene Benzo(a)pyrene Benzo(k)fluoranthe ne	730,000 280,000 220,000 110,000 150,000
MW14 area	Although soils along the south side of building were solidified, untreated free phase coal tar was observed to extend beneath building, degree and extent of contamination not fully defined	Free product	No analytical samples collected since 2000
Well 17T, 18T	Discrepancy between narrative, boring log and well construction documentation		
Full VOC analysis in May 2005. TCE measured in monitoring wells and influent	Likely not related to manufactured coal gas plant; may be an ubiquitous groundwater phenomenon in the City of Manitowoc. Several other nearby ERP cases have unexplained (phantom) TCE contamination	TCE (ug/L)	Influent 54, MW1 11,MW2 50, MW8 2.5, MW17T 89, MW18T 56, MW19T 85, MW20T 90, MW21T 54 QC-2 47?
MW-6 Winter building See June 1997 report)	Downgradient(?) of 200 MCF, gas holder, cyanide ES in 1997	Cyanide	
Sample location SB-95-3 (depth 3-5 ft) On Wisconsin Central Railroad property.	Nearby boring (SB20) on WPSC property at 22-25 ft visually observed impacted soil. No samples collected at SB-95-3 at depth. Should confirm if impacts at 3-5 ft are related to railroad or MGP activities (given that	Benzo(a) pyrene Dibenzofuran?	48,000

	other samples on WCL property did not show this kind of contamination		

ATTACHMENTS

ATTACHMENTS

Attachment 1	WPSC, Schrock, 2005 – letter to Bill Smith, WDNR, to request lead transfer from WDNR to EPA.
Attachment 2	WDNR, Smith, 2005 – letter to Charles Schrock, WPSC, agreeing to lead transfer from WDNR to EPA.

Attachment 1

Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
600 North Adams Street
P.O. Box 19002
Green Bay, WI 54307-9002

March 14, 2005

Mr. William Smith
Deputy Secretary
Wisconsin Department of Natural Resources
101 South Webster Street
Post Office Box 7921
Madison, WI 53707-7921

Re: Superfund Alternatives

Dear Bill:

Thank you for taking the time to meet with us to discuss our decision to have the United States Environmental Protection Agency ("U.S. EPA") take the lead overseeing our remediation of sediment contamination related to our former manufactured gas plant operations. As I mentioned at the beginning of the meeting, our goal is to move forward with the investigation and remediation of these sites in an expeditious and cost effective manner. We believe this goal can best be accomplished by transferring the "lead" from the Department to U.S. EPA. As such, we very much appreciate your willingness to work with us to smoothly transfer the sites to U.S. EPA.

As we noted in the meeting, the recent decision of the United States Supreme Court in *Cooper Industries v. Aviall*, caused us to re-evaluate our options. This evaluation led us to the conclusion that transferring the sediment portion of the sites to U.S. EPA's Superfund Alternatives Program is the preferred course of action. As the costs of addressing these sites are borne by our ratepayers, we have an obligation to make sure that others who are legally required to pay for the remediation do so. The federal Superfund Alternatives Program allows us to pursue such other parties and, if appropriate, obtain funds from them to offset the costs we incur.

During the meeting, we also discussed our shared goal that the Marinette site move forward quickly. We will work with all interested parties during the next several months so that work can commence this fall. To that end, our environmental team is compiling the necessary information and will work closely with U.S. EPA and the Department in order to meet this goal. Also, with respect to Marinette, we assume, given the mutual agreement to transfer the sites to U.S. EPA, it will not be necessary to address the Department's proposed agreement for that site. If that understanding is mistaken, please let me know.

We further appreciate the Department's willingness to terminate the 1991 Sheboygan contract with us and the City of Sheboygan. Since our meeting, we contacted the Sheboygan City Attorney, Steve McLean, who is the City's contact person under the agreement. We understand from Mr. McLean that the City is very willing to cooperate in terminating the contract.

Finally, at the meeting the Department expressed an interest in reviewing in more detail the factors that led to our decision in order to assist in improving the Department's sediment program. We are certainly willing to participate in such a meeting.

Thank you again for meeting with us. We look forward to a smooth transition and to the Department's continuing participation in the Superfund Alternatives Program.

Very truly yours,

Charles A. Schrock

Charles A. Schrock
President & COO – Generation

cc: Connie Lawniczak – WPSC G6
Ed Newman - WPSC D2
Mark Thimke – Foley & Lardner LLP
Larry Weyers – WPSC G6
Barbara Nick – WPSC D2
Tom Meinz – WPSC A2

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary

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June 24, 2005

Attachment 2

Mr. Charles A. Schrock
President and COO - Generation
Wisconsin Public Service Corporation
600 North Adams Street
Green Bay, WI 54307-9002

Subject: Superfund Alternatives Program

Dear ~~Mr.~~ Charlie Schrock:

This is in response to your letter of April 11, 2005 and provides the Department's position on transfer of sites from DNR oversight to EPA oversight. I apologize for the amount of time we have taken but there were several issues regarding the St. Point site that needed to be resolved before a complete response could be given.

First, I would like to reiterate that the Department is supportive in having the Sheboygan – CampMarina, Two Rivers, Marinette, Oshkosh, Manitowoc and Green Bay sites transferred to EPA under the Superfund Alternatives Process. DNR staff met with EPA in April and has had several subsequent conversations to achieve an orderly transition of these projects.

We also agree with your analysis that the Sheboygan – Wildwood and Wausau sites are not appropriate for transfer. However, you indicated that the St. Point site should not be transferred, in part because it did not meet the scoring threshold. We have done a re-evaluation of the NPL scoring process and this analysis indicated the score for the St. Point site exceeds the 28.5 level. We requested that EPA review our assumptions and they concur with the revised score. Therefore, based on our agreement with EPA that sites scoring over 28.5 would become a Federal lead, WDNR is also transferring the St. Point site to EPA for oversight under the Superfund Alternatives Process.

We wish you success in moving forward with the cleanup of these sites. If you have any questions regarding this letter or anything else related to these projects, please do not hesitate to contact Mark Giesfeldt, Director of the Remediation and Redevelopment Program, at 608-267-7562.

Sincerely,

William Smith
Deputy Secretary

c: Mark Thimke – Foley and Lardner
Bruce Urben – NER
Jim Schmidt – SER
Bill Evans – WCR

REFERENCES

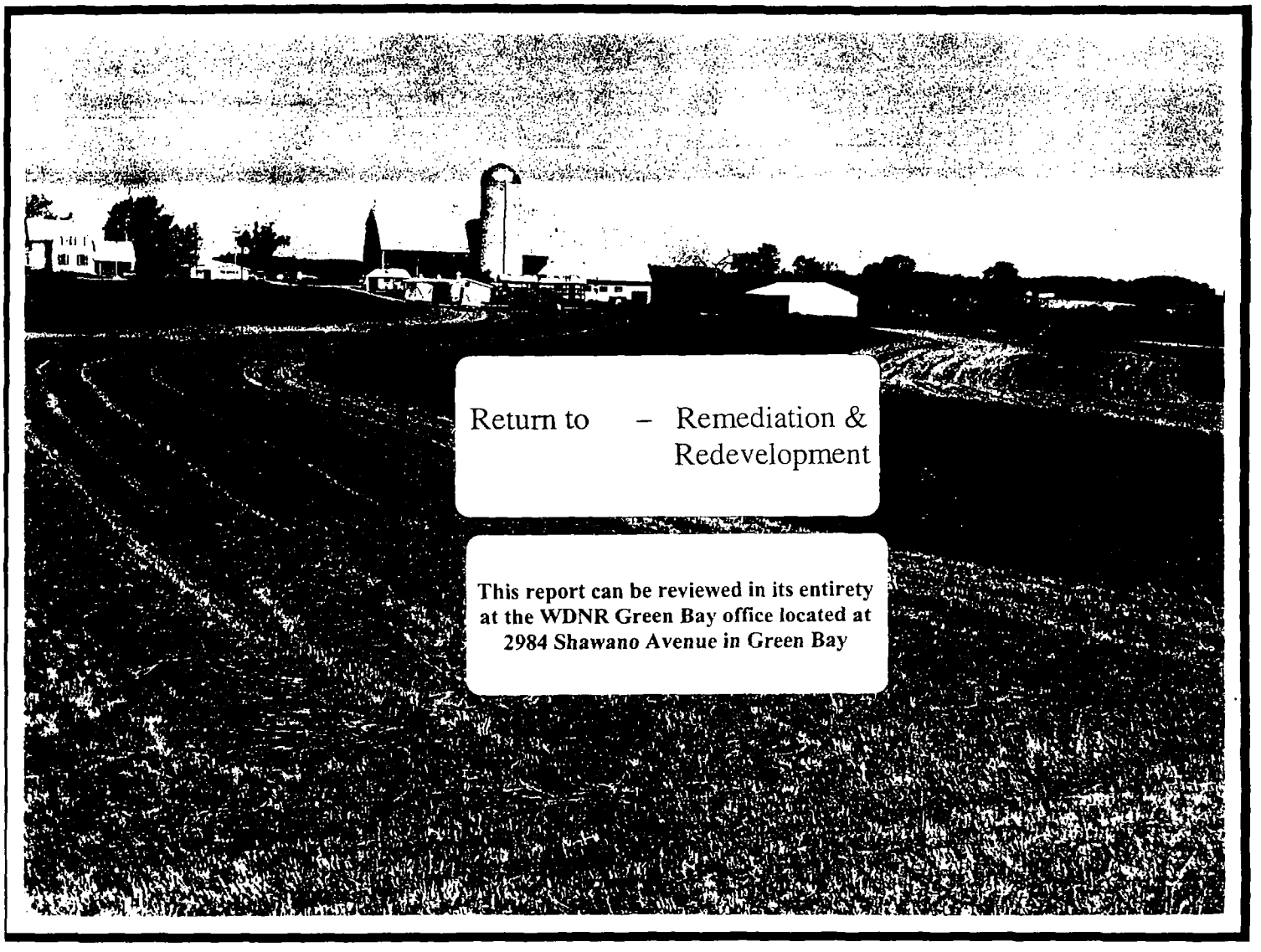
Reference	Document
1*	May 1980 – USDA Soil Survey of Calumet and Manitowoc Counties, Wisconsin, United States Department of Agriculture, Soil Conservation Service
2*	November 1988, Site Investigation, Former Coal Gas Manufacturing Plant, Manitowoc WI, EDI Engineering and Science,
3*	Hathaway, Allan, Former Manufactured gas plants, Site and Waste Characterization. Remedial Engineering of former Manufactured gas plants and other coal tar sites. http://www.hatheway.net/08_residuals_components.htm
4	September 13, 1990, memo from Jim Aasen to file. Notes on sediment sampling conducted 9/13/90
5	October 17, 1990, memo from Tim Rasman WDNR, to Jim Aasen WDNR, regarding sediment samples collected from the Manitowoc River.
6*	June 6, 1991, Letter to Mark Maranger, WI Fuel and Light (WFL) from J. Reyburn WDNR, requiring investigation and cleanup per WI Stats 144.76 (also known as RP Letter)
7*	January 1992, Environmental Site Investigation former Coal Gas Manufacturing Plant, Manitowoc WI, WW Engineering & Science
8*	November 23, 1992, Aquatic Toxicity Testing Plan for Manitowoc River Sediments, WW Engineering
9*	November 20, 1992, Sampling and Analysis Plan... WW Engineering
10*	February 1993, Pilot Test Report for In-situ Stabilization/Solidification Coal Tar Impacted Soil/Sediments WI Fuel & Light Company, WW Engineering
11	July 23, 1993, Workplan approval letter to T. Vallis, WFL from J. Reyburn, WDNR
12	May 7, 1993, Pilot Test approval letter to T. Vallis from J. Reyburn, WDNR
13*	June 21, 1993, workplan for Interim Remediation of on-site Soils
14*	September 20, 1993, Revised Aquatic Toxicity Testing Workplan for Manitowoc River Sediments, WW Engineering
15	September 23-24, 1993, In-situ Solidification Demonstration Program, WFL
16*	October 7, 1993, Soil Characterization Sampling, WW Engineering
17*	October 25, 1993, workplan approval letter to T. Vallis, WFL, from J. Reyburn, WDNR
18*	March, 18, 1994, Interim Closure Report for Shallow Soils Excavated along the west and south sides of the WFL Building, WW Engineering
19*	July 15, 1994, Workplan for Verification Sampling of in-situ stabilized/solidified soils and installation of groundwater monitoring wells, Earth Technology Corporation
20*	March 1995, Interim Environmental Site Closure, Earth Tech
21*	September 1995, Subsurface Investigation Of Properties Adjacent To Former WFL Co. Coal Gas Manufacturing Plant, Manitowoc WI, Horizon Environmental
22*	April 1996, Subsurface Investigation (Geoprobe/geophysical), Horizon Environmental
23*	February 1997, Subsurface Investigation (borings), Horizon Environmental
24*	March 26, 1997, letter from J. Venn, WFL, to J. Reyburn, WDNR, with site map of planned deep monitoring well locations
25*	June 1997, Groundwater Control Investigation, Horizon Environmental
26*	January 1998, Groundwater Control System Installation and Start-up, Horizon Environmental
27*	May 1998, Annual Groundwater Monitoring, Horizon Environmental
28*	May 1999, Annual Groundwater Monitoring, Horizon Environmental
29*	May 2001, Annual Groundwater Monitoring, Horizon Environmental
30	April 19, 2002, status update letter from C. Lawniczak, WPS, to A. Weissbach, WDNR
31*	April 29, 2002, status update letter from C. Lawniczak, WPS, to B. Urben, WDNR
32*	September, 2002, June 2000 Survey of Sediment Contamination, US EPA Great Lakes National Program Office
33	January 29, 2003, status update letter from C. Lawniczak, WPS, to A. Weissbach, WDNR
34*	March, 12, 2003, Report on the Investigation of the public water supply system serving the city of Manitowoc, Ken Scherer, WDNR Water Supply Engineer
35*	May 7, 2003, Source Water Assessment for Manitowoc Public Utilities, WDNR, Bureau of Drinking Water and Groundwater
36*	July 23, 2003, MGP Site Status Summaries letter from C. Lawniczak, WPS, to B. Urben, WDNR
37	August 18, 2003, email from R. Chronert WDNR, to A. Weissbach, WDNR, regarding oil sheen on river
38	October 2, 2003, letter from A. Weissbach, WDNR, to C. Lawniczak, WPS, regarding release of coal tar to Manitowoc River (also known as a Responsible Party letter)
39*	October 14, 2003, Phase I Sediment Sampling Results, Natural Resource Technology, Inc. (NRT)

Reference	Document
40*	October 14, 2003, Operation, Maintenance and Monitoring Status Report, July 2001 to August 2003, Natural Resource Technology, Inc.
41*	December 10, 2003, Response to [WDNR] questions and comments on the 2001-2003 Report, NRT
42	August 3, 2004, observations for the Presence of Oil Sheens on the Manitowoc River, WPS
43	September 3, 2004, letter from A. Weissbach, WDNR, to B. Handlos, City of Manitowoc, with update on status of WPSC Manitowoc MGP
44*	November 4, 2004, Operation, Maintenance and Monitoring Status Report, September 2003 to August 2004, NRT
45	February 7, 2005, email from A. Weissbach, WDNR, to S. Scharff, WPSC, regarding response to WDNR comments on 03-04 Operation and Monitoring Report
46*	March 11, 2005, Health Consultation, US Department of Health and Human Services (prepared by Wisconsin Department of Health and Family Services)
47*	October 7, 2005, Operation, Maintenance and Monitoring Status Report, September 2004 to August 2005, NRT
48*	November 17, 2005, WPSC Sediment Site Summaries, NRT
49*	March 23, 2006, email/attachments from S. Hogler WDNR Fisheries Biologist regarding fisheries in the Manitowoc River
50	June 26, 2006, A. Walden, WDNR, Memo on Endangered Resources associated with the Manitowoc WSPC Manufactured Gas Site
51	November 17, 2004, letter from A. Weissbach, WDNR, to S. Scharff, WPSC, concerning the need to take interim action regarding the presence of coal tar sheens in the Manitowoc River.
52	July 17, 2006, email/attachments from S. Hogler WDNR Fisheries Biologist regarding fisheries in the Manitowoc River
53*	Coastal Wetlands of Wisconsin's Great Lakes- A Data Compilation and Assessment http://www.dnr.state.wi.us/org/land/er/publications/cw/#Projects
54*	2006, A healthy guide to eating fish in Wisconsin, WDNR PUB-FH 824 2006
55*	WDNR, March 27, 2003, Source Water Assessment for Two Rivers Waterworks, WDNR Bureau of Drinking Water and Groundwater
56*	May 5, 2006, Administrative Settlement Agreement and order on Consent for Remediation Investigations and Feasibility Studies, US EPA
57	November 30, 2005, letter to Mary Logan, EPA, from Edward Newman, WPSC, regarding validity of existing environmental data.

**Those references that are marked with an * by the numbers are too voluminous to include with this report. These references can be viewed in their entirety at the WDNR Northeast Regional Office at 2984 Shawano Avenue in Green Bay Wisconsin*

Reference 1

SOIL SURVEY OF CALUMET AND MANITOWOC COUNTIES, WISCONSIN



Return to – Remediation & Redevelopment

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Research Division of the
College of Agricultural and Life Sciences
University of Wisconsin

grown for processing. Except for field corn, most of the crops grown are cool-weather crops.

The climate of Calumet and Manitowoc Counties is continental, characterized by marked changes in weather common to the latitude and the interiors of large land areas. A small, narrow belt adjacent to Lake Michigan has a modified continental climate. Lake Michigan's influence is strongest in spring, summer, and fall.

There is a tendency for extremes in the climate. Spring is often slow in arriving and is a mixture of warm and cold periods. As summer approaches, precipitation is less frequent but increases in intensity. Several hot and humid periods in summer last only a few days. Cool periods can occur in any month in summer. Dew, which is often heavy, forms in most mornings. Fall arrives suddenly early in October and often lingers into November. In nearly every year, after the first killing freeze, there are periods of days that are abnormally warm and that have generally clear and sunny skies and cool nights. The change from fall to winter is often abrupt.

The average date of the last 32 degree freeze in spring is May 17, and the first freeze in fall is October 2. The growing season, which is the number of days between the last 32 degree freeze in spring and the first in fall, averages 138 days. It varies slightly within the county, depending on nearness to water and location, that is, in a valley or on a hilltop or slope.

Precipitation generally is adequate for agricultural purposes, although in July and August there is some deficiency in soil moisture. Severe drought affecting crops is rare. Most of the precipitation in summer falls in the form of showers that tend to vary greatly in intensity.

Dry days are important in curing hay in the field; a dry day is one in which less than 0.1 inch of rain falls. The number of dry days averages 22 in June and 25 each in July and August.

Hail falls on about 2 days a year, but in extreme years it falls on about 5 to 10 days.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Chilton for the period 1930 to 1959. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring.

In winter the average temperature is 20 degrees F, and the average daily minimum temperature is 11.8 degrees. The lowest temperature on record, which occurred at Chilton in January 1951, is -33 degrees. In summer the average temperature is 68.8 degrees, and the average daily maximum temperature is 80.9 degrees.

Of the total annual precipitation, 19.12 inches, or 65.4 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 9 inches. The heaviest 1-day rainfall during the period of record was 6.39 inches at Manitowoc on July 23, 1920. There are thunderstorms each year, and most occur in June and July.

Average seasonal snowfall is 43.8 inches. The maximum monthly snowfall during the period of record was 29.5 inches. The average date when there is 1 inch or more of snowfall in 1 day is November 21. The chance of this amount of snowfall by October 21 is 1 in 10 years and by December 22, 9 in 10 years.

The percentage of possible sunshine is 60 in summer and 40 in winter. The prevailing wind is from the west, northwest, and southwest. Average windspeed is highest, 13 miles per hour, in April and November.

Settlement and development

The land now included in Calumet County was probably first visited in 1634 by Jean Nicolet, a French explorer (*4*). The county was formed from a part of Brown County in 1836 and named after an Indian village on the shore of Lake Winnebago. The county was organized in 1843, and its present boundaries were established in 1848.

Father Marquette and Louis Joliet first skirted Manitowoc County along the shore of Lake Michigan in 1673. It was established as a county in 1836, and its present boundaries were established in 1850.

The first settlement in the survey area was concerned with harvesting timber, which was abundant. Water power was developed to saw the logs. Logs were shaped into boards and shingles and transported by water to Milwaukee, Chicago, and more distant markets. Fishing enterprises were established around Lake Michigan to take advantage of the abundance of whitefish in the lake. During this period, the city of Manitowoc grew as an important lake port.

As the timber was removed, wheat farming became the main enterprise. About 1870, wheat farming gave way to diversified farming. Eventually dairy farming became the main farming enterprise.

Both counties were at one time inhabited by Indians. In the early years, immigration into the counties was light. In the first census, taken in 1850, a total of 1,743 people lived in Calumet County and 3,702 in Manitowoc County. The population of the survey area increased rapidly between 1850 and 1860. It continued to increase but at a slower rate until about 1950. The census of 1970 showed that both counties were decreasing in population.

Transportation and industry

The first means of transportation was by boat because of the many watercourses throughout the survey area. In about 1840 the first county road was surveyed, and in 1872 the first railroad was established. Since this time many miles of roads have been built, and only a few places are more than one-half mile from the nearest road.

Reference 2

Site Investigation
Former Coal Gas Manufacturing Plant
Manitowoc, Wisconsin

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

prepared for . . .

WISCONSIN FUEL & LIGHT COMPANY

Wisconsin Fuel and Light Company

November, 1988

20969

EDI Engineering & Science
Environmental Engineering, Geology, Biology and Chemistry
a subsidiary of WW Engineering & Science

Grand Rapids, Michigan (616) 942-9600 Livonia, Michigan (313) 591-[illegible]

EXECUTIVE SUMMARY

An initial investigation of the Wisconsin Fuel and Light Company former coal gas facilities at the 10th Street facility and Peak Shaving Plant in Manitowoc, Wisconsin was conducted between August 22 and 26, 1988.

At the 10th Street site, 5 soil borings and 5 monitoring wells were constructed using hollow stem augers and split spoon sampling equipment. The soil borings were drilled either within or near former gas holders and purifying boxes. The monitoring wells were constructed at selected areas on the property to perform a hydrogeological evaluation of the site including (1) determination of the direction of ground water flow, and (2) evaluation of impacts to the shallow water table aquifer.

One soil boring was drilled at the Peak Shaving Plant within the former relief holder, and two surface soil samples were collected to check for possible contaminants in the exposed surface soils.

Based upon a review of the analytical and hydrogeological data from this investigation, the following conclusions can be drawn.

- No immediate hazards to human health or the environment exist at either the 10th Street facility or the Peak Shaving Plant site in its present condition.

- The surface soil samples collected at the Peak Shaving Plant indicate that the surface soils are not impacted by coal gasification operations. However, the subsurface soils found in the Peak Shaving Plant relief holder foundation are impacted by what appears to be coal gasification process related cyanide. These soils do not appear to be contained nor are they capped.

- The subsurface soils investigated at the 10th Street facility suggest that the soils are diffusely impacted by low levels of coal gasification process related contaminants such as volatile organics, base neutral organics and inorganics (i.e. metals and cyanide). In addition, coal tar impacted

subsurface soils are found in the bottoms of each of the site's gas holders (plant site proper and Winter Building location).

- All impacted soils are isolated from human contact because they are buried, and for the most part, each of the holders is covered by either paved parking lots or buildings. There are no immediate human health exposure concerns from surface or subsurface soils found at either the Peak Shaving Plant and the 10th Street facility (including the Winter property). However, ground water could be affected if these impacted soils come into contact with ground water or they have surface water percolating down through them.

- The direction of ground water flow at the 10th Street facility is to the southwest, west, and northwest (toward the Manitowoc River). No ground water quality or flow data were gathered at the Peak Shaving Plant.

- The ground water in the drift aquifer under the 10th Street facility contains many organic and inorganic compounds which are characteristic of contaminants from coal gasification plant operations. Of these contaminants, benzene and toluene were detected above the State of Wisconsin Public Health Ground Water Quality Enforcement Standard (NR. 140.10). Total cyanide, arsenic and selenium were found in concentrations above the State's Public Health Ground Water Quality Preventative Action Limits (NR. 140.10). Zinc was found in concentrations above the State of Wisconsin Public Welfare Enforcement Standards, while sulfate was found in concentrations above the State's Public Welfare Ground Water Preventative Action Limit (NR.140.12). There are other contaminants found in the ground water such as ethylbenzene, heavy metals, naphthalene and other base neutral organics for which there are no State Ground Water Standards.

- It is not known to what extent the shallow water table (drift) aquifer is isolated hydraulically from the bedrock aquifer.

- Based on the MW-1 sample, it does not appear as if the ground water under the Winter property has been affected by the operation of the former

coal gasification facility across the street. However, no monitoring wells were installed downgradient from the gas holder foundation on this property.

- There are no recorded ground water wells in the immediate vicinity of the 10th Street facility. Therefore, no human exposure to contaminated ground water at the site is presently anticipated.

- The extent of the off-site contaminant plume cannot be determined at this time.

- The hydrological data presented in this report suggest that part of the ground water from the 10th Street site discharges to the Manitowoc River. Such a discharge of contaminated ground water could have localized environmental effects upon the river. The scope of the present study did not involve an off-site investigation of potential contaminated ground water movement or its potential release to the Manitowoc River. It should be noted, however, that an incidental observation made along the near shore of the Manitowoc River at the site's northern edge during the field investigation phase included an apparent upwelling of oily hydrocarbon type material from the river bed up through the water to the surface. This observation could indicate a direct ground water release of contaminated materials to the river at this location and/or indicate the presence of a significant on-shore deposit of coal tar or coal tar impacted soils near this location.

Based upon this study and a review of existing information, the following additional studies are recommended to more fully define conditions at the Wisconsin Fuel and Light Company, Manitowoc facilities.

1. Investigate upwelling of hydrocarbons in the river adjacent to the site. This investigation should include installation of three to four on shore soil borings along the retaining wall to confirm the presence or absence of concentrated coal tars, and the collection and analysis of river sediments and surface waters to confirm the nature of the hydrocarbon material upwelling from the river bottom at this location. Sediment and surface water

samples should be analyzed for benzene, ethylbenzene, toluene, xylene, naphthalene, oil and grease, and cyanide (total and amenable).

2. Install an additional monitoring well downgradient from the gas holder foundation on the Winter property to determine ground water quality in the drift aquifer to confirm or deny that the impacted soils in this holder are acting as a source of ground water contamination. The sample collected from this monitoring well should be analyzed for benzene, ethylbenzene, toluene, xylene, naphthalene and cyanide (total and amenable).

3. Investigate potential concentrated coal tar source(s) with four to six shallow soil borings upgradient of MW-4.

4. Obtain two additional subsurface soil samples from the relief holder foundation at the Peak Shaving Plant, and analyze for total and amenable cyanide to determine the extent of cyanide impacted soils in this old holder.

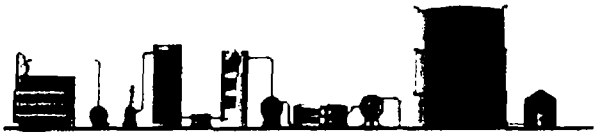
http://www.hatheway.net/08_residuals_components.htm

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

MGP | FORMER MANUFACTURED GAS PLANTS

te and Waste Characterization. Remedial Engineering of ›rmer Manufactured Gas plants and Other Coal-Tar Sites

ıe



Each of the various processes of gas manufacturing used feedstock materials to create gas, first for purposes of illumination and later (generally after 1890) for heat and fuel. In order to generate and capture the gas released from the feedstock, organic matter of some type was sealed in retorts, ovens or generator set shells (names depending on the process) and heated in the absence (pyrolytically) of oxygen. This roasting drove off the volatile content of the feedstock, as gas, which was captured and cleansed of impurities so that it would serve the consumer for the intended purpose (light, heat or fuel energy).

This chapter of the website identifies the residuals and wastes that were also created in generation of gas. As the feedstock was roasted to release the wanted gas, also released were tiny particles of aerosolized tars. The tars were known as "oils" by the historic gas makers who knew that such compounds must be separated from the gas in order to give the gas the correct properties of illumination (in order of their adoption, "candle power," British Thermal Units (B. T. U.), then (1930) "Therms."). Also as the gas was generated, the feedstock would release various amounts of contaminated waters of condensation, which became known as "ammoniacal liquor" in the case of coal gas or "gas liquor" for all of the other gas generation processes. By 1860 a clear concept of the hierarchy of product and waste was well in place. Gas generation produced residuals and from residuals valuable secondary by-products could be further captured and sold in local, regional or international commerce, for considerable revenue. At the same time whatever was allowed to be wasted was observed and known to have detrimental characteristics and properties when "discharged to the ground" (environment).

► CONCEPT of PRODUCT, RESIDUAL, BY-PRODUCT AND WASTE

There is a hierarchy of product and residual involved in gas manufacture. In most cases gas was manufactured with itself as the desired product, and the other forms of liquids and solids produced in the process were considered residuals and waste. At the first instant, the two of the residuals were recognized as by-products of value (coke) or potential value (tar) and the ammoniacal liquor considered largely as a waste. By about 1820 forms of tar distillation were underway as water sealant-repellent, and ammonia was being concentrated as a cleansing fluid. In the 1850s initial discoveries were made (Britain) of the dye qualities available from oil (tar) fractions separated to the individual compound level and the world chemical industry was launched on the basis of coal tar as its feedstock

Reference 4

CORRESPONDENCE/MEMORANDUM State of Wisconsin

Date: September 13, 1990 Ref: 3200

To: Jim Aasen - Conservation Warden, Manitowoc

From: RASMAN.

Subject: Samples For Organic Analyses From Manitowoc River

I just wanted to document what we did today. Two sediment samples were collected with a petite ponar to analyze for a variety of organic chemicals. The sites were approximately 1.5 miles from the mouth of the Manitowoc River adjacent to the Wisconsin Fuel and Light Co. (see attached map). The organic material was volatilizing or rising to the surface and dispersing in oily circles across the water. The area is sizable.

Samples were collected approximately 120 feet from shore, 50 feet from shore and 20 feet from shore. The Coast Guard from Two Rivers assisted us.

1. 120 feet from shore the sediment sample consisted mostly of clay with some sand. The sediments did not have an oily sheen or smell oily. They were dark gray. Depth was 6 to 7 meters.

2. The sample 50 feet from shore was clay with a black color to it. An oily sheen was given off by the sample. The sample had a definite oily smell to it. Depth was 6 meters. This sample was sent to the Lab of Hygiene for analyses and identified with field #M1

3. The sample 20 feet from shore was similar in consistency to the sample 50 feet from shore. Depth was 4 meters. This sample was also sent to the lab and identified with field #M2.

4. A sample adjacent to the sheet pilings in 3.5 meters of water was oily, like the last two samples.

Samples were collected in glass wide mouth quart jars, with teflon lids. They will be analyzed for PAH's, PCB's, oil and grease. A "chemical fingerprint" for organics will also be run.

Jim noted that there was a coal dock or coal stock piled at this site quite a few of years ago. He fealt that coal gasification could be occurring as a result. Lab results will be included in a final report.

cc: Dennis Weisensel - DNR, Green Bay

CORRESPONDENCE/MEMORANDUM **State of Wisconsin**

Date: October 17, 1990

To: Jim Aasen - Conservation Warden, Manitowoc

From: Tim Rasman - Water Resources, Green Bay

Subject: Sediment Samples Collected From The Manitowoc River

Jim and I along with the Coast Guard from Two Rivers collected sediment samples from a site on the Manitowoc River adjacent to the Wisconsin Fuel and Light Co. (see attached memo). The results are as follow:

Site	Benzene ug/g	Ethylbenzene ug/g	Toluene ug/g	Xylene ug/g	PCB-1254 ug/g
M1 #2 memo	0.38	0.98	2.20	1.60	0.28
M2 #3 memo	1.80	2.00	0.45	3.40	0.30
NR 140.10 PAL Standards	.067 ~~mg~~/l ug/L	272.0 mg/l	68.6 mg/l	124.0 mg/l	

What better standard than to compare our results from the two sites to public health groundwater quality standards contained in NR 140.10. PCB concentrations are low. Dave Degenhardt gave me the results over the phone and related to me that the chemical fingerprint using GC resembled creosote. He also told me there were other hydrocarbons they were unable to identify. Alkylated benzenes such as napthalene were also identified but not quantified.

All concentrations were very low, according to the drinking water standard and Len Polczinski - hazardous waste (10/17/90).

Annette Weissbach indicated to me there is a site in the Manitowoc that is being considered for EPA superfund status. A plan is being developed by hazardous waste personnel for this site and it is referred to as the Manitowoc Boat Ramp site.

This doesn't provide much satisfaction for the boaters who, according to Jim, complain about the tar like substance floating to the surface and coating their boats with the sticky substance resembling creosote.

I am providing hazardous waste with this report for further action if needed.
cc: Doug Rossberg, Bruce Urben, Len, Annette and WRM Personnel

COPY TO Jennifer
She will check with Rasman as it relates to Boat Ramp!

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Lake Michigan District Headquarters
Box 10448, 1125 N. Military Avenue
Green Bay, Wisconsin 54307-0448
Main Number: 414-492-5800
Fax Number: 414-492-5913

June 6, 1991

File Ref: 4400

Reference 6

Mr. Mark Maranger, President
Wisconsin Fuel & Light Co.
402 N. 10th
P.O. Box 970
Manitowoc, WI 54221-0970

Subject: Former Coal Gasification Plant Located at 10th St., Manitowoc, WI

Dear Mr. Maranger:

As we discussed on the phone Monday, June 3, 1991, the Department has received numerous complaints regarding a tar-like petroleum substance that appears to be coming out of the sediment-bank of the Manitowoc River in the area of the former 10th St. coal gasification facility. The Department has a copy of the November 1988 EDI Engineering site assessment report for this facility. It states on page 3 that an upwelling of oily hydrocarbon type material was observed on the water surface coming from the river bed. During our conversation, you indicated that some lab analysis had been done on this oily substance after the report was completed. The report found groundwater contamination at the facility in excess of Wisconsin Administrative Code Chapter NR 140 Enforcement and Preventative Action Limits. Soil borings indicated that some soils on site had been impacted by coal gasification type waste.

Wisconsin State Statute Chapter 144.76 regulates the discharge of hazardous substance to the environment and requires the person who possesses or controls the hazardous substance to take the necessary actions to restore the environment to the extent practicable. Coal gasification wastes would be classified as a hazardous substance under this chapter.

The Department is very concerned about the potential impact of coal gasification waste to the Manitowoc River.

Therefore, Wisconsin Fuel & Light shall take the following actions:

1) Provide to this office as soon as possible a description of current site conditions and any information or waste analysis obtained after the 1988 EDI report.

Reference 7

ENVIRONMENTAL SITE INVESTIGATION
FORMER COAL GAS MANUFACTURING PLANT
MANITOWOC, WISCONSIN

This report can be reviewed in its entirety
at the WDNR Green Bay office located at
2984 Shawano Avenue in Green Bay

WISCONSIN FUEL & LIGHT COMPANY
MANITOWOC, WISCONSIN

Prepared by

WW ENGINEERING & SCIENCE
5555 GLENWOOD HILLS PARKWAY
GRAND RAPIDS, MICHIGAN 49588-0874

JANUARY 1992

PROJECT 22159

Reviewed by:

James G. Venn
Project Manager

Thomas M. Brunelle, C.P.G.
Manager, Geology

EXECUTIVE SUMMARY

WW Engineering & Science (WWES, formerly EDI Engineering & Science) initially investigated Wisconsin Fuel & Light Company's former coal gas facility in Manitowoc, Wisconsin between August 22 and 26, 1988. WWES continued the investigation during September through November 1991. During both phases of the investigation, a total of 22 soil borings were drilled on-site and 15 borings were drilled off-shore in the Manitowoc River adjacent to the site. Six of the on-site borings were completed as permanent monitoring wells and three were completed as temporary monitoring wells. Five additional sediment samples were collected from the Manitowoc River at locations near the site, and upstream and downstream of the site.

Based upon a review of the analytical and hydrogeological data from this investigation, the following conclusions can be drawn.

- No immediate hazards to human health exist at the Wisconsin Fuel & Light Company site.

- Coal tars and coal tar impacted soils were encountered primarily within former gas holders and adjacent to or beneath the Manitowoc River.

- The impacted soils encountered in the former gas holders are isolated from human contact due to the fact that they are buried, and for the most part, the gas holders are covered by either paved parking lots or buildings.

- Review of the soil boring log sheets indicate that the coal tar impacted soils not contained in the former gas holders are concentrated at depth in the northwestern portion of the site near the shoreline retaining wall. Discolored and odorous soils encountered in on-shore soil borings were typically found at depths of between 5 to 27 feet below ground surface. Concentrations of volatile and polynuclear aromatic hydrocarbons typical of the manufactured gas process were found in the area of coal tar impacted soils.

- Impacted river sediments were found to occur up to a depth of 13 feet below the bottom of the Manitowoc River. In general, the shallowest sample interval (0 to 2 feet below river bottom) contained the most impacted sediments relative to samples obtained from deeper depths in the same boring. High concentrations of volatile organic compounds (benzene, ethylbenzene, toluene, and xylene) and polynuclear

aromatic hydrocarbons (particularly naphthalene, fluoranthene, and phenanthrene) were found in borings near the retaining wall where the hydrocarbon upwelling has been occurring. These organic compounds are very indicative of the manufacturing gas process.

- Soil and sediment samples were collected for toxicity characteristic leaching procedure (TCLP) analyses from borings located near the retaining wall in the area that was indicated to be the most heavily impacted with coal tar. Results of the TCLP analyses indicate that benzene concentrations in the TCLP leachates are above the regulatory limit of 0.5 mg/l for a characteristically hazardous waste in three of the four samples tested.

- Volatile organic compounds detected in ground water samples collected at the site include: benzene, toluene, ethylbenzene, xylene, trichloroethylene, and methylene chloride. The occurrence of VOC's in the ground water was similar to that in the soils at the site. The highest concentrations were found in ground water samples collected in the northwestern portion of the site near the retaining wall.

- Various base-neutral organic compounds were present in ground water samples obtained from the site. Generally, the same monitoring wells that yielded ground water samples containing volatile organic compounds also contained polynuclear aromatic hydrocarbons.

Reference 8

WW Engineering & Science
A Summit Company

November 23, 1992

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Mr. Ted Vallis, Vice President
Manitowoc Division
Wisconsin Fuel and Light Company
402 North Tenth Street
PO Box 970
Manitowoc, WI 54221-0970

RE: AQUATIC TOXICITY TESTING PLAN FOR MANITOWOC RIVER SEDIMENTS

Dear Mr. Vallis:

WW Engineering and Science is pleased to present this proposal for conducting toxicity tests on Manitowoc River sediments. The proposed work is based on our consultation with Dr. Peter Meier, an aquatic toxicologist at the University of Michigan and with Linda Talbot of the Wisconsin Department of Natural Resources (WDNR).

We are proposing to conduct the tests recommended by the WDNR with only a few very minor modifications, which are discussed below. The tests will be conducted on five types of sediment: background sediments, untreated impacted sediments, impacted sediments treated by solidification and stabilization, impacted sediments treated by solidification and stabilization (crushed samples), and laboratory control sediment.

OBJECTIVES

The sediment toxicity tests will be done: (1) in conjunction with the pilot study of *in situ* sediment stabilization and solidification being conducted at the site; and (2) in support of our planned 1993 remediation of the Manitowoc site.

The overall objectives of the toxicity testing are to :

- Evaluate the toxicity of the treated sediments, untreated sediments, and the background sediments.
- Compare the toxicity of the treated sediments to the toxicity of the background and untreated sediments.

5555 Glenwood Hills Parkway SE PO Box 874 Grand Rapids MI 49588-0874 616 942-9600 Fax 616 942-6499
Bloomington IN Chattanooga TN Columbus OH Detroit MI Indianapolis IN Milwaukee WI Minneapolis MN

Reference 9

WW Engineering & Science
A Summit Company

November 20, 1992

RECEIVED
NOV 23 1992
SOLID WASTE

Mr. Ted Vallis, Vice President
Manitowoc Division
Wisconsin Fuel and Light Company
402 North Tenth Street
Manitowoc, WI 54221-0970

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

RE: SAMPLING AND ANALYSIS PLAN FOR: (1) SAMPLING AND ANALYSIS OF VERIFICATION SAMPLES OF *IN SITU* SOLIDIFIED SOILS FOR PHYSICAL AND CHEMICAL ANALYSIS; (2) SAMPLING AND ANALYSIS OF FOUR SOIL BORINGS FOR ADDITIONAL EQUILIBRIUM LEACHABILITY TESTING; AND (3) ADDITIONAL SAMPLING AND ANALYSIS AT THE WISCONSIN FUEL AND LIGHT COMPANY SITE IN MANITOWOC, WISCONSIN

Dear Mr. Vallis:

WW Engineering & Science (WWES) is pleased to respond to your request for a sampling and analysis plan to: (1) collect and analyze verification samples of *in situ* solidified soils for physical and chemical analyses; (2) sample and analyze four soil borings for additional equilibrium leachability testing; and (3) perform additional sampling and analysis as specified in this proposal. This sampling and analysis plan has been prepared to supplement the work plan for this same scope of work that was submitted on October 30, 1992. The only additional items that are listed in this sampling plan which were not included in the October 30, 1992 work plan are: (1) drilling a deep soil boring designated TB-7 next to one of the areas of solidified soils on land; and (2) the sampling and analysis of verification samples of the *in situ* solidified river sediments (at a depth of 0 to 2 feet) six months after the completion of the November 1992 pilot test.

Our sampling and analysis plan to conduct the above items is documented in Table 1. The locations of all of the verification samples and soil borings are shown in Figures 1 and 2, and the methodologies for collecting the samples are shown in the October 30, 1992 work plan. The proposal for the toxicity testing will be submitted in a separate proposal.

The modified leach technique that we are proposing (using solidified cores leached with river water) is shown in Appendix A.

Reference 10

PILOT TEST REPORT

IN-SITU STABILIZATION/SOLIDIFICATION

COAL TAR AND IMPACTED SOIL/SEDIMENTS

WISCONSIN FUEL & LIGHT COMPANY

MANITOWOC, WISCONSIN

This report can be reviewed in its entirety
at the WDNR Green Bay office located at
2984 Shawano Avenue in Green Bay

WISCONSIN FUEL & LIGHT COMPANY
402 N. TENTH STREET
MANITOWOC, WISCONSIN 54221

Prepared by

WW ENGINEERING & SCIENCE
5555 GLENWOOD HILLS PARKWAY SE
GRAND RAPIDS, MICHIGAN 49588-0874

FEBRUARY 1993

PROJECT 22466

Reviewed by:

Lucy B. Pugh, P.E.
Director, Engineering

James G. Venn
Project Manager

1.0 INTRODUCTION

1.1 OVERVIEW

The Wisconsin Fuel & Light Company (WF&L) Manitowoc, Wisconsin site was used for production of coal gas from before 1900 to the 1950's. The coal gas manufacturing plant was dismantled in the 1960's to make way for WF&L's new offices. Site investigations were performed in August of 1988 and September through November of 1991 by WW Engineering & Science (WWES, formerly EDI Engineering & Science). Two reports were prepared (EDI Engineering & Science, 1989, and WW Engineering & Science, 1992a). Both are fully referenced in Section 7.0. These investigations indicated the presence of coal tars and coal tar impacted media in the site soils as well as within the sediments of the adjacent Manitowoc River. WWES found that the majority of the impacted soils were located below the ground water table, which is approximately six feet below the ground surface. The majority of impacted sediments were encountered adjacent to the sheetpile bulkhead that separates the land from the river. The river depth is approximately twelve feet in this location and the water level is approximately six to eight feet below the ground surface. A preliminary engineering evaluation was performed during 1992 to evaluate the potential effectiveness of various remediation alternatives for remediation of coal tar constituents at the site. The preliminary engineering evaluation of treatment technologies indicated that stabilization/solidification shows promise for treatment of coal tar constituents in a cost effective manner.

1.2 TECHNOLOGY DESCRIPTION

The stabilization/solidification (S/S) process involves addition of various agents to the soil and sediment material to be treated in order to reduce the leachability of contaminants in the material and/or to increase the structural integrity of the material. S/S may be applied to excavated materials with process mixing equipment, or S/S may be implemented *in situ* by injection of S/S agents into the subsurface soils or sediments with subsurface mixing equipment. Stabilization may be achieved by creation of chemical bonds between the contaminants of concern and the stabilizing materials, or by physical entrapment of the contaminants within a very low permeability matrix (also called encapsulation).

1.3 FEASIBILITY STUDY

The engineering evaluation included consideration of a number of remediation technologies for application to the site. *Ex situ* (excavation and manipulation of contaminated media) and *in situ* (treatment in place) alternatives were considered. *Ex situ* technologies have been developed which would ordinarily be considered applicable to soils impacted with coal tar constituents. However, the location of the impacted media within saturated conditions (that is, below the ground water table on the site and in the sediments beneath the river) greatly increases the complexity of implementing traditional extractive remediation alternatives. Above ground soil treatment would require installation of sheet piling to stabilize the excavation, construction of runoff controls, dewatering of the soils either before or after excavation, stockpiling and treatment of soils, treatment of water removed from the soils, discharge of the water, disposal of the soils, and control of emissions during the remediation. The requirements for removal of contaminated sediments from the river are similar, and further complicated by dredging and provisions for control of releases to the river water column.

The engineering evaluation indicated that implementation of an *in situ* remediation alternative would avoid many of the short term impacts identified in the preceding paragraph. However, before full scale implementation, *in situ* stabilization/solidification must be tested to evaluate its applicability to site conditions.

1.4 TREATABILITY TESTING

Treatability testing was undertaken during the summer of 1992 to evaluate the effectiveness of S/S to immobilize the coal tars contaminants in the impacted media from the site. More specific objectives included:

- Consideration of the effects of varying the binder system compositions;
- Preliminary identification of a binder system to be used for a pilot test in the field; and
- Preliminary evaluation of the process economics.

Test methods and data evaluation criteria were selected to support these objectives. The methods and criteria were intended to be conservative from the standpoint of protectiveness of human health and environmental impacts. The data requirements, test

methods, evaluation criteria, and collected data are described in a written report (WW Engineering & Science, 1992b) that was completed in October, 1992. This report was also submitted to the Wisconsin Department of Natural Resources (WDNR) for review during October, 1992.

Results of the treatability test showed that S/S is effective in reducing the leachability and permeability of coal tar contaminated soils and river sediments. Other conclusions of the treatability test were:

- Cement-fly ash binder systems are effective for solidification of soil and sediment which is heavily impacted by coal tar. Unconfined compressive strength of at least 50 psi and permeability on the order of 10^{-7} cm/s may be achieved.

- Stabilizing agents, in the form of organophilic clay and granular activated carbon, do not adversely affect the physical properties of the solidified matrix at the concentrations tested.

- Sodium silicate may be useful to flash set cement-fly ash binder systems, but such a requirement is not observed with coal tar contaminated media because the set rate is not decreased by the grout additives. Sodium silicate increases the difficulty of handling the mixture because the workability is rapidly decreased.

- Cement-fly ash binder systems, with added stabilizing agents, are effective for reducing leachability of organic constituents from coal tar contaminated media. In samples from the most heavily impacted media encountered at the site, the leachability of all constituents except benzene and naphthalene was below NR 140 and NR 105 standards. Under actual field conditions the mobility of benzene and naphthalene would be controlled by incapsulating the most impacted areas by extending the S/S treatment into adjacent clean media such that ground water flowing around the monolithic solidifed areas would not be exposed to the interior of the mass where benzene and naphthalene leachability might exceed NR 140 and NR 105 standards.

- Increasing the concentration of cement in the binder system has a slight beneficial impact on reducing leachability of semi-volatile constituents.

- Increasing the concentration of fly ash in the binder system also has a measurable beneficial impact on reducing leachability of semi-volatile constituents. Based on

work described in the technical literature, increasing the concentration of fly ash is expected to increase the ultimate unconfined compressive strength of the stabilized material. However, it is expected to reduce the set rate and early unconfined compressive strength.

- Increasing the concentration of stabilizers (organophilic clay and/or granular activated carbon) in the binder system also has a measurable beneficial impact on reducing leachability of semi-volatile constituents.

- Varying mixture composition parameters did not appear to affect leachability of benzene. However, decreased leachability of benzene was observed in treated samples compared to unstabilized, heavily impacted samples.

Based on the results of the treatability test, WWES prepared a pilot test work plan (WW Engineering & Science, 1992c) to assess the field implementability of S/S at the WF&L Manitowoc site. The plan was submitted to the WDNR for review, and their written approval was obtained in a letter dated October 29, 1992. On-site pilot testing was executed during November 1992.

Additional samples of slightly impacted soils and sediments were collected from 4 soil borings during November, 1992 for treatability testing in the WWES Treatability Laboratory. These additional samples were collected to determine if treated (solidified) soils and sediments from less heavily impacted media would be leached in excess of NR 140 and NR 105 standards. After the soil samples were treated in the laboratory, leachate was extracted from these samples and submitted for laboratory analyses. The results of the additional treatability testing are presented in Section 4.3.

file

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

WISCONSIN
DEPT. OF NATURAL RESOURCES

George E. Meyer
Secretary

Lake Michigan District Headquarters
1125 N. Military Avenue
P.O Box 10448
Green Bay, WI 54307-0448
TELEPHONE # (414)492-5800
TELEFAX # (414)492-5913

July 23, 1993

Reference 11

Mr. Ted Vallis - Vice President
Wisconsin Fuel and Light Co.
P.O. Box 970
Manitowoc, WI. 54221-0970

Re: Former Coal Gas Facility Located At 402 N 10th St., Manitowoc, WI.

Dear Mr. Vallis;

The Department has reviewed the Workplan for Interim Remediation Of On-Site Soils Using In Situ Stabilization/Solidification (Including Collection And Analysis Of Verification Samples And Installation And Sampling Of Monitoring Wells), at the Wisconsin Fuel & Light Company dated June 21, 1993, submitted by WW Engineering & Science. The Department hereby approves the workplan to use the in situ stabilization/solidification technology for use in the treatment of contaminated on shore soils, subject to the following conditions. This approval does not include the proposed second pilot test of sediments in the Manitowoc River which will be addressed in a separate letter.

1. The interim solidification remedy and follow up verification and ground water sampling will take place in calendar year 1993.

2. The grout mixture will be the same as approved by the department for the 1992 pilot study, comprised of 60% Portland cement, 22% fly ash, 9% clay, and 9% granular activated carbon, on a dry weight basis. The grout will be injected into soils at a minimum rate of 400 pounds per cubic yard of soil on a dry weight basis.

3. Verification borings for VS 5-9 and VS 12-17 shall be taken 30 days after the treatment columns are allowed to cured in-situ and a boring log kept. All cores will be screened in the field with an organic vapor analyzer. Physical testing and chemical analysis of the core samples shall be done as described in the workplan, except VS 17 which should have both the top and bottom 5 ft samples tested.

4. The modified static leach test of the solidified core samples should be run using distilled water as the solvent. Polynuclear aromatic hydrocarbon (PAH) analysis of groundwater and the modified leach test should be run using EPA Method 8310 and the volatile organic compounds using EPA method 5030/8021. Total phenol analysis should be included with the semi-volatile.

5. The installation, sampling and abandonment of all monitoring wells and boreholes should follow Wisconsin Administrative Code Chapter NR 141 and Department PUBL-WR153. All ground water monitoring wells placed around the periphery of the monolith shall have 15 ft screens extending downward from the static water level. In addition two monitoring wells should be constructed through the 12 feet of solidified material in the northeast corner of the treatment area, terminating with a 5 ft screen in the sand under the monolith. The wells should be placed in the area of proposed VS-14 and the former well MW-4. These wells could be substituted for proposed ground water monitoring wells MW-10 and MW-9. For each well installed and sampled, a WDNR monitoring well construction form (4400-113A), monitoring well development form (4400-113B) and a well information form (4400-89) shall be completed and made a part of the final report.

6. After completing two rounds of groundwater monitoring and evaluation of the data, a long term groundwater monitoring plan shall be submitted to the Department for approval.

7. An interim remediation plan report describing field activities, observations, test results and conclusions shall be submitted to the Department by March of 1994. The report will also address the proposed final remediation of all contaminated soils on shore.

As we discussed this is an "interim" remediation addressing the most heavily contaminated soils on Wisconsin Fuel & Light property close to the Manitowoc River. Additional investigation and remediation of contaminated on shore soils and river sediments is required. Failure to take all actions necessary to restore the environment to the extent practicable may result in secondary enforcement actions. If the responsible party is unwilling or unable to conduct remedial actions the Department or it's authorized agent may take those actions necessary to prevent damage to the air, land, or waters of the State, and seek appropriate cost recovery. The Department's authority to require these actions is obtained from s. 144.76 and s. 144.442 Wis. Stats.

NOTICE OF APPEALS RIGHTS

If you believe you have a right to challenge this decision, you should know that Wisconsin statutes and administrative rules establish time periods within which requests to review Department decisions must be filed.

For judicial review of a decision pursuant to sections 227.52 and 227.53, Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to file your petition with appropriate circuit court and serve the petition on the Department. Such a petition for judicial review shall name the Department of Natural Resources as the respondent.

This notice is provided pursuant to section 227.48(2), Stats.

If you have any questions please contact me at (414) 492-5864.

Sincerely:

James Reyburn
Project Manager

cc:
James Venn - WW Engineering and Science
Tim Doelger - LMD
Lee Liebenstein - WM/2

Reference 12

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Lake Michigan District Headquarters
1125 N. Military Avenue
P.O. Box 10448
Green Bay, WI 54307-0448
TELEPHONE # (414)492-5864
TELEFAX # (414)492-5913

George E. Meyer
Secretary

May 7, 1993

Mr. Ted Vallis
Wisconsin Fuel and Light Co.
P.O. Box 970
Manitowoc, WI. 54221-0970

RE: Former Manufactured Gas Plant Site Located at 402 North 10th St., Manitowoc WI.

Dear Mr. Vallis;

The Department has reviewed the pilot test report for in-situ stabilization and the feasibility study report and interim remediation plan for coal tar and impacted soils, dated February 1993, prepared by WW Engineering for Wisconsin Fuel & Light. The department hereby approves of your selection of in-situ stabilization/solidification as the remedy for treating contaminated soils on land at the 10th St. site. As we discussed this is considered an interim remedy because suspected soil contamination to the west and known contaminated sediments within the Manitowoc River still need to be addressed. You should proceed with the development of a detailed work plan for the full scale in-situ soil stabilization to be submitted to the department for approval prior to implementation. When developing the work plan please keep in mind:

1. As stated in the report, one of the remedial action objectives is to prevent soil impacts to groundwater. This should be expanded to prevent the discharge of contaminated groundwater to the Manitowoc River. The success of the remedy will be assessed by comparing the groundwater quality to Wisconsin Administrative Code Chapter NR 140 groundwater standards. Failure to achieve the NR 140 standards over time could require additional remedial action.

2. The key to achieving groundwater objectives is to solidify an adequate amount of "clean" soils which will act as a cutoff wall around the perimeter of the solidified monolith. Adequately defining the contaminate concentration of perimeter soils is critical in order to establish the extent of solidification. I understand WW Engineering has done additional soil borings around the perimeter in the area of SB-14 and SB-36 to further define the area of clean soils. This data should be included in the workplan in support of defining the extent of the solidification.

3. The work plan should include sampling, long term maintenance and monitoring of the remedy. This should include post solidification sampling of the monolith and installation of monitoring wells around the perimeter of the solidified monolith to assess leaching impacts to the groundwater and the Manitowoc River.

4. If Wisconsin Fuel & Light wishes to conduct a second solidification pilot study of sediments in the Manitowoc River at the same time as the on shore soil remediation is conducted, a separate workplan should be submitted for Department review as soon as possible. The workplan should describe the reasons as to why the first river stabilization pilot was a failure and what procedures will be changed in a second pilot study. Wisconsin Fuel & Light is responsible for obtaining any local or Corps of Engineer permits that may be needed for work in the river.

5. How are impacted soils within the area of the former 100 MCF and 200 MCF gas holders to be addressed? Was the 100 MCF gas holder dismantled when the existing building was constructed?

Enclosed is a memo dated May 6,1993 from Mr. Douglas Rossberg - Lake Michigan District Solid Waste Supervisor granting approval to place investigative waste back into the site for solidification. Please contact me at (414) 492-5864 if you have any questions.

Sincerely:

James Reyburn
Project Manager

cc:
Mr. James Venn - WW Engineering & Science
Mr. Lee Liebenstein - WR/2
Mr. Tim Doelger - LMD
Mr. Douglas Rossberg - LMD
LMD Day File

Reference 13

WW Engineering & Science
A Summit Company

June 21, 1993

Mr. Ted Vallis, Vice President
Manitowoc Division
Wisconsin Fuel & Light Company
402 North Tenth Street
P.O. Box 970
Manitowoc, WI 54221-0970

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

RE: WORK PLAN FOR INTERIM REMEDIATION OF ON-SITE SOILS USING *IN SITU* STABILIZATION/SOLIDIFICATION (INCLUDING COLLECTION AND ANALYSIS OF VERIFICATION SAMPLES AND INSTALLATION AND SAMPLING OF MONITORING WELLS), AT THE WISCONSIN FUEL & LIGHT COMPANY SITE, MANITOWOC WISCONSIN

Dear Mr. Vallis:

WW Engineering & Science (WWES) is pleased to respond to your request for a work plan for interim remediation of on-site soils using *in situ* stabilization/solidification, including collection and analysis of verification samples from the solidified materials, and ground water monitoring at the Wisconsin Fuel & Light Company (WF&L) site in Manitowoc, Wisconsin. The work plan has been prepared in response to the May 7, 1993 letter from the Wisconsin Department of Natural Resources (WDNR) in which the selection of the *in situ* stabilization/solidification technology for interim remediation of the site soils was approved. This work plan includes sections on previous investigations, implementation of the *in situ* stabilization/solidification technology for the WF&L site, collection and analysis of verification samples for the remediation, and installation and sampling of monitoring wells. The work plan for the second (1993) pilot test in the Manitowoc River has already been provided under separate cover.

PREVIOUS INVESTIGATIONS

Three site investigations were conducted in November 1988, November 1991, and April 1993 to characterize the nature and extent of soil and ground water contamination at the WF&L Manitowoc site. The initial investigation entitled, "Site Investigation, Former Gas Manufacturing Plant, Manitowoc, Wisconsin," dated November 1988, concluded that along the north perimeter of the WF&L building, soils and ground water were impacted with coal tar related compounds.

RECEIVED
JUN 2 2 1993
LMD SOLID WASTE

5555 Glenwood Hills Parkway SE PO Box 874 Grand Rapids MI 49588-0874 616 942-9600 Fax 616 942-6499
Bloomington IN Chattanooga TN Columbus OH Detroit MI Indianapolis IN Milwaukee WI Minneapolis MN

Reference 14

WW Engineering & Science
A Summit Company

September 20, 1993

Mr. Ted Vallis, Vice President
Manitowoc Division
Wisconsin Fuel and Light Company
402 North Tenth Street
PO Box 970
Manitowoc, WI 54221-0970

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

RE: REVISED AQUATIC TOXICITY TESTING WORK PLAN FOR MANITOWOC RIVER SEDIMENTS

Dear Mr. Vallis:

WW Engineering and Science (WWES) is pleased to present this proposal for conducting toxicity tests on Manitowoc River sediments. The proposed work is based on our consultation with Dr. Peter Meier, an aquatic toxicologist at the University of Michigan, with Linda Talbot of the Wisconsin Department of Natural Resources (WDNR), and WDNR's July 23, 1993 comments. This work will be completed in conjunction with the Work Plan for the 1993 Pilot Test and a Sampling and Analysis Plan, which we have provided under separate cover.

The major changes between this toxicity testing work plan and the June 17 toxicity testing work plan are:

Treated, crushed, and unrinsed sediments will be evaluated withthe toxicity tests in addition to the other sediment types;

Analytical data on all of the sediment types, including the laboratory control sediment, will be provided;

The revised plan includes more detaail on sample collection, handling, transporting, etc.

This revised Aquatic Toxicity Testing Plan does not consider the recent decision to cap the treated area with clean sand and grout/cement. We are asking the WDNR to review their toxicity testing requirements in light of this refinement, which should provide an additional degree of protection. Specifically, we are sugesting to the WDNR that the crushing of the treated sediments is no longer needed because the cap should (pending our evaluation of the structural sucess of the procedure) greatly reduce or practically eliminate the possibility that the treated waste material could be crushed and that aquatic life could be exposed to the crushed waste material.

5555 Glenwood Hills Parkway SE PO Box 874 Grand Rapids, MI 49588-0874 (P) 616 942-9600 Fax 616 942-6499
Bloomington IN Chattanooga TN Columbus OH Detroit MI Indianapolis IN Milwaukee WI Minneapolis MN

WISCONSIN FUEL & LIGHT COMPANY

402 N. 10th • P.O. BOX 970
MANITOWOC, WI 54221-0970
PHONE 414-682-8241
FAX 414-683-2505

Reference 15

INSITU SOLIDIFICATION
DEMONSTRATION PROGRAM

SEPTEMBER 23-24, 1993

AGENDA

Welcome/Opening Remarks	Ted Vallis	10:00
Project Overview	Jim Venn & Mike Lawson	10:10
Site/Aqua MecTool Orientation	Jeff Jacobs	10:30
Site Visit		10:35
Aqua MecTool Bench Test Program	Jeff Jacobs & Chuck Holoweski	11:20
Question & Answer Session	Group	11:40
Departure		Noon

WISCONSIN FUEL & LIGHT COMPANY

Site History and Selection of Stabilization/Solidification as the Preferred Remedial Technology

Coal tar-impacted soils and river sediments at the Wisconsin Fuel & Light Company facility and in the adjacent Manitowoc River are the results of the operation processes of a manufactured gas plant that was operated on the site from the mid-1800's until the early 1950's. The manufactured gas plant was constructed for the Manitowoc Gas Company, which during the 1920's became Wisconsin Fuel & Light Company, for the production of gas from coal for lighting and heating.

The coal tars were generated as a by-product of the coal gas production. The coal gas production process consisted of heating large brick ovens (retorts) that were partially filled with coal which vaporized during the heating process, creating the manufactured gas. This gas was passed through a hydraulic main where the temperature of the coal gas was lowered. Liquids with the highest boiling points, such as heavy tars, condensed here and were then removed. After leaving the hydraulic main, the gas was further cooled to approximately air temperature by pulling it through air and water condensers. Generally, scrubbers removed napthalene from the gas before it entered the condenser, whereas vapors or liquids with lower boiling points, such as ammonia or light oils, were removed in the condensers through condensation and separation methods. The coal gas was sent to be stored in gas holders, but was first forced through purifying vessels where carbon dioxide, hydrogen cyanide, and additional ammonia were removed.

Beginning in 1909, the coal tar waste was inventoried and sold to outside parties. The records indicate that Wisconsin Fuel & Light sold the coal tar as it was produced and that measurable quantities of the tar were not allowed to accumulate at the Manitowoc site. However, Wisconsin Fuel & Light became concerned about the environmental impact of possible coal tar deposits that may have remained on their site and decided to contract an outside consultant to explore remediation possibilities.

A feasibility study was conducted by WW Engineering & Science (WWES) prior to choosing the stabilization/solidification technology as the remediation alternative for the Wisconsin Fuel & Light Company site. A number of other remediation alternatives, including excavation and off-site disposal, and excavation and incineration were evaluated, but were rejected on the basis of excessive cost, and the potential for environmental impact on the Manitowoc River. The decision to use stabilization/solidification technology as the remediation alternative was based specifically on the following factors:

- *Its effectiveness in immobilizing contaminants in an essentially non-leachable, non-permeable solid;*
- *The high potential for successfully obtaining required permits, applying the method to the site, and the reliability of the technology (its implementability); and*
- *Its lower cost as compared to other remediation alternatives.*

The volume of soils to be stabilized/solidified was calculated from the results of a remedial investigation initiated in 1988 and completed in 1993. These investigations defined the horizontal extent of impact both on land and in the Manitowoc River sediments and determined that vertical impact extended to the underlying weathered bedrock.

The stabilization/solidification method involves the immobilization of contaminants through the injection of a cement-based solidifying grout that is mixed with the impacted media. The injection and mixing of the grout is accomplished through the use of a drilling and injection system (MecTool™) developed and patented by Millgard Environmental Corporation (MEC). MecTool™ is used to drill deep, overlapping, cylindrical treatment columns comprised of solidifying grout mixed with soil. To ensure uniformity of the treatment columns, the amount of overlap between treatment columns is such that no spaces of untreated soil exist within the solidified area of remediation. The mixture is allowed to solidify, resulting in a relatively impermeable mass of immobilized contaminants that is left buried on the site.

Upon completion of the feasibility study, WWES conducted a treatability study to evaluate the effectiveness of the stabilization/solidification method in immobilizing coal tar contaminants in the soils at the site. An integral part of the treatability study was the development and testing of the grout mixture. During a series of scoping tests, the weights and proportions of components of the grout mixture were evaluated for physical properties, implementability, and economic feasibility. The results of the test showed that stabilization/solidification is effective in significantly reducing the leachability of coal tar-impacted river sediments to levels lower than regulatory limits. The test also indicated that the materials mixed with the solidifying grout formulated by WWES exhibited significant strength and durability. The resulting mixture was subsequently installed utilizing the MecTool™ system during the pilot test of the stabilization/solidification method on the Manitowoc site.

WWES submitted the pilot test work plan to the Wisconsin Department of Natural Resources to test the effectiveness and field implementability of the stabilization/solidification method on coal tar-impacted soils. Written approval was received in October, 1992, and the pilot test was completed in November, 1992. During the pilot test, coal tar-impacted soils were successfully treated.

As a result of the successful pilot test, land remediation began in July, 1993. It is currently in progress and is scheduled to be completed in late November, 1993. Testing of the stabilization/solidification method on river sediments is continuing with a pilot test scheduled during October, 1993, utilizing MEC Aqua MecTool™ technology.

WW Engineering & Science
A Summit Company

Reference 16

October 7, 1993

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Mr. Ted Vallis, Vice President
Manitowoc Division
Wisconsin Fuel & Light Company
402 North Tenth Street
Manitowoc, WI 54221-0970

RE: SOIL CHARACTERIZATION SAMPLING

Dear Mr. Vallis:

WW Engineering & Science (WWES) collected and analyzed soil samples from soil borings installed at the Wisconsin Fuel & Light company facility in Manitowoc, Wisconsin. These soil samples were collected and analyzed for the purpose of characterizing the soils as hazardous or non-hazardous. In addition, analysis were performed to determine if these soils would be acceptable for disposal at the Ridgeview Recycling and Disposal Facility in Whitelaw, Wisconsin.

On September 1, 1993, WWES installed five soil borings (SB-54, 55, 56, 57 and 58) to the west and south of the existing building at the Wisconsin Fuel & Light facility in Manitowoc, Wisconsin. The locations of these soil borings are illustrated on Figure 1 and the boring logs are provided in Attachment 2. A total of six soil samples were collected from the soil borings at various depths. All six of the soil samples were analyzed to determine the total concentrations of metals, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in the soils. The results of these analysis are summarized on Table 1 and the analytical data sheets are provided in Attachment 1. Five of the soil samples were analyzed for metals, VOCs and SVOCs using the Toxicity Characteristic Leaching Procedure (TCLP). In addition, these five soil samples were analyzed for flash point, pH and sulfide/cyanide reactivity. The results of these analysis are summarized on Table 2 and the laboratory data sheets are provided in Attachment 1.

Based upon a review of the analytical data, none of the five soil samples analyzed using the TCLP method exhibited a characteristic of a hazardous waste as defined by the Wisconsin Hazardous Waste Management rules and the Resource Conservation and Recovery Act (RCRA). Although this soil does not exhibit a characteristic of a hazardous solid waste, many landfills, including Ridgeview landfill, have their own requirements

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file

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

WISCONSIN
DEPT. OF NATURAL RESOURCES

George E. Meyer
Secretary

Lake Michigan District Headquarters
1125 N. Military Avenue
P.O. Box 10448
Green Bay, WI 54307-0448
TELEPHONE # (414)492-5864
TELEFAX # (414)492-5913

October 25, 1993

Reference 17

Mr. Ted Vallis, Vice President
Wisconsin Fuel and Light Company
402 North 10th Street
Manitowoc, WI. 54221-0970

RE: Second In-Situ Stabilization/Solidification Pilot Test in the Manitowoc River

Dear Mr. Vallis;

The department has reviewed the following documents prepared by WW Engineering in support of a second pilot test in the Manitowoc River using the Millgard stabilization/solidification technology; a) September 17, 1993 Work Plan for Performance of a Second Pilot Test, b) September 17, 1993 Sampling and Analysis plan for Verification Samples, c) September 20, 1993 Revised Aquatic Toxicity Testing Work Plan. The Department hereby approves the second pilot test within the Manitowoc River subject to the following conditions:

1. The construction of the solidification/stabilization treatment columns will occur in calendar year 1993, prior to the de-mobilization of the Millgard equipment presently on site. The physical and chemical testing of the treatment columns will extend into 1994.

2. The number of test columns shall not exceed a total of four separate 5 foot diameter columns.

3. Attached is a list of comments and conditions from the Bureau of Water Resource Management dated October 19, 1993 that must be addressed as part of the pilot test approval.

4. Within 90 days after completion of the pilot test, sampling activities and analytical results you shall submit a final pilot test report to this office. The report will summarize the objectives, observations, sampling and analytical results and provide an assessment for use of this technology for remediation of impacted sediments at this site.

Reference 18

WW Engineering & Science
A Summit Company

March 18, 1994

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JUN 13 1994
LMD SOLID WASTE

Mr. Ted Vallis
Vice President
Wisconsin Fuel & Light Company
Manitowoc Division
402 North Tenth Street
Manitowoc, WI 54221-0790

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

RE: INTERIM CLOSURE REPORT FOR SHALLOW SOILS EXCAVATION ALONG THE WEST AND SOUTH SIDES OF THE WISCONSIN FUEL AND LIGHT COMPANY BUILDING IN MANITOWOC, WISCONSIN

Dear Mr. Vallis:

WW Engineering & Science (WWES) has completed the construction management services related to shallow soils excavation along the west and south sides of the Wisconsin Fuel & Light (WF&L) Company building in Manitowoc, Wisconsin. The work was performed in accordance with the December 16, 1993 work plan that was submitted to WF&L on December 16, 1993. This letter report summarizes the field activities, field observations, and geotechnical/analytical results of verification samples. This report also presents recommendations for monitoring of ground water along the west side of the WF&L building.

HISTORICAL PERSPECTIVE

The extent of soil and ground water impact was investigated at the WF&L site between 1988 and 1993. *In situ* solidification/stabilization technology was selected for the interim remediation of the WF&L site during early 1993 when a remedial action plan was completed by WWES and approved by the WDNR. The original proposed depths of solidification used for the northern, central, and southern areas of the WF&L site were 32 feet, 35 feet, and 40 feet, respectively (Figure 1). Approximately 7300 cubic yards of subsurface soils were solidified within the proposed areas (shown in blue on Figure 1) during the period of July through November 1993.

Additional solidification/stabilization of subsurface soils to complete the 32-foot area will be conducted during the summer of 1994. The previously proposed additional solidification/stabilization of subsurface soils within the 35-foot and 40-foot areas was not implemented based on a field investigation that was conducted during September 1993 along the west and south sides of the WF&L building. The collection and analysis of soil

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samples from five soil borings within this area indicated the subsurface materials were not characteristically hazardous and would meet the requirements for disposal at Ridgeview Landfill in Whitelaw, Wisconsin. The selected remediation approach for the remaining unsolidified areas within the 35-foot and 40-foot areas was excavation of the shallow soils and future monitoring of ground water quality. The excavation, sampling and backfilling activities of the shallow soils are summarized below.

SHALLOW SOILS REMOVAL

In January 1994, WWES provided construction management services for soil excavation activities at the WF&L site. The excavation of shallow soils was performed within the non-solidified portions of the 35-foot and 40-foot areas, as shown in red on Figure 1. The excavated area consisted of: (1) a small area located west of the storm sewer; and (2) a larger area located west and south of the WF&L building and east of the storm sewer.

During soils excavation, approximately 1410 cubic yards (1975 tons) of coal tar impacted soils were removed from the WF&L site. The final depth of excavation was based on the depth to ground water, ranging from 10 feet to 12 feet below the ground surface. The contaminated soils were excavated by McMullen-Pitz Construction Company of Manitowoc, Wisconsin. Schenian Trucking transported the soils to Ridgeview Landfill in Whitelaw, Wisconsin for proper disposal. During soil removal, a 4-inch diameter sanitary sewer, aligned in a north-south fashion, was encountered in the central portion of the large excavation west of the WF&L building, 5 feet below ground surface (Figure 1). Since the sanitary sewer currently services the WF&L building, additional steps were taken to support and insulate the sewer during excavation activities.

A steel storage tank containing coal tar was encountered 3 to 6 feet below grade during the soil excavation south of the WF&L building along the loading dock. A part of the storage tank had been solidified during the *in situ* solidification/stabilization work that was conducted during November of 1993. The eastern end of the tank, extending five feet to the east beyond the end of the solidification area, will be solidified during the summer of 1994.

VERIFICATION SAMPLING AND BACKFILLING

Upon completion of soil removal, the excavations were filled with approximately 2 feet of clean, 3/4" crushed limestone and then backfilled with clean sand fill. The sand fill was compacted in one foot lifts up to an elevation of one foot below the original ground surface. The top one foot of backfill material consisted of 3/4" road gravel to grade. A sample of the sand fill ('Schenian Sand') was collected for laboratory analyses prior to backfilling for verification purposes.

STS Consultants Ltd. of Green Bay, Wisconsin performed geotechnical testing services associated with the shallow soils excavation. Compaction and moisture density tests were conducted using a modified proctor during backfilling following placement of each one foot lift of fill material (ASTM D 1557-91). Additional compaction of each lift was performed, if necessary, until a minimum of 90 percent compaction was obtained. A field compaction summary, density test location diagram, analysis of aggregates report, and moisture-density laboratory results prepared by STS Consultants Ltd. are included in Attachment 1.

Two verification samples were collected from the excavation areas (ES-1 and ES-2) for anticipated future site closure (Figure 1). Verification sample ES-1 was a soil sample collected from the west wall of the small excavation, approximately 5 feet below grade. Verification sample ES-2 was a ground water sample collected beneath the large excavation, west of the WF&L building. The ground water sample was collected by placing a 3-foot long, 2-inch diameter PVC screen below the floor of the excavation and backfilled with native soils. The well was developed and sampled using a clean Teflon bailer. The sample collected for metals analysis was filtered upon sample collection using a 0.5 micron in-line filter.

The verification samples ('Schenian Sand', ES-1, and ES-2) were placed in appropriate laboratory containers and transported in a chilled cooler to WWES Environmental Laboratory in Grand Rapids, Michigan for laboratory analysis. Sample "Schenian Sand' was analyzed for VOC's and polynuclear aromatic hydrocarbons (PNA's). Samples ES-1 and ES-2 were analyzed for VOC's, semi-volatile organic compounds (SVOC's) including PNA's, 11 metals, total sulfate, and total and amenable cyanide.

RESULTS AND RECOMMENDATIONS

Table 1 provides a summary of the analytical results of two soil samples (ES-1 and 'Schenian Sand') and one ground water sample (ES-2) collected during the shallow soils excavation activities (see analytical report in Attachment 1). The table also presents the Wisconsin NR 140 ground water quality standards for comparison purposes for ground water sample ES-2.

The analytical results indicate that no VOC's or SVOC's were detected in soil samples ES-1 and 'Schenian Sand' above their respective method detection limits. Similarly, total sulfate, total cyanide, and amenable cyanide were not detected in the two soil samples above their respective method detection limits. Metals in soil sample ES-1 were reported at concentrations below or slightly exceeding the method detection limit.

Elevated detection limits of VOC's and SVOC's were reported for ground water sample ES-2 due to matrix interferences during sample analysis, with the exception of benzene,

ethyl benzene, toluene, and total xylene (BTEX), and naphthalene. BTEX compounds were detected in the ground water sample at concentrations of 4.6 mg/L for benzene, 1.5 mg/L for ethylbenzene, 4.8 mg/L for toluene, and 7.1 mg/L for total xylene. Naphthalene was present in the ground water sample at a concentration of 9.5 mg/L. Total cyanide was detected in ES-2 at a concentration of 2.1 mg/L, and total sulfate was detected in ES-2 at a concentration of 260 mg/L. The reported concentrations of BTEX, naphthalene and total cyanide in ES-2 exceed the enforcement standard and preventive action limit of the Wisconsin NR 140 Public Health Ground Water Quality Standards.

The concentrations of BTEX, naphthalene and total cyanide in ES-2 may be elevated because of the possible movement of contaminated ground water away from the area that was solidified along the west side of the WF&L building during November 1993. The investigation conducted along the west side of the WF&L building during September 1993 indicated that the shallow soils above the water table had elevated levels of BTEX, naphthalene and total cyanide.

It is recommended that a permanent monitoring well be placed in the area of ES-2 as part of the verification of *in situ* solidification/stabilization program that is planned for the summer of 1994. Sampling and analysis of the monitoring well for VOC's, SVOC's including PNA's, 11 metals, total sulfate, and total and amenable cyanide is also recommended. Additional recommendations for future monitoring and/or remediation will be made after the proposed monitoring well in addition to other verification monitoring wells are sampled and analyzed.

If you have any questions regarding this interim closure report or desire additional information, please do not hesitate to call.

Sincerely,

WW ENGINEERING & SCIENCE
Environmental Services

Douglas W. Lectka
Manager, Construction Services

James G. Venn
Project Manager

Enclosures: Figure 1, Table 1, Attachment 1

Reference 19

Rec'd 7-19-94

This report can be reviewed in its entirety
at the WDNR Green Bay office located at
2984 Shawano Avenue in Green Bay

WORK PLAN FOR VERIFICATION SAMPLING OF IN SITU STABILIZED/SOLIDIFIED SOILS AND INSTALLATION OF GROUNDWATER MONITORING WELLS WISCONSIN FUEL & LIGHT COMPANY MANITOWOC, WISCONSIN

Prepared for:
Mr. Ted Vallis
Vice President
Manitowoc Division
Wisconsin Fuel & Light Company
402 North 10th Street
P.O. Box 970
Manitowoc, Wisconsin 54221-0970

Submitted by:
The Earth Technology Corporation
12129 West Feerick Street
Wauwatosa, Wisconsin 53222
414/466-9266

Project No.: 22574

July 15, 1994

rec'd July 19, 1994

WORK PLAN FOR VERIFICATION SAMPLING OF IN SITU STABILIZED/SOLIDIFIED SOILS AND INSTALLATION OF GROUNDWATER MONITORING WELLS WISCONSIN FUEL & LIGHT COMPANY MANITOWOC, WISCONSIN

1.0 VERIFICATION SAMPLING OF IN SITU STABILIZED/SOLIDIFIED SOILS FOR PHYSICAL TESTING AND CHEMICAL ANALYSIS

Cores of treated soils will be collected after the completion of the second phase of soil remediation to verify that the stabilized/solidified media has been treated to design specifications.

The cores will be collected with a drill string comprised of 6-inch I.D. hollow-stem augers (HSA) and a 5-foot long, 3-inch diameter continuous split-spoon sampling device, mounted on a drilling rig. The split-spoon sampler is positioned inside of and flush with the bottom of the lead auger and is pushed under hydraulic pressure into the treated media, as the augers are advanced. At 5-foot intervals, the augers will be stopped and the sampling device retrieved. Cores will be collected and visually inspected throughout the entire thickness of treated soils to show that complete mixing and solidification have occurred. The contents of the sampling device will be transferred to sample containers fashioned out of 5-foot sections of PVC gas line, sealed with duct tape and transported to EARTH TECH's (The Earth Technology Corporation), formerly WW Engineering & Science (WWES), facilities for testing and analyses.

The cores will be collected at eleven (11) locations as shown in Figure 1. Verification locations VS-2, VS-3, and VS-4 were completed in 1993. Verification locations VS-1 and VS-5 through VS-8 will be drilled to verify encapsulation at the top and bottom of the coal tar-impacted soils. Verification locations VS-12 through VS-17 will be drilled to verify that the flanks of the impacted soils have been encapsulated. The verification samples will be collected after all of the impacted soils have been stabilized/solidified.

Cores from all verification sampling locations will be collected continuously from the surface to the bottom of the treated media. Cores collected from the top 5 feet and bottom 5 feet of the treated soils from verification sampling locations VS-1 and VS-5 through VS-8 will be submitted for physical testing and chemical analysis. The thickness of impacted soils decreases along the southern and eastern flanks of the impacted soils. Therefore, cores collected from verification sampling locations located along the flanks of the treated soils (VS-12 through VS-17) will come from the middle portion of treated soils (approximately 12 to 17 feet below the top of the treated soils). Cores submitted for testing and analyses from the top, bottom, and flanks of the treated soils will, therefore, verify the effectiveness of soil stabilization/solidification to encapsulate the coal tar-impacted soils within a very low permeability matrix.

There are two areas within the coal tar-impacted soils that will not be completely solidified and encapsulated during the 1993 remediation, which is why the 1993 land remediation is called an "interim remediation." One of the areas is the west boundary of the site adjacent to the Wisconsin Central property. The heavily impacted materials extend right up to the property boundary, and almost certainly go beyond it. However, Wisconsin Fuel & Light Company (WF&L) has arranged for permission to investigate the extent of impact on the Wisconsin Central property, but this area could not be included in the 1993 and 1994 land remediation.

The other area of impacted materials that will not be completely remediated during 1993 and 1994 is the area near SB-53 (intersection of 11th and Chicago Streets). This area was not included in the 1993 and 1994 remediation because of project timing and logistics. However, WF&L understands that both areas of impacts which are not included in the 1993 and 1994 interim remediation will have to be addressed at a later date.

The modified static leachate test procedure using Manitowoc River water will be used for the analysis of the samples of treated cores from the top, bottom, and flank of the stabilized/solidified monolith. A description of this procedure is contained in Appendix D of the 1993 WWES report "Pilot Test Report, *In Situ* Stabilization/Solidification, Coal Tar Impacted Soil/Sediments, Wisconsin Fuel & Light Company, Manitowoc, Wisconsin," dated February 1993. The modified leachate test procedure is also presented in Appendix A of this Work Plan. The pilot test report indicated that the static leachate procedure provided the best and most realistic constituent concentrations. We expect that the analytical data from the static leachates from the verification cores will meet NR 140 groundwater quality standards.

All verification sampling boreholes will be backfilled with a cement bentonite grout from the bottom up using a tremie pipe. The grout will be comprised of 97% neat cement and 3% bentonite.

The verification cores will be analyzed for the parameters listed on Table 1. These physical and chemical parameters are identical to the parameters that were selected for the verification cores collected after the completion of the November 1992 pilot test. A sample of Manitowoc River water will also be collected and analyzed as noted on Table 1 to assure that the river sample is not contaminated prior to initiation of the laboratory leaching procedure.

Decontamination of all sampling and drilling equipment will be accomplished with a steam cleaner. Decontamination water will be collected in a decontamination tank located at the site, and pumped into 55-gallon drums for characterization and eventual disposal by WF&L.

Reference 20

This report can be reviewed in its entirety
at the WDNR Green Bay office located at
2984 Shawano Avenue in Green Bay

INTERIM ENVIRONMENTAL SITE CLOSURE FOR FORMER COAL GAS MANUFACTURING PLANT MANITOWOC, WISCONSIN

Prepared for:

Wisconsin Fuel & Light
Manitowoc, Wisconsin

Prepared by:

EARTH TECH
5555 Glenwood Hills Parkway
Grand Rapids, Michigan 49588-0874

March 1995

22574

1.0 INTRODUCTION AND BACKGROUND

1.1 PURPOSE

EARTH TECH, formerly WW Engineering & Science (WWES), initially investigated Wisconsin Fuel & Light Company's Manitowoc facility in August 1988 because the site at one time was the location of a coal gas facility. EARTH TECH returned to the site in October 1991, November 1991, and April 1993 to further investigate the subsurface environmental conditions at the site. The purpose of the investigations was to perform a detailed study to confirm the absence or presence of coal tar-impacted soils and groundwater at the site. The studies resulted in the gathering of on-site information concerning soil conditions, groundwater flow direction, and groundwater quality.

A work plan was developed in June 1993 for interim remediation of on-site soils using *in situ* stabilization/solidification, including collection and analysis of verification samples from the solidified materials, and groundwater monitoring at the Wisconsin Fuel & Light Company (WF&L) site. This remedial action plan was approved by the Wisconsin Department of Natural Resources (WDNR) by a letter dated July 13, 1993. The remediation plan was implemented in 1993 and 1994.

The purpose of this report is to briefly summarize the scope of past investigations and their conclusions, and to describe in detail the remediation work performed in 1993 and 1994 to achieve interim environmental site closure.

1.2 SITE LOCATION AND DESCRIPTION

The Wisconsin Fuel & Light Company's former coal gas facility is located in the southeast corner, Section 19, T19N, R24E within the City of Manitowoc, Manitowoc County, Wisconsin. The site is bounded on the east by 10th Street and on the west by 11th Street. The Manitowoc River and the Winter property border the site on the northwest and southeast, respectively (Figure 1).

The Winter property consists of an office building and small storage building with a paved parking lot on the northeast side of the office building. The office building is located directly over a former 200 MCF (200,000 cubic feet) gas holder foundation.

Semivolatile Organic Constituents

Groundwater samples from MW-2 and -7 were found to contain concentrations of di-n-butyl phthalate of 5 and 8 ug/L, respectively. The equipment blank was found to contain di-n-butyl phthalate at a concentration of 28 ug/L. Di-n-butyl phthalate is not a normal constituent of coal tar. No PAL or ES has been established for di-n-butyl phthalate. The groundwater sample from MW-11 was found to contain acenaphthene, acenaphthylene, 2,4-dimethylphenol and phenol concentrations of 5, 5, 11 and 34 ug/L, respectively. No PALs or ESs have been established for acenaphthene, acenaphthylene or 2,4-dimethylphenol. The detected phenol concentration does not exceed the PAL.

The sample from MW-14 was found to contain 2-methylnaphthalene and naphthalene at concentrations of 940 and 12,000 ug/L, respectively. No PAL or ES has been established for 2-methylnaphthalene. The detected naphthalene concentration exceeds both the PAL and ES. No other SVOCs were detected in any groundwater samples.

3.2 CONCLUSIONS

The measured water level elevations suggest that groundwater flow has been altered in the vicinity of the solidified soil. Borings advanced into the solidified soils were dry to depth, well below the groundwater table, and remained dry until filled. These results indicate that groundwater does not permeate the interior of the solidified monolith of soils.

The results of laboratory analyses of soil verification samples indicate that constituent concentrations in sample extracts are low. In most cases, extracted concentrations are below the respective PALs, and in all cases are below the ESs. Since the verification samples were collected from the upper, lower and side surfaces of the solidified monolith, it can be concluded that the monolith will not impact above groundwater applicable standards.

The results of physical testing of soil verification samples indicate that the solidified soils exhibit significant physical strength (UCS values ranging from 307 to 1492 psi). The solidified soils are relatively impermeable, with all values less than or equal to 2.3×10^{-5} cm/s, and all but two less than or equal to 3.1×10^{-6} cm/s. Measured sample weight losses during durability tests ranged from 12.7 to 17.5 percent. The increase in weight loss values relative to the pilot test results is attributed to the hardness of the matrix and the difficulty of obtaining an undamaged sample by coring. The physical test results indicate that the remediation method resulted in a strong, relatively impermeable monolith of solidified soil that encapsulates heavily-impacted soils and prevents release of coal tar constituents to the surrounding groundwater.

The results of laboratory analyses of groundwater samples indicate that groundwater near the solidified monolith is impacted by several constituents associated with coal tar in concentrations exceeding their respective ESs. As expected, the detected groundwater concentrations are higher than were observed before remediation. These constituents include sulfate (MW-8), amenable cyanide (MW-8 and -13), total cyanide (MW-2, -6 through -10 and -12 through -14), benzene (MW-10 through -14), toluene (MW-14), xylene (MW-14) and naphthalene (MW-14). With the exception of MW-2 and MW-6, each of these monitoring wells is in close proximity to the solidified monolith. The remediation method displaces groundwater that cannot be incorporated into the solidified monolith from the treated soil. It is likely that the enforcement standard exceedances observed are related to groundwater displaced from heavily impacted soil. WF&L understands that additional assessment, and possibly remediation, of the impacted groundwater will be required.

3.3 RECOMMENDATIONS

Coal tar-impacted soil was encountered along the western and southwestern boundary of the site. It is recommended that the adjacent property to the west (Wisconsin Central Railroad) and Chicago Street be investigated to evaluate the nature and extent of coal tar-related impacts.

Groundwater adjacent to the solidified monolith appears to have been impacted by remediation activities. It is expected that groundwater quality will improve over time. It is recommended that additional sampling and analysis be conducted to monitor changes in groundwater quality.

Remediation alternatives for the coal tar-impacted sediments of the Manitowoc River are still being considered. The results of the November, 1992 pilot test did not demonstrate the effectiveness of *in situ* stabilization/solidification for treatment of river sediments. The cost for developing effective *in situ* S/S techniques for river sediments at this site are expected to be prohibitive. At this time, other remediation methods are expected to be more readily implementable and cost-effective.

Reference 21

SUBSURFACE INVESTIGATION OF PROPERTIES ADJACENT TO FORMER WISCONSIN FUEL & LIGHT CO. COAL GAS MANUFACTURING PLANT MANITOWOC, WISCONSIN

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Wisconsin Fuel & Light Co.
402 North Tenth Street
P.O. Box 970
Manitowoc, Wisconsin 54221-0970
(414) 683-2538

Prepared by:

Horizon Environmental Corporation
4595 Broadmoor SE
Suite 200
Grand Rapids, Michigan 49512
(616) 554-3210

WFL-0101

September, 1995

HORIZON ENVIRONMENTAL

EXECUTIVE SUMMARY

Horizon Environmental Corporation performed a subsurface investigation on the Wisconsin Fuel & Light Co. site (the site) in the City of Manitowoc, Manitowoc County, Wisconsin and on the Wisconsin Central Ltd. property located adjacent to and west of the site. The investigation included ten soil borings on and around the site, four of which were completed as semipermanent monitoring wells. In addition, ground water samples were collected for analysis from existing monitoring wells on and around the site.

The results of the investigation included the following:

- One soil sample collected from a boring on the Wisconsin Central Ltd. property contained detectable concentrations of semivolatile organic compounds. Two other soil samples contained detectable concentrations of total but not amenable cyanide;

- One ground water sample collected from a monitoring well on the Wisconsin Central Ltd. property contained detectable concentrations of total and amenable cyanide;

- Ground water samples collected from existing monitoring wells located around the solidified soil at the site contained detectable concentrations of volatile and semivolatile organic compounds that generally were lower than concentrations detected during the previous sampling and analysis event (October, 1994);

- One ground water sample collected from the site contained detectable concentrations of volatile and semivolatile organic compounds in excess of concentrations detected during the October, 1994 sampling and analysis event; and

- Ground water samples collected from the site contained detectable concentrations of total and amenable cyanide that were generally unchanged from those detected during the October, 1994 sampling and analysis event.

The conclusions of the subsurface investigation included the following:

- Coal tar impacts on the Wisconsin Central Ltd. property are limited in nature and extent;

- Concentrations of volatile and semivolatile organic compounds in ground water at the site generally are decreasing, and will likely continue to decrease;

- Cyanide impacts in ground water on and around the site have not decreased appreciably. If cyanide concentrations do not decrease below applicable standards, remediation activities may be required; and

- Ground water in the vicinity of one monitoring well on the site appears to be affected by coal tar constituents remaining in site soils. Remediation activities may be required in the vicinity of this monitoring well.

Continued ground water monitoring is recommended to evaluate the attenuation of coal tar impacts at the site. Based on the results of continued ground water monitoring, remediation alternatives may be required.

Reference 22

SUBSURFACE INVESTIGATION
FORMER WISCONSIN FUEL & LIGHT CO.
COAL GAS MANUFACTURING PLANT
MANITOWOC, WISCONSIN

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

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Prepared by:

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April, 1996

HORIZON ENVIRONMENTAL

SUBSURFACE INVESTIGATION
FORMER WISCONSIN FUEL & LIGHT CO.
COAL GAS MANUFACTURING PLANT
MANITOWOC, WISCONSIN

Reference 23

RECEIVED
FEB 20 1997
LMD SOLID WASTE

This report can be reviewed in its entirety
at the WDNR Green Bay office located at
2984 Shawano Avenue in Green Bay

Prepared for:

Wisconsin Fuel & Light Co.
402 North Tenth Street
P.O. Box 970
Manitowoc, Wisconsin 54221-0970
(414) 683-2538

Prepared by:

Horizon Environmental Corporation
4595 Broadmoor SE
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Grand Rapids, Michigan 49512
(616) 554-3210

WFL-0105

February 1997

HORIZON ENVIRONMENT

EXECUTIVE SUMMARY

Horizon Environmental Corporation performed a subsurface investigation on the Wisconsin Fuel & Light Company site (the site) in the City of Manitowoc, Manitowoc County, Wisconsin. The investigation included twelve soil borings on the southwest portion of site and in the adjacent Chicago Street, south of the site. One temporary monitoring well was installed in the vicinity of the twelve borings. In addition, ground water samples were collected from fifteen monitoring wells on and around the Wisconsin Fuel & Light Co. property for analysis.

The results of the investigation included the following.

- Samples collected from twelve soil borings contained detectable concentrations of volatile organic compounds, semivolatile organic compounds, or both. Four soil samples contained detectable concentrations of total and amenable cyanide. Evidence of product was observed in the saturated zone in four of the borings. Discoloration, odor, or headspace concentrations exceeding 1 ppm were noted in ten of the twelve borings.

- Six ground water samples collected from existing monitoring wells contained detectable concentrations of volatile organic compounds. The concentrations exceeded the applicable Enforcement Standards in five of the samples. The sample collected from the temporary monitoring well contained detectable concentrations of volatile organic compounds, but none exceeded the applicable Enforcement Standards.

- Three ground water samples collected from existing monitoring wells contained detectable concentrations of semivolatile organic compounds. The concentrations exceeded the applicable Enforcement Standards in two of the samples. The sample collected from the temporary monitoring well contained a detectable concentration of naphthalene in excess of the Enforcement Standard.

- Ground water samples collected from all but one of the existing monitoring wells contained detectable concentrations of total and/or amenable cyanide. Five of the samples contained total or amenable cyanide in excess of the Enforcement Standard for cyanide. The sample collected from the temporary monitoring well contained detectable concentrations of total and amenable cyanide, but neither exceeded the applicable Enforcement Standards.

- Three ground water samples collected from the site contained detectable concentrations of volatile organic compounds in excess of concentrations detected during the previous sampling and analysis event (May 1995). The concentrations decreased slightly in one sample and were essentially unchanged in the remaining two that contained detectable concentrations.

- Two ground water samples collected from the site contained detectable concentrations of semivolatile organic compounds in excess of concentrations detected during the previous sampling and analysis event. The concentrations were essentially unchanged in the remaining sample that contained detectable concentrations.

- Eight ground water samples collected from the site contained concentrations of total cyanide that were substantially less than those detected during the previous sampling and analysis event. Four were essentially unchanged and one had increased.

- Seven ground water samples collected from the site contained concentrations of amenable cyanide that were substantially less than those detected during the previous sampling and analysis event. Four were essentially unchanged and two had increased.

The conclusions of the subsurface investigation included the following.

- The subsurface product in the vicinity of MW-14 appears to be limited to an area approximately 20 feet wide, extending approximately 45 feet southeast of MW-14. Based on field observations, the product appears to be present in discontinuous, thin layers, below the water table.

- Ground water in the vicinity of MW-14 appears to be impacted by coal tar constituents remaining in the saturated zone.

- Ground water concentrations of volatile and semivolatile organic compounds are decreasing beneath all but the northwest portion of the site, and probably will continue to decrease. Concentrations in the northwest portion of the site are increasing, possibly indicating ground water movement to the west around the south boundary of the solidified soil.

- Cyanide impacts in ground water beneath the site generally have decreased, although in two locations total or amenable cyanide concentrations have increased since the previous sampling and analysis event.

Over the majority of the site, continued ground water monitoring is recommended to follow the progress of attenuation of coal tar impacts. Two issues will require action: 1) Impacted ground water along the northwest boundary of the Wisconsin Fuel & Light Co. property should be prevented from leaving the site; and 2) the area of free phase organic liquid in the vicinity of MW-14 should be monitored for migration of free phase and dissolved organic constituents to minimize future ground water impacts. If future monitoring indicates that the free phase and dissolved constituents are migrating away from the area of MW-14, then remediation of the source area may be required.

HORIZON ENVIRONMENTAL

Reference 24

RECEIVED
MAR 31 1997
LMD SOLID WASTE

March 26, 1997

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Mr. James R. Reyburn
State of Wisconsin
Department of Natural Resources
Environmental Response & Repair Program
1125 N. Military Avenue
Box 10448
Green Bay, Wisconsin 54307-0448

RE: WISCONSIN FUEL AND LIGHT COMPANY

Dear Mr. Reyburn:

Please find enclosed a site map of our planned deep monitoring well locations at the Wisconsin Fuel & Light site. As we discussed last week, the four wells will be terminated at a maximum depth of 40 feet with the screens in Chicago Street set at a depth of 25 to 40 feet. This will eliminate the necessity of drilling from 40 to 60 feet with mud rotary.

In addition, we are planning to start the work on March 31, 1997. I will contact you late this week concerning startup of the job.

Sincerely,

HORIZON ENVIRONMENTAL

James G. Venn
Senior Project Geologist

Horizon Environmental Corporation 4595 Broadmoor SE. Suite 200. Grand Rapids MI 49512 616 554.3210 Fax 616 554.3211

jb\f:\Janet\Project\WisconsinFuel&Light\0106\3-26ltr

Reference 25

GROUND WATER CONTROL INVESTIGATION
WISCONSIN FUEL & LIGHT COMPANY
FORMER COAL GAS MANUFACTURING PLANT
MANITOWOC, WISCONSIN

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Prepared for:

Wisconsin Fuel & Light Co.
402 North Tenth Street
P.O. Box 970
Manitowoc, Wisconsin 54221-0970
(414) 683-2538

Prepared by:

Horizon Environmental Corporation
4595 Broadmoor SE
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Grand Rapids, Michigan 49512
(616) 554-3210

RECEIVED
AUG 08 1997
LMD SOLID WASTE

WFL-0106

June 1997

HORIZON ENVIRONMENTAL

EXECUTIVE SUMMARY

Horizon Environmental Corporation performed a ground water control investigation at the Wisconsin Fuel & Light Company site in the City of Manitowoc, Manitowoc County, Wisconsin. The investigation included installing three deep monitoring wells around the perimeter of the free phase product area in Chicago Street, installing one deep monitoring well adjacent to MW-12, collecting and analyzing ground water samples from the 18 new and existing on-site monitoring wells, conducting *in situ* hydraulic conductivity tests on five monitoring wells to determine the hydraulic conductivity of the water table aquifer, and estimating the pumping rate for a future ground water control well which will be constructed to prevent ground water from migrating from the western boundary of the WF&L site.

The results of the investigation included the following.

- Ground water samples collected from all eighteen monitoring wells contained detectable concentrations of amenable and total cyanide, with the exceptions of MW-5 and MW-17T which did not contain amenable cyanide. The concentrations of amenable and total cyanide exceeded the applicable Enforcement Standards in nine of the wells.

- Ground water samples collected from ten monitoring wells contained detectable concentrations of volatile organic compounds. The concentrations exceeded the applicable Enforcement Standards in eight of the wells.

- Ground water samples collected from six monitoring wells contained detectable concentrations of semivolatile organic compounds. The concentrations exceeded the applicable Enforcement Standards in four of the wells.

- The amenable and total cyanide concentrations observed in ground water samples from the monitoring wells in the vicinity of the solidified soil matrix have generally decreased since the May, 1995 and June, 1996 monitoring events. Only MW-2 and MW-6 have shown significant increases in cyanide concentrations. The increase in MW-2 may be related to the nearby free phase product area in Chicago Street. The increase in MW-6 may be related to the nearby gas holder foundation.

- The volatile organic concentrations in the monitoring wells have generally improved between the June, 1996 and April, 1997 monitoring events. BTEX concentrations have decreased significantly in MW-11 and MW-14 between 1996 and 1997. The monitoring wells that have shown significant increases in volatile organics are benzene in MW-10 and BTEX in MW-12.

- The semivolatile organic concentrations in the monitoring wells are concentrated in MW-12, MW-12D, MW-13, and MW-14 which are located along the south side of the solidified soil matrix, and within the free phase product area in Chicago Street.

Monitoring wells MW-12, MW-12D, and MW-13 are located in areas where heavily coal tar impacted soils were excavated and removed after nearby soils were solidified with the soil stabilization/solidification process during 1993.

- It appears that the inorganic and organic constituents in MW-14 have not migrated very far from the free phase product area in the western portion of Chicago Street. This is based on the .low concentrations of inorganic and organic constituents in the ground water in deep monitoring wells MW-19T, MW-20T, and MW-21T that were constructed during April 1997.

- The average hydraulic conductivity for the 30 feet thick aquifer within the western portion of the WF&L site is approximately 53 feet/day. The estimated ground water flow velocity within this area of the site is 0.355 feet/day (130 feet/year).

- A ground water control well simulation was accomplished assuming a purge well (designated PW-1) would be placed along the western boundary of the WF&L site southwest of the MW-12, MW-12D well cluster. The ground water simulation was accomplished using a two dimensional ground water flow model called TWODAN.

- A pumping rate of up to 20 GPM for PW-1 should be sufficient to capture and to prevent offsite migration of impacted ground water along the western boundary of the WF&L site. This capture zone includes the monitoring wells that are particularly impacted and have the Enforcement Standard exceedances, namely MW-12, MW-12D, MW-13, and MW-14.

Based on the results of this investigation, the following recommendations were made.

- A pumping well should be installed at the location of PW-1 in order to control migration of impacted ground water along the western boundary of the WF&L site. A pumping rate of up to 20 GPM for the pumping well should be established based on the results of the ground water control well simulation.

- Continued annual monitoring of ground water from the eighteen monitoring wells is recommended to track the ongoing attenuation of cyanides and volatile and semivolatile organic compounds.

Reference 26

GROUND WATER CONTROL SYSTEM INSTALLATION AND START-UP

WISCONSIN FUEL & LIGHT COMPANY FORMER COAL GAS MANUFACTURING PLANT MANITOWOC, WISCONSIN

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Prepared for:

Wisconsin Fuel & Light Co.
402 North Tenth Street
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Manitowoc, Wisconsin 54221-0970
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Prepared by:

Horizon Environmental Corporation
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RECEIVED
FEB 17 1998
LMD SOLID WASTE

WFL-0107

January 1998

HORIZON ENVIRONMENTAL

EXECUTIVE SUMMARY

Horizon Environmental Corporation installed and started up a ground water control system, consisting of a ground water production well (designated PW-1) and carbon adsorption pretreatment system, at WF&L's Manitowoc facility during October and November 1997. The installation and operation of the ground water production well and pretreatment system had two primary purposes, which were (1) to prevent off-site migration of impacted ground water along the western boundary of the WF&L site and (2) to verify that the impacted ground water is being captured at the production well by measuring static water levels in all of the on-site wells at timed intervals after system start-up.

The ground water control system installation and start-up included the following:

The installation of the production well was provided with 6-inch diameter black steel casing, a wire wound screen set at a depth of 20 to 35 feet below grade, and a ½ HP stainless steel electrical submersible well pump selected to pump up to a rate of 20 GPM.

The installation of the carbon adsorption pretreatment system included two 800-pound granular activated carbon vessels in series, a bag filter, a turbine flow meter, and transmission piping from the production well to the WF&L building and the sanitary sewer manhole.

WF&L was required to obtain two permits prior to start-up of the ground water control system. The first permit from the City of Manitowoc Director of Public Works allows discharge of up to 20 GPM of pretreated ground water into the sanitary sewer. The second permit is a ground water discharge permit from the City of Manitowoc Wastewater Treatment Facility (WTF), and it allows discharge of pretreated ground water into the sanitary sewer as long as the effluent samples from the pretreatment system meet the WTF's discharge limits.

Horizon started up the production well and pretreatment system at 6:30 P.M. on November 12, 1997 at 10.6 GPM after completing an initial test at 20 GPM to check the system for leaks.

Influent and effluent ground water samples were collected one hour after start-up, one day after start-up, and one set of samples per week during the first month of operation (as required by the WTF permit). The ground water samples were analyzed for volatile organic compounds, semi-volatile organic compounds, total petroleum hydrocarbons (TPH), oil & grease, pH, total and amenable cyanide, and 13 metals.

Static water levels were measured in all of the site monitoring wells and PW-1 prior to start-up and three times after start-up to verify that the production well is effectively capturing the impacted ground water in Chicago Street and North 11th Street and preventing off-site migration. Ground water elevation maps were generated for each set

of static water levels. The maps that were generated from the three sets of static water level measurements taken after start-up indicate that PW-1 has created a zone of capture that is effectively controlling ground water flow and preventing off-site migration in Chicago Street and North 11th Street.

Reference 27

ANNUAL GROUND WATER MONITORING
WISCONSIN FUEL & LIGHT COMPANY
FORMER COAL GAS MANUFACTURING PLANT
MANITOWOC. WISCONSIN

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Prepared for:

Wisconsin Fuel & Light Co.
402 North Tenth Street
P.O. Box 970
Manitowoc, Wisconsin 54221-0970
(414) 683-2538

Prepared by:

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RECEIVED
JUN 01 1998
AND SOLID WASTE

WFL-0109

May, 1998

HORIZON ENVIRONMENTAL

Reference 28

ANNUAL GROUND WATER MONITORING
WISCONSIN FUEL & LIGHT COMPANY
FORMER COAL GAS MANUFACTURING PLANT
MANITOWOC, WISCONSIN

RECEIVED
JUN 04 1999
LMD SOLID WASTE

Prepared for:

Wisconsin Fuel & Light Co. – has merged with WPS - april 2001
402 North Tenth Street
P.O. Box 970
Manitowoc, Wisconsin 54221-0970
~~(414) 683-2538~~
1-800-848-1397

Prepared by:

Horizon Environmental Corporation
4595 Broadmoor SE
Suite 200
Grand Rapids, Michigan 49512
(616) 554-3210

telcon Connie Lawnaczak June 8, 2001 asked about 2000 report. Should be sent to DWL shortly.

WFL-0109

May, 1999

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

HORIZON ENVIRONMENTAL

Reference 29

ANNUAL GROUND WATER MONITORING

for the

FORMER WISCONSIN FUEL & LIGHT COMPANY FACILITY
402 NORTH 10TH STREET
MANITOWOC, WISCONSIN

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Prepared for:

Wisconsin Public Service Corporation
700 North Adams Street
P.O. Box 19002
Green Bay, Wisconsin 54307-9002

Prepared by:

Horizon Environmental Corporation
4595 Broadmoor, SE, Suite 200
Grand Rapids, Michigan 49512

WFL-0110

May 2001

HORIZON ENVIRONMENTAL

Reference 30

Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
700 North Adams Street
P.O. Box 19002
Green Bay, WI 54307-9002

WI DNR RECEIVED APR 2 2 2002 NER WASTE/RR

April 19, 2002

Ms. Annette Weissbach
Wisconsin Department of Natural Resources
P. O. Box 10448
Green Bay, WI 54307-0448

Dear Ms. Weissbach:

Case Status Update, WPS School Street, Two Rivers, WDNR BRRTS #: 02-36-000255 and 402 N. 10th Street, Manitowoc, WDNR BRRTS #: 02-36-000219

At a meeting held on March 8 with representatives of the Department, Bruce Urben, Jenny Pelczar, and Cathy Rodda, WPS agreed to provide a proposed plan for conducting additional groundwater monitoring and sediment investigations at our gas plant sites. We also agreed to propose a prioritization of sites for the next cleanup. The date for this submittal was originally April 15. However, because we were unable to meet with city of Marinette officials until April 12, it will be submitted by April 29.

The proposed plan will include groundwater monitoring at the Two Rivers site. A specific cleanup schedule for the Two Rivers site is uncertain at this point. (At our meeting, we were asked to evaluate Marinette as the next cleanup priority.) Although city of Two Rivers officials contacted us a few years ago about redevelopment of the area, it is my understanding that the city elected not to proceed due to constraints imposed by floodplain issues and the condition of the large adjoining parcel. At the time, this information was used to establish Oshkosh as the next cleanup priority.

The plan will also include a proposal for a follow-up investigation of river sediments at the Manitowoc site since all prior studies were done when Wisconsin Fuel and Light owned the site. WPS will continue to operate the groundwater treatment system at Manitowoc and will conduct groundwater monitoring in accordance with the existing plan.

Our proposal for work to be done in 2002 and 2003 will be submitted to Bruce Urben by April 29. In the meantime, you may be interested in observing the cleanup now underway in Oshkosh. Kathy Sylvester and two other Department representatives are planning to visit the site in early May. An engineer from our consulting firm, Natural Resource Technology, will accompany them on their visit to explain the cleanup activities.

If you have additional questions, please call me at (920) 433-1140.

Sincerely,

Connie Lawniczak

Connie K. Lawniczak
Manager Environmental Programs

cc: Jenny Pelczar - WDNR
Bruce Urben - WDNR

Reference 31

Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
700 North Adams Street
P.O. Box 19002
Green Bay, WI 54307-9002

April 29, 2002

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Mr. Bruce Urben
Wisconsin Department of Natural Resources-Northeast Region
P. O. Box 10448
Green Bay, WI 54307-0448

WI DNR RECEIVED APR 30 2002 NER WASTE/RR

Dear Mr. Urben:

Remedial Program Planning Update, Former Manufactured Gas Plant Sites
WDNR BRRTS # as Listed Below By Site

In follow up to our meeting of March 8, 2002 and our response letter of April 2, 2002, Wisconsin Public Service Corporation (WPS) is pleased to provide you with an update of our site characterization and remediation activities at our various former manufactured gas plant (MGP) sites. One of the objectives of our March 8, 2002 meeting at your office was to discuss the priorities envisioned by WPS for the sites in our program planning goals. This letter summarizes our MGP program accomplishments and, based on input from the Wisconsin Department of Natural Resources (WDNR), its immediate future direction.

MGP Program Background

WPS has been actively engaged in addressing our former MGP sites for a considerable period of time. Our progress in the assessment of environmental restoration needs of these properties is summarized on the attached Table 1. As we discussed, WPS only recently became responsible for the Manitowoc and Wausau MGP sites through its acquisition of Wisconsin Fuel & Light Company in 2001.

During the mid to late-1980's, the potential concerns associated with these sites was becoming evident. In 1985, a U.S. EPA study (known as the Radian Report) identified some 1500 former MGP sites around the country and concluded that much more research was needed to ascertain the full effects of wastes deposited at these sites. WPS actively identified those sites for which the company had potential cleanup liability through its predecessor corporations dating back to the late 1800's. During that period through the late 1980's, sampling was conducted to preliminarily identify the presence or absence of MGP residuals on the properties. Based on these findings, WPS developed an MGP site management program.

Phase I and/or II site investigations were conducted on at least four sites annually from the early to mid-1990's in order to gather comparable levels of environmental data from each of the sites. Site investigations were completed through Phase II in order to evaluate ultimate probable costs and develop remedial priorities. In the mid-1990s, sediment issues also had been identified at five sites and investigations were subsequently expanded into adjacent rivers. By 1997, these studies had been concluded and Remedial Action Option Reports (RAOR) had commenced for the Green Bay, Oshkosh and Stevens Point sites.

Remediation of the sites commenced in 1998 at Stevens Point while the RAOR and remedial design continued at the Sheboygan-Campmarina and Oshkosh sites, respectively. During this time, WPS also became aware of the Menominee Michigan MGP site. We have worked with the Michigan Department of Environmental Quality (MDEQ) in completing site investigations at that location as well.

In order to accommodate Brownfield redevelopment plans of the City of Sheboygan remediation of the two Sheboygan sites commenced in 2000 and continued into 2001. Work at the Oshkosh site commenced in 2002 and is in progress. In addition, supplemental investigations have continued at other sites.

As shown on Table 1, WPS has actively performed site characterization, RAOR, remedial design and/or remediation activities on from four to seven sites simultaneously each year since 1994. Based on our discussions on March 8, 2002, there may be some confusion within WDNR on the status of data collection and/or remedial planning at each MGP site. Because of the large number of submittals made to the various WDNR offices over this period of time, WPS has summarized the reports completed and submitted to-date in Attachment A.

Future Activities

WPS planned program activities for the next 18-month period through 2003 are shown on Table 1. In summary, remediation planning activities will commence in 2002 for both the Marinette and Menominee sites, and in 2003 for the Two Rivers site. Other sites awaiting remediation will be monitored or investigated as needed to prepare for future remediation. We believe the anticipated activities into 2003 are responsive to WDNR's concerns and preferences discussed at our March 8, 2002 meeting. These activities are summarized in greater detail by site below:

Green Bay, Wisconsin (BRRTS # 02-05-000254)

A round of groundwater monitoring will be performed in the Summer of 2002, as indicated in our February 14, 2002 letter to Kristin DuFresne of WDNR. An updated summary of groundwater conditions will be provided to the WDNR in 2002 with plans for subsequent annual monitoring.

Manitowoc, Wisconsin (BRRTS #: 02-36-000219)

The existing groundwater remediation system will be maintained and monitored. Supplemental assessment of sediments will be conducted in fall 2002 to evaluate current conditions. A work plan will be submitted to the WDNR in advance of the additional sediment assessment work.

Marinette, Wisconsin (BRRTS #: 02-38-000047)

WPS has agreed to work cooperatively with the City of Marinette on their Menominee River access project at Boom Landing Park. Toward this goal, WPS will conduct supplemental

Reference 32

JUNE 2000 SURVEY OF SEDIMENT CONTAMINATION ON THE MANITOWOC RIVER, MANITOWOC, WISCONSIN

This report can be reviewed in its entirety
at the WDNR Green Bay office located at
2984 Shawano Avenue in Green Bay

Prepared by:

Scott Cieniawski
Kathy Bryant
Demaree Collier

U.S. Environmental Protection Agency
Great Lakes National Program Office
77 W. Jackson Blvd. (G-17J)
Chicago, IL 60604
phone: 312-353-9184

September 2002

Reference 33

Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
700 North Adams Street
P.O. Box 19002
Green Bay, WI 54307-9002

WI DNR
RECEIVED
JAN 31 2003
NER WASTE/RP

January 29, 2003

Ms. Annette Weissbach
Wisconsin Department of Natural Resources
P.O. Box 10448
Green Bay, WI 54307-0448

Dear Ms. Weissbach:

SUBJECT: Request for Case Status Update:
Manitowoc Gas Plant Site - WDNR BRRTS#: 02-36-000219

An update on activities at the Manitowoc site will be submitted by the end of February. This update will include the results of the annual groundwater sampling, the remediation system operation and monitoring report, and plans for a current conditions sediment assessment to be performed this year, 2003.

Please call me at (920) 433-1140 if you have any questions.

Sincerely,

Connie Lawnizak

Connie K. Lawnizcak
Manager Environmental Programs
Telephone: (920) 433-1140

vav

March 12, 2003

Reference 34

Report On The Investigation Of The Public Water Supply System Serving The City Of Manitowoc, Wisconsin

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

General Facility Description

The water supply system is owned by the City of Manitowoc and operated by Manitowoc Public Utilities (MPU). The water supply system is composed of 1 raw water intake, a shore well, 3 low lift pumps delivering raw water to the microfiltration plant, 2 clearwells, 3 highlift pumps delivering water to the distribution system, 2 radial collectors, 2 booster stations, about 170 miles of water main, 2 elevated storage tanks, one ground storage reservoir, and 3 pressure zones. Chemical addition consists of polyphosphate, chlorine, and fluoride. Auxiliary power is provided for the microfiltration plant through alternate electrical feeds equipped with automatic transfer switches. The New York Booster Station includes 1 pump with a diesel-fueled engine drive. The Southwest Booster Station includes 1 pump with a natural gas-fueled engine drive.

Description of Unit Processes

Raw Water Intakes: One main intake supplies water from Lake Michigan to the shore well. This intake was installed in 1970. It is 48 inches in diameter, approximately 9250 feet long, located in 35 feet of water. There are also 2 additional intakes supplying water to the power plant that can be utilized if needed.

Underwater inspection of the intake has revealed minimal concern over zebra mussel encrustation. The intake has not been inspected for several years however. The intake should be scheduled for inspection in 2003 and annually thereafter.

Shore Well: The shore well and pumping station is located on the shore of Lake Michigan directly east of the microfiltration plant and MPU. This structure houses the shore well, bar screen, and low lift pumps.

Each February, the shore well is isolated and deoxidized for 7 days using a sodium bisulfate solution in order to control the accumulation of zebra mussels.

The shore well itself is circular and is 32 feet in diameter and 50 feet deep. A traveling screen separates the raw water intake and the shore well. The shore well is divided in half by a wall with a 48' sluice gate. The total capacity of the shore well is approximately 300,000 gallons.

A portion of Manitowoc's source water area draining into Lake Michigan
Photograph courtesy of E. Spencer

Source Water Assessment For Manitowoc Public Utilities

Manitowoc, Wisconsin

May 7, 2003

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

A report provided by the
Wisconsin Department of Natural Resources
Bureau of Drinking Water and Groundwater

WISCONSIN
DEPT. OF NATURAL RESOURCES

Reference 36

Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
700 North Adams Street
P.O. Box 19002
Green Bay, WI 54307-9002

WI DNR RECEIVED JUL 25 2003 NER WASTE/RR

July 23, 2003

Mr. Bruce Urben
Wisconsin Department of Natural Resources-Northeast Region
P.O. Box 10448
Green Bay, WI 54307-0448

Dear Mr. Urben:

only includes manitowoc update
DW

MGP Site Status Summaries

Attached is an updated timeline overview and individual site summaries for Wisconsin Public Service Corporation's former manufactured gas plant (MGP) site management program. We are providing this update as part of our continued effort to communicate to the Wisconsin Department of Natural Resources the status and priorities envisioned by WPS for our MGP site program as planning and remediation work evolves. Individual project contacts within WDNR are copied on this transmittal to keep them informed of current progress with respect to sites they manage.

Our progress in the assessment of environmental restoration needs and remediation of these properties is summarized on the attached Table 1. Status summaries for our ten sites in Wisconsin are included by site in Attachment A.

As you know, WPS needs to be somewhat flexible in implementing our MGP site management program. We continually review planned activities and will adjust our priorities in response to new information on site conditions and/or required resources. Of course, any major change to this program will be communicated to WDNR, as appropriate. If you have any additional questions, please call me at (920) 433-1140.

Sincerely,

Connie Lawniczak

Connie K. Lawniczak
Manager Environmental Programs

Enc: Table 1 - Manufactured Gas Plant Site Management Summary Timeline
Attachment A – Status Summaries by Site

cc: Ms. Kristin DuFresne, Northeast Region/Green Bay
Ms. Annette Weissbach, Northeast Region/Green Bay
Ms. Cathy Rodda, Northeast Region/Peshtigo Service Center
Ms. Kathy Sylvester, Northeast Region/Oshkosh Service Center
Mr. John Feeney, Southeast Region/Milwaukee
Mr. Tom Hvisdak, Northern Region/Wisconsin Rapids Service Center
Ms. Lisa Gutknecht, West Central Region/Wausau Office
Ms. Jennifer Pelczar, Northeast Region/Oshkosh Service Center
Mr. David Hildreth, Northeast Region/Green Bay

MANITOWOC MGP SITE PROGRESS SUMMARY

BRRTS#: 02-36-000219

JULY 2003

UPLAND

Status Summary

The Manitowoc Site has undergone a soil excavation and solidification remediation in 1994. Additionally, an active groundwater treatment system has been in place since 1997. These were done while the site was still property of WF&L. In 2001, WPS purchased the property and has performed an evaluation of the groundwater treatment system. Annual groundwater monitoring and operation of the system continues at the site.

Reporting

Results of annual groundwater monitoring will be reported in 2003. Reporting format is being converted over to using WDNR form 4400-194.

Monitoring

Seventeen monitoring wells are at the facility. The wells are being monitored for VOCs, PAHs and cyanide on an annual basis.

Future Direction

The future direction for this site is the continued operation and monitoring of the groundwater remediation system. DNAPL coal tar removal from one monitoring well was initiated in 2003. In addition, groundwater monitoring will continue annually. The forthcoming 2003 annual report will include recommendations for changes to the monitoring network.

Work Completed

1988 – Site Investigation
1994 – Soil Shallow Excavation and Solidification
1995 – Phase II Site Investigation
1996 – Phase II Site Investigation
1997 – Groundwater Treatment System Installed
2001 – WPS purchase property from WF&L and re-evaluate treatment system

MANITOWOC MGP SITE PROGRESS SUMMARY

BRRTS#: 02-36-000219

JULY 2003

SEDIMENTS

Determination of Areal Extent of MGP Residuals

The aerial extent of MGP Residuals in the Manitowoc River has been determined in 1992 (by consultants for Wisconsin Fuel & Light) and by U.S. EPA's Great Lakes National Program Office (GLNPO) in 2000. WPS performed a follow-up survey of the extent of MGP residuals in May 2003. This survey consisted of poling and collecting grab samples.

Sediment Coring Survey

GLNPO collected eight core samples in the Manitowoc River in 2000. Most samples were collected in the vicinity of the former MGP site. Sample concentrations ranged from less than detection (in buried sediments upstream of the site) to 277 ppm (in buried sediments adjacent to the site) total PAHs.

Sediment Investigation Reports

GLNPO produced "June 2000 Survey of Sediment Contamination on the Manitowoc River, Manitowoc, Wisconsin". WPS will provide results of the poling and grab sample survey in summer 2003.

Remedial Design

A pilot solidification of contaminated sediments was conducted in 1993. No additional remedial design activities are planned at this time.

Remediation/Natural Recovery

Remediation activities are not planned at Manitowoc at this time, as WPS is addressing other sediment sites.

Future Direction

WPS has conducted a survey of the extent of MGP residuals in the river and will report results to WDNR.

Work Completed

1992 – Environmental Site Investigation
1993 – Pilot Test Report *In Situ* Stabilization/Solidification Coal Tar Impacted Soil/Sediment

Weissbach, Annette E

From: Chronert, Roxanne N.
Sent: Monday, August 18, 2003 11:30 AM
To: Weissbach, Annette E
Subject: FW: Manitowoc River

MVC-012S.JPG MVC-013S.JPG MVC-014S.JPG MVC-009S.JPG MVC-010S.JPG MVC-011S.JPG

-----Original Message-----
From: Volenberg, Ryan M
Sent: Sunday, August 17, 2003 4:41 PM
To: Chronert, Roxanne N.
Subject: Manitowoc River

Roxanne-

I got a call about this from the Manitowoc PD this weekend. This is a really weird spill.....I think it is more of an ongoing release. There is what appears to be a petroleum sheen on the water surface (Manitowoc River) that burns off with the sun. However, when I go over the area with my boat motors, the stuff boils up to the top and creates another sheen. I took waters samples and will be mailing them out the the lab tomorrow. If you get the chance, give me a call tomorrow. Thanks. I will fill out the spill form this week.

Ryan

Your files are attached and ready to send with this message.

Intensive Training Course

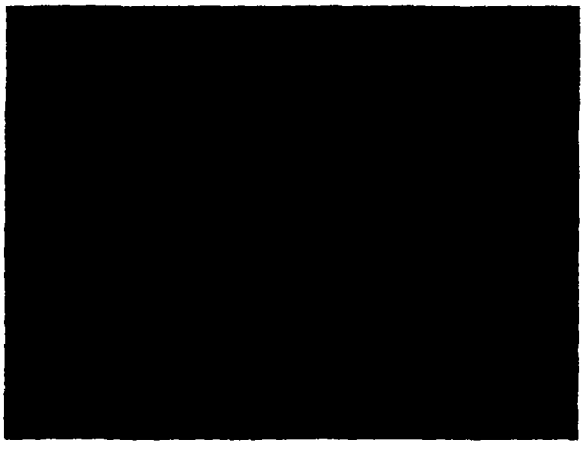
Manitowoc River
near [illegible] coal [illegible] site

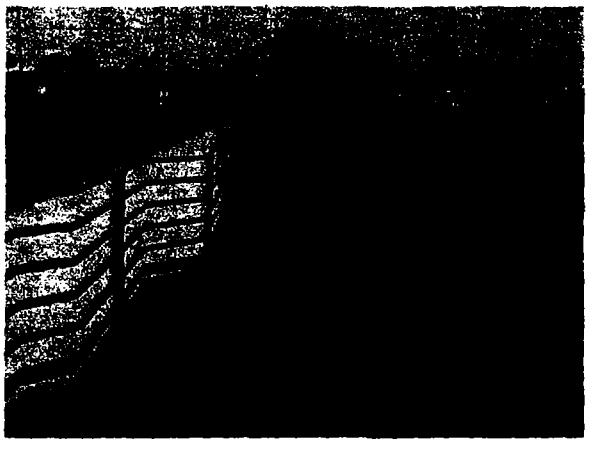
Ryan Vollenberg took samples [illegible]
Stran, two [illegible], two [illegible]

- I called state lab and asked if they could differentiate between coal tar and/or recent diesel fuel oil. They said yes. I left [illegible] w/ Ryan to send samples to [illegible] and ask to analyze for coal tar and fuel oil.

DW.
8-18.

AESF





08-16-2003 Manitowoc River – Turning Basin near WPS Coal Tar Site
Photos by Ryan Volenberg

file

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary
Ronald W. Kazmierczak, Regional Director

Northeast Region Headquarters
1125 N. Military Ave., P.O. Box 10448
Green Bay, Wisconsin 54307-0448
Telephone 920-492-5916
FAX 920-492-5859
TTY 920-492-5912

October 2, 2003

Reference 38

Connie Lawniczak
Manager – Environmental Programs
Wisconsin Public Service Corporation
PO Box 19002
Green Bay WI 54307-9002

SUBJECT: Release of Coal Tar to the Manitowoc River
Surface Water Sampling Results
WPS Site (former WI Fuel & Light), 402 10th Street, Manitowoc
BRRTS # 02-36-000219

Dear Ms. Lawniczak:

Enclosed are photos and analytical results of surface water samples collected near the coal tar deposit in the Manitowoc River in August 2003. The State Lab of Hygiene (SLOH) has indicated that the fingerprint of the hydrocarbon analysis most closely represents "possible creosote oil components." Based on the analysis and these comments it appears this sample indicates that coal tar is being released to the environment.

We believe you are responsible for investigating and restoring the environment at the above-described site under Section 292.11, Wisconsin Statutes, known as the hazardous substances spills law. The Department hereby requires WPS to investigate the degree and extent of the problem and at a minimum, conduct an Interim Action according the requirements of NR 708.11 Wis. Adm. Code.

By October 17, 2003, please provide me with a letter and workplan describing what interim action WPS intends to take to remedy the coal tar release into surface water at the WPS site in Manitowoc.

Background

There have been occasional sitings of oil sheens and slicks on the surface of the Manitowoc River, behind the old WPS building, by the 8th Street bridge, submarine, and harbor area since the Fall of 2002 (Warden-substance release notifications). We had assumed that the releases were related to motorboat/tugboat traffic, but at times, the oil sheens/slicks were observed without the presence of the any boating/tugging activities. It wasn't until recently that a complaint from anglers on the river led us to the actual WPS coal tar deposit area where the local Conservation Warden collected surface water samples and had them analyzed. It is likely that the oil sheen described in the previous reports and complaints had originated from the coal tar deposit. There is little human activity along the shore between the coal tar deposit and the immediate downtown area, thus the connection wasn't as obvious as perhaps it should have been.

Warden Jon Scharbarth was notified by the Manitowoc City Police Department on the night of August 15, 2003, when someone reported large oil sheens on the surface of the water at the retaining wall near the former Wisconsin Fuel and Light building on 10th Street. Warden Scharbarth visited the site around midnight that night but it was too dark to see anything, however, he did report smelling a coal-tar type odor.

On August 16, 2003, Warden Ryan Volenberg, along with two members of the US Coast Guard in their boat, drove to the site to follow up on the complaint. Volenberg collected a surface water sample at the oil sheen observance area above the deposit, as well as two additional samples, upstream and downstream of the oil sheen observance area (photos enclosed). Warden Volenberg reported that while collecting the samples and "going over the area with my boat motor, the stuff boils up to the top and creates another sheen. He submitted the samples to the SLOH where a comparative analysis was performed to identify the source of the oil sheen, more specifically to ascertain if the oil sheen was fuel oil or coal tar related. As they didn't have a specific chromatograph of coal tar, Matt Roach of the SLOH stated that the chromatograph most closely resembles creosote (see attached analyses). No detects of petroleum compounds were measured in the upstream and downstream samples.

I understand that your consultant, Natural Resource Technology, was planning to conduct poling and grab sample survey in summer of 2003. We are awaiting results of that survey as well as the annual groundwater monitoring reports of 2002 and 2003. You may submit those reports along with the letter and workplan on October 17, 2003.

We very much appreciate that WPS has developed an overall former manufactured gas plant (MGP) site management program. We understand that you are able to be flexible in implementing this program and continually review and adjust priorities in response to new information on site conditions. In light of this apparently on-going release of coal tar occurring in the Manitowoc River, we believe you now need to consider reprioritizing your overall work effort and address the Manitowoc site in the immediate future.

If you have questions in regard to this letter please call me at 920-492-5865 or email me at Annette.Weissbach@dnr.state.wi.us. I look forward to your timely response.

Sincerely,

Annette Weissbach

Annette Weissbach
Hydrogeologist
Remediation & Redevelopment Program

Attach: Analytical results and Photos

e-cc: Ryan Volenberg, Mike Hanaway – DNR Mishicot field office
Jenny Pelczar – DNR Oshkosh Service Center

Natural Resource Technology, Inc.

N R T

WI DNR RECEIVED OCT 15 2003 NER WASTE/RR

Reference 39

October 14, 2003
(1530)

Ms. Connie Lawniczak
Wisconsin Public Service Corp.
700 N. Adams Street
Green Bay, WI 54307-9002

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

RE: Phase 1 Sediment Sampling Results for the Former Wisconsin Fuel & Light Manufactured Gas Plant, Manitowoc, Wisconsin
BRRTS ID: 02-36-000219

During the week of May 18, 2003 Natural Resource Technology, Inc. (NRT) conducted the first phase (Phase 1) of sediment investigative field work at the former Wisconsin Fuel & Light (WF&L) manufactured gas plant (MGP) site. The investigation focused on defining the horizontal extent of impacted surficial sediments in the Manitowoc River, sediment thickness and surface sediment types.

The former MGP site is located at 402 North Tenth Street in Section 19, Township 19 North, Range 24 East, City of Manitowoc, Manitowoc County, Wisconsin (Figure 1).

PREVIOUS SEDIMENT INVESTIGATIONS

WW Engineering and Sciences (WWE) performed sediment sampling in 1991 using an offshore drill rig (for stations SB-21 through SB-35, SB-41, and SB-42) and Wildco® Sediment Corer (for stations SD-01 through SD-06). Results are reported in "Environmental Site Investigation Former Coal Gas Manufacturing Plant – Manitowoc, Wisconsin, Project No. 22159," WW Engineering & Sciences, January 1992. Sampling locations are shown on Figure 2. Core samples collected from the drill rig ranged from 4-14 feet while the Wildco® Sediment Corer penetrated 30 inches or less. All sediment samples were collected from within approximately 200 feet of shore. In addition, results were reported for a "heavily coal tar impacted sediment" sample with 14,000 mg/kg total PAHs in "Pilot Test Report, In-Situ Stabilization/Solidification Coal Tar Impacted Soil/Sediments, Wisconsin Fuel & Light Company, Manitowoc, Wisconsin, Project No. 22446," WW Engineering & Sciences, February 1993. No details on sample locations or collection methods were presented.

The following observations were noted during review of WWE reports:

- Total polynuclear aromatic hydrocarbons (PAHs) ranged from below the detection limit to 11,000 mg/kg (mg/kg) in core samples. The highest total PAHs were measured in SB-28 (Figure 2);

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- The stations with sediment PAHs above 450 mg/kg were generally near shore, adjacent to the site (except for SB-27 and SB-31 which were approximately 100 feet off shore; Figure 2);
- The U.S. Army Corps of Engineers (USACE) has performed periodic maintenance dredging of the river in the vicinity of the site; and,
- MGP residuals were generally reported in the upper 6 feet of sediments.

During June 2000, the U.S. Environmental Protection Agency's Great Lakes Nation Program Office (GLNPO) and the USACE collected vibracores and Ponar® grab samples for a screening level sediment survey on the Manitowoc River (Appendix A). Several of the sampling stations were in the vicinity of the former WF&L site. The vibracores were extended to approximately 50 inches below river bottom, while the Ponar® grab sampled the top 6 to 8 inches of sediment. GLNPO screened for PAHs, oil and grease, pesticides, PCBs, volatile organic compounds (VOCs), total organic carbon (TOC), total cyanide, ammonia and metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc). Laboratory toxicity tests (using *Hyalella azteca* and *Chironomus tentans)* were also conducted on grab samples. Based upon the sediment survey, GLNPO drew the following conclusions:

- PAH concentrations in the sediments in the vicinity of the former WF&L facility are elevated and potentially present an ecological and/or human health risk;
- PAHs and Oil & Grease are the primary contaminants of concern identified at the site;
- Metals and PCBs are not present in the sediments at levels that present a major ecological and/or human heath risk; and,
- Historical data along with the results of the 2000 assessment indicate a potential on-going source of contamination to the sediments of the turning basin, potentially from contaminated soil/groundwater coming from the former WF&L site.

It should be noted that from 1992 to 1994 shallow excavation and in-situ stablization was performed on upland soils at the site. In addition, upland groundwater has undergone remediation since 1997 that includes groundwater recovery and treatment.

PROJECT OBJECTIVES

Based on the available historic information pertaining to the site, the investigation was developed to evaluate MGP related impacts on the sediments of the Manitowoc River. The Phase 1 sediment investigation objectives include the following:

- Evaluate the lateral extent and thickness of surficial soft sediments in the river;
- Compare the 2003 results with WWE samples (1991) and GLNPO samples (2000) and,

- Obtain an accurate survey of the site to rectify sample locations with previous sediment studies.

2003 SITE INVESTIGATION

Poling Locations

Soft sediments were penetrated with a pole along transects to determine the current status of areas where MGP residuals were detected during the 1991 and 2000 surveys and to fill in data gaps and to aid with determining the current extent of sediment with MGP residuals (Figure 3). Poling was conducted along 8 transects, 6 perpendicular to shore (transects 1 through 6) and 2 horizontal (transects 7 and 8) to the shore (Figure 3). Transects were located within the WWE sediment sample locations completed in 1991 and the GLNPO sample locations completed in 2000. Poling locations for transects 1 through 6 were initiated close to shore (approximately 0-10 feet from the existing shoreline) and proceeded out at approximately 100 foot intervals across the turning basin. Poling locations for transects 7 and 8 were based upon field observations of MGP related impacts.

Transect 1 was located approximately 2,000 feet upstream of the site in order to determine background conditions. Transects 5 and 6, which were located downstream of the site and outside the area previously identified as being MGP impacted by WWE during 1991. Transect 7 included the furthest down stream locations, T7-1 and T7-2. These two locations were used to evaluate whether MGP related impacts had migrated and re-deposited near the rail road bridge. The other station locations along transect 7, as well as those along Transect 8, were used to further constrain the MGP related impacts in the surficial sediments near shore.

Transects 1, 5, and 6 did not exhibit any MGP related sheen at any of the poling locations. No MGP related sheen was noted at either station T7-1 or T7-2. Transects 3 and 7 (near the site) did exhibit MGP related sheen at one or more of their respective locations. Free phased tar was found along the former WF&L property boundary, approximately 100 feet out into the river channel, and 350 feet down stream. The tar consisted of emulsified globules that were fluid in consistency, and visually appeared as small "specks" in the sediment matrix. The specific locations with sediments that exhibited MGP residuals are summarized below and shown on Table 1.

Location ID	MGP Residual	Location ID	MGP Residual
T3-1	Tar, Odor, Sheen	T7-6	Tar, Odor, Sheen
T3-2	Tar, Odor	T7-7	Tar, Odor, Sheen
T7-3	Tar, Odor, Sheen	T7-8	Tar, Odor, Sheen
T7-4	Tar, Odor, Sheen	T7-9	Tar, Odor, Sheen
T7-5	Tar, Odor, Sheen		

Natural Resource Technology, Inc.
N R T

WI DNR RECEIVED OCT 15 2003 NER WASTE/RR

Reference 40

October 14, 2003
(1530)

Ms. Annette Weissbach
Wisconsin Department of Natural Resources-Northeast Region
P.O. Box 10448
Green Bay, WI 54307-0448

Re: Operation, Maintenance and Monitoring Status Report
Reporting Period – July 1, 2001 to August 31, 2003
Former Wisconsin Fuel & Light Manufactured Gas Plant
402 North Tenth Street, Manitowoc, Wisconsin
BRRTS # 02-36-000219

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Dear Ms. Weissbach:

On behalf of Wisconsin Public Service Corporation, Natural Resource Technology, Inc. (NRT) has prepared this Operation, Maintenance and Monitoring (OM&M) Status Report for the Former Wisconsin Fuel & Light (WF&L) Manufactured Gas Plant site in Manitowoc (Figure 1). This report includes a summary of prior work, a status update for the active groundwater control system, and a groundwater conditions update. Also included is a completed Form 4400-194 (Appendix A). Subsequent reports will follow this format in accordance with NR 724, and will be submitted annually.

BACKGROUND

Historic site information (Appendix B) is briefly stated below in the chronology of previous environmental investigation and response activities related to the site:

Timeframe	Description of Activity
1988 – 1992	Subsurface and sediment investigations performed and documented.
1992 – 1994	Feasibility study, pilot testing, interim remediation of soil and groundwater by shallow excavation, combined with an in-situ stabilization process.
1995 – 1997	Supplemental investigations, groundwater control study and installation of extraction well and treatment system.
1997 – 2001	Operation of groundwater control system.
2001 – Current	WPS purchase of property from WF&L. System evaluation, modifications and continued operation and monitoring.

Activities performed since WPS acquired the property in 2001 are summarized below.

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SITE STATUS 2001 THROUGH 2003

The following field activities were performed during this reporting period:

- System operation, maintenance and modifications as needed; and,
- Groundwater elevation measurements and sampling according to the sampling schedule provided in Table 8.

These activities are discussed below and in the attached *Operation, Maintenance, Monitoring and Optimization Reporting of Soil and Groundwater Remediation Systems* form (4400-194).

System Operation

The existing groundwater control system consists of one extraction well (PW-1), filtration/carbon treatment, flow measurement, and discharge to the Manitowoc WWTP (Figure 2). Operation occurred as stated in the attached Form 4400-194 with the following overview:

- The extraction system operated throughout the period, with exception of minor downtime for maintenance and modifications (refer to Table 5).
- Optimization testing was initiated in January 2002 to review system performance relative to a noted decrease in production rate from the pumping well (refer to Table 5).
- Modifications were made including a well pump replacement and related system modifications to reduce iron build-up/scaling problems in January/February 2002. The existing ½ horsepower (hp) pump was replaced with a 1 hp motor pump.
- Re-establishment of required sampling frequency and parameters for discharge reporting with the WWTP, including influent/effluent sampling and submittals to the Manitowoc WWTP on May 31 and December 13, 2002 and July 23, 2003.
- Intermediate sampling between carbon canisters to evaluate breakthrough potential. The carbon units were changed-out in January 2003.
- Periodic removal of DNAPL product from MW-14 was initiated in May 2003. This well is currently not being sampled due to the presence of product.

System Performance and Groundwater Conditions

Capture Zone Verification

Historic (pre-remedial) groundwater flow across the site is generally east to west following the flow direction of the Manitowoc River and to the north-northwest adjacent to the river. Current groundwater flow is greatly influenced by the drawdown effects of the pumping well (PW-1).

Groundwater elevations at most monitoring wells were measured on several occasions from 2001 through August 2003 (Table 1). Groundwater contour maps for the June 5, 2002 and May 15, 2003 measurements are shown on Figures 2 and 3. Figure 2 demonstrates the capture zone of the pumping well, which likely has a radius of influence of greater than 100 ft. Consistent with previous analysis, the pumping well operating at 10 to 15 gpm is adequately preventing off-site migration to the west-northwest and to the river. Water table elevations indicate a groundwater divide has developed east of pumping well capture zone, allowing groundwater in the northeast portion of the site to flow toward the river.

Groundwater Quality

Monitoring wells at the facility were sampled for Petroleum Volatile Organic Compounds (PVOCs), Polynuclear aromatic hydrocarbons (PAHs), and total, amenable and weak acid dissociable cyanide on June 5, 2002 and May 15, 2003 (Tables 2 and 3, Appendix C). Figures 4 and 5 also illustrate the concentration trends from 2000 to 2003.

PVOCs and PAH concentrations have decreased or remained stable between 2001 and 2003, with the exceptions of monitoring wells MW-1 and MW-9 where PAH concentrations have increased. It is possible that the higher concentrations at MW-1 can be attributed to either an upgradient source of contamination or questionable well integrity, given the variable water levels (Table 1). The condition of MW-1 will be further evaluated by subsequent site visits. Of note, overall detection levels for the PAHs are lower beginning in 2002, when there was a change in laboratories. Hence, there is no trend noted for total PAHs at wells such as MW-6, MW-7, and MW-8 where concentrations are close to the historical detection limits. MW-5 was not previously sampled and the significance of PAH concentrations detected in 2002-2003 will be evaluated as sampling continues. Notably, the BTEX and naphthalene concentrations at MW-13 have significantly decreased (also refer to concentration vs. time graph in Appendix D).

The NR 140 cyanide standards have historically been compared to total cyanide concentrations. Table 2 presents the cyanide data and compares the standards to weak acid dissociable cyanide concentrations, in accordance with current practices. Weak acid dissociable cyanide concentrations are below the NR 140 enforcement standard at all wells. Monitoring wells MW-8 and MW-13 are the only wells to exceed the NR 140 preventive action limit (PAL). The amenable and total cyanide analysis will be eliminated in future rounds, pending WDNR's concurrence.

The groundwater treatment system continues to remove contaminants at levels required for discharge to the Manitowoc WWTP (refer to Tables 4 and 7). The site contaminant removal rates for BTEX and naphthalene are presented on Tables 6a and 6b with graphs in Appendix D. The tables and graphs indicate a tapering in the contaminant concentrations and mass removal rate since pumping began in 1997, that is typical of groundwater extraction system performance. Contaminant removal trends will continue to be assessed in future reports.

FUTURE ACTIVITIES

The future direction for site activities includes the continued operation and maintenance of the groundwater remediation system, continued groundwater monitoring on an annual basis, and continued product removal. NRT proposes the following changes to the sampling schedule:

- Abandon monitoring well MW-11 due to its low contaminant levels and close proximity to MW-10.
- Discontinue sampling at wells MW-6 and MW-7 with the wells to remain for water level measurement. MW-6 has indicated consistent very low to non-detectable concentrations. MW-7 has also indicated low concentrations and is also located in close proximity to other wells.
- Discontinue analysis for total and amenable cyanide at the monitoring wells.

Please contact us if you have any questions or comments regarding the status of groundwater monitoring and reporting for this site.

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

Julie A. Zimdars

Julie A. Zimdars, P.E.
Project Manager

Laurie L. Parsons /sjc

Laurie L. Parsons, P.E.
Principal Engineer

Natural Resource Technology, Inc.

N R T

Reference 41

December 10, 2003
(1530)

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

WI DNR
RECEIVED
DEC 15 2003
NER WASTE/RR

Ms. Annette Weissbach
Wisconsin Department of Natural Resources
1125 N. Military Avenue
P.O. Box 19448
Green Bay, WI 54307-0448

Re: Responses to Questions and Comments on the 2001-2003 O&M Report
Former Wisconsin Fuel & Light Manufactured Gas Plant, Manitowoc, Wisconsin
BRRTS ID 02-36-000219

Dear Ms. Weissbach:

The purpose of this letter is to respond, on behalf of Wisconsin Public Service Corporation (WPSC), to the comments/questions contained in your October 28th email message to Julie Zimdars regarding the Manitowoc 2001-2003 O&M Report (see attached comments and responses).

An additional purpose of this email is to inform you that I am the new technical point of contact for the former Wisconsin Fuel & Light manufactured gas plant (MGP) site. I recently joined Natural Resource Technology (NRT) with 22 years of comprehensive environmental and geotechnical experience, including sediments. My email address and contact phone numbers are listed below. If I am unavailable for any reason, an alternate NRT point of contact on technical matters is Laurie Parsons. Of course, Julie Zimdars is still available if necessary to assist us with project historical matters.

All formal correspondence regarding Manitowoc or other questions should continue to be directed to Connie Lawniczak of WPSC, with copies sent to me at NRT. This clarification is provided as agreed to in the annual MGP program meeting with WDNR representatives on October 30, 2003.

23713 W. Paul Road, Unit D • Pewaukee, WI 53072 • (262) 523-9000 • Fax (262) 523-9001
www.naturalrt.com

Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
700 North Adams Street
PO Box 19002
Green Bay, WI 54307

Reference 42

August 3, 2004

Ms. Annette Weissbach
Wisconsin Department of Natural Resources
1125 N. Military Avenue
P.O. Box 19448
Green Bay, WI 54307-0448

Re: Observations for the Presence of Oil Sheens on the Manitowoc River
Former Wisconsin Fuel & Light Manufactured Gas Plant, Manitowoc, WI
BRRTS ID 02-36-000219

Dear Ms. Weissbach:

On January 13, 2004, Ms. Connie Lawniczak sent you a letter regarding Wisconsin Public Service Corporation (WPSC) observations for the presence of oil sheens on the Manitowoc River. In response to concerns expressed in your October 2, 2003 letter that the oil sheens may be related to the former Wisconsin Fuel & Light manufactured gas plant (MGP) site, now owned by WPSC. As agreed, WPSC has continued to monitor the situation to better assess the occurrence, possible sources, and potential relationships to MGP residuals. Enclosed is an updated summary table of additional WPSC observations made monthly during the winter and weekly since April at five locations (Figure 1) on the river, as noted below and shown on the enclosed Figure 1:

1. by the site;
2. upstream by the 21st Street bridge;
3. downstream by the railroad bridge;
4. downstream by the 8th Street Bridge; and
5. downstream by the submarine and harbor.

Beginning last fall, we have made 24 site visits for these oil sheen observations. As indicated on the enclosed summary table, oil sheen has often been observed on the river immediately adjacent to the site. Exceptions with no river oil sheen at the site were during the winter months during ice cover and a few occasions last fall and this spring. Because of the limited observation time during site visits, we cannot make a correlation of oil sheens to boating activity (i.e., from boat engine emissions or from prop disturbance of industrially-impacted sediments). Therefore, the possibility remains, although not conclusive, that these river oil sheen observations adjacent to the site are related to coal tar residuals in the sediments, the presence of which were documented in the Phase I Sediment Sampling Report dated October 14, 2003. No river oil sheen has been observed at the downstream 8th Street Bridge, whereas oil sheen was observed once at the upstream 21st Street Bridge and twice at the

downstream submarine and harbor location. It is our consultant's opinion, Natural Resource Technology (NRT), that these few occurrences of oil sheen are not related to the former MGP site. River observations at the railroad bridge located approximately 750 feet downstream from the former MGP site indicated no oil sheen until late May, since then a sheen has been observed six out of ten site visits. The oil sheen observed at the railroad bridge has generally been around wooden piling supporting the bridge structure. It is NRT's opinion that the occasional oil sheen at the railroad bridge is likely related to oil or tar treatments on/in the bridge's timber piling, and not to the former MGP site located several hundred feet upstream.

WPSC has concluded that there is no benefit in continuing the oil sheen observations and will discontinue them. We are willing to discuss with the Department the potential need to install an oil boom in the river around the area identified as potentially impacted by MGP residuals on Figure 3 in the October 2003 Phase I Sediment Sampling Report. The oil boom, if installed, may require periodic maintenance of the boom, associated anchors, buoys, and lights, as well as potentially soaking up accumulated oil sheen inside the boom area with absorbents. The oil boom would have to be removed in the fall and re-installed in the spring to avoid ice damage. The oil boom would likely remain until it is no longer needed, or until the sediments undergo additional remedial investigation and, if warranted, appropriate pertinent remedial action.

Please call me to discuss the content of this letter at your earliest convenience. A conference call with NRT or a meeting at the site may be appropriate.

Sincerely,

Wisconsin Public Service Corporation

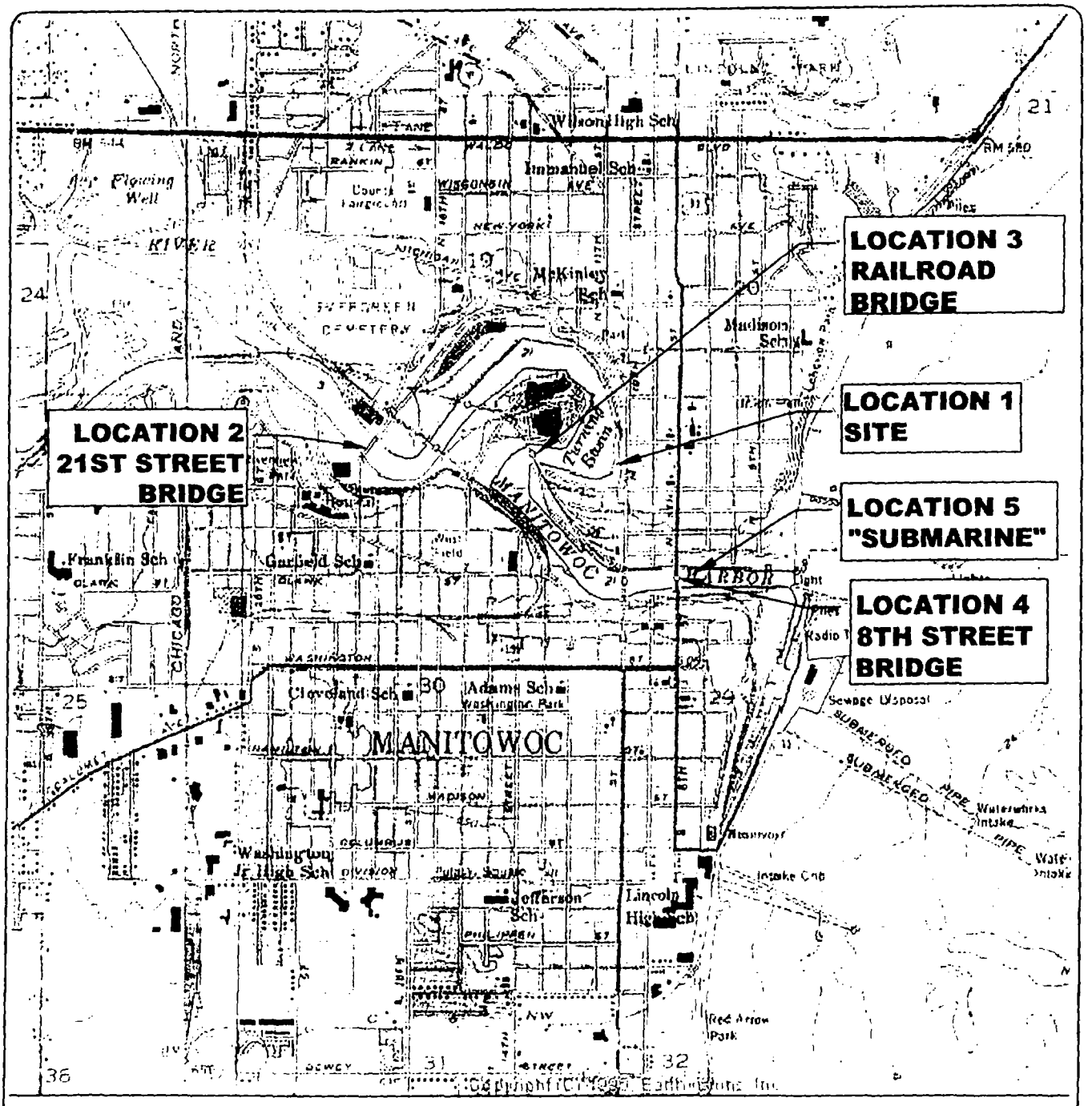
Shirley A. Scharff

Shirley A. Scharff
Manager - Environmental Programs
Enc Figure 1 – Surface Water Observation Locations
Summary Table of River Oil Sheen Observations

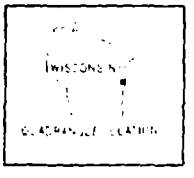
cc (w/encl.): Mr. Bruce Urben, WDNR NER
Mr. John Robinson, WDNR NER
Mr. Rich Weber, NRT

RIVER OIL SHEEN OBSERVATIONS
FORMER MGP SITE, MANITOWOC, WI

Date	Location of River Water Observations (Figure 1)				
	1	2	3	4	5
	Site	Upstream 21st St. Bridge	Downstream Railroad Bridge	Downstream 8th St. Bridge	Downstream Submarine
19-Nov-03	**YES**	No	---	No	No
25-Nov-03	No	No	No	No	No
2-Dec-03	No	No	No	No	No
15-Dec-03	**YES**	No	No	No	No
13-Jan-04	No	No	No	No	No
25-Feb-04	No	No	No	No	No
31-Mar-04	No	No	No	No	No
8-Apr-04	No	No	No	No	No
15-Apr-04	**YES**	No	No	No	No
20-Apr-04	No	No	No	No	**YES**
28-Apr-04	**YES**	No	No	No	No
6-May-04	**YES**	No	No	No	No
13-May-04	**YES**	No	No	No	No
21-May-04	No	No	No	No	No
28-May-04	No	**YES**	**YES**	No	No
4-Jun-04	**YES**	No	**YES**	No	No
11-Jun-04	**YES**	No	No	No	No
17-Jun-04	**YES**	No	**YES**	No	No
24-Jun-04	**YES**	No	No	No	No
30-Jun-04	**YES**	No	No	No	**YES**
9-Jul-04	**YES**	No	**YES**	No	No
16-Jul-04	**YES**	No	**YES**	No	No
23-Jul-04	**YES**	No	No	No	No
27-Jul-04	**YES**	No	**YES**	No	No



SOURCE: EARTHVISIONS U.S. TERRAIN SERIES,
© EARTHVISIONS, INC. 603-433-8500.
USGS 7.5 MINUTE QUADRANGLE,
MANITOWOC. DATED 1954.
PHOTOREVISED 1973.



N

0 2000 4000

SCALE IN FEET

CONTOUR INTERVAL 10 FEET

Natural Resource Technology

N R T

SURFACE WATER OBSERVATION LOCATIONS

FORMER MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
MANITOWOC, WISCONSIN

PROJECT NO. 1530/4.2

DRAWING NO. 1530-42-A02

FIGURE NO. 1

DRAWN BY: TAS 12/01/03 APP'D BY: JTB DATE: 12/19/03

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary
Ronald W. Kazmierczak, Regional Director

Northeast Region Headquarters
1125 N. Military Ave., P.O. Box 10448
Green Bay, Wisconsin 54307-0448
Telephone 920-492-5800
FAX 920-492-5913
TTY 711

Reference 43

September 3, 2004

Bill Handlos, Director of Public Works
City of Manitowoc
900 Quay Street
Manitowoc, WI 54220

Subject: Former Wisconsin Fuel & Light Manufactured Coal Gas Plant Site
Now owned by Wisconsin Public Service
BRRTS: 02-36-000219

Dear Bill:

Thank you for meeting with us on August 31, 2004, at the former coal gas site.

I did follow up on your advice and talked to Mike Dailey at Cemex shortly after we all left. He said they get approximately 30 cement deliveries per year from either the Challenger or the Conquest barges. He said a boom at 100-foot distance from the shore would definitely be a problem for the barges. It appears that Wisconsin Public Service (WPS) will be looking at some other options. We'll work with them on that and keep you informed on their progress.

Just to recap – we met with WPS and their Consultant, NRT, to discuss options for dealing with the observations of "river oil sheen" immediately adjacent to the former gas plant. Last August, the river water sheen was sampled and found to have an analytical fingerprint more similar to creosote than to any other "oil" type liquid. Creosote contains similar polyaromatic hydrocarbons as found in coal tar. Thus DNR concluded that the oil sheen was likely the result of upwhelling of the coal tar deposits from the former gas plant. An upland soil solidification remediation was completed by Wisconsin Fuel & light, however, the sediment contamination in the Manitowoc River has not been addressed to date. WPS is now the responsible party for the site.

I've included a copy of the ***2003 Phase I Sediment Sampling Results*** report submitted by NRT on behalf of WPS. I also included excerpts from the 1992 WWE report referenced in NRT's report.

I wanted the City of Manitowoc to have copies of this information so that you are aware of the extent of the coal tar problem in the Manitowoc River at the former coal gas plant. Considering the barge traffic in the turning basin, it is likely there will always be disturbance of the contaminated sediments.

Should any boaters, anglers or residents complain about the oil sheens, you will have an understanding of the environmental conditions in the river at the site. You can tell them that WPS is trying to work on a solution. WPS took over responsibility of the Wisconsin Fuel and Light property in 2001 and in addition to this site, they are working on 9 other manufactured gas plants that are in various stages of investigation and clean up.

If you have any questions or comments, please feel free to call me at (920) 492-5865 or email at Annette.weissbach@dnr.state.wi.us

Sincerely,

Annette Weissbach

Annette Weissbach
Hydrogeologist
Remediation & Redevelopment Program

Enclosure

Cc w/enclosures

Shirley Scharff – WPS, PO Box 19002, Green Bay, WI 54307-9002
Robert Thiboldeaux – Bureau of Environmental Health, DPH/DHFS, 1 W. Wilson St., Madison 53701-2659

Cc w/o enclosure

Rich Weber – NRT, 23713 W. Paul Road, Suite D, Pewaukee, WI 53072
Ryan Volenberg – Conservation Warden, 2220 E. CTH V, Mishicot, WI 54228

Natural
Resource
Technology, Inc.

RECEIVED
NOV - 4 2004
NE WI STA

Reference 44

November 2, 2004
(1530)

Ms. Annette Weissbach
Wisconsin Department of Natural Resources-Northeast Region
P.O. Box 10448
Green Bay, WI 54307-0448

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Re: Operation, Maintenance and Monitoring Status Report
Reporting Period – September 1, 2003 to August 31, 2004
Former Wisconsin Fuel & Light Manufactured Gas Plant
402 North Tenth Street, Manitowoc, Wisconsin
BRRTS # 02-36-000219

Dear Ms. Weissbach:

On behalf of Wisconsin Public Service Corporation (WPSC), Natural Resource Technology, Inc. (NRT) has prepared this annual Operation, Maintenance and Monitoring (OM&M) Status Report for the Former Wisconsin Fuel & Light (WF&L) Manufactured Gas Plant site in Manitowoc, Wisconsin (Figure 1). The report narrative includes a summary of prior work, a status update for the active groundwater control system, and a groundwater conditions update. Enclosed in Appendix A is a completed Form 4400-194: *Operation Maintenance Monitoring and Optimization Reporting*, along with various other appendices, figures, and tables to support the narrative. As requested by the Wisconsin Department of Natural Resources (WDNR) following their review of last year's OM&M Status Report dated October 14, 2003, the enclosed documents include analytical test results by others from 1996 through 2000 (Appendix C) prior to the purchase of the site by Wisconsin Public Service, and geologic cross sections (Figures 2 and 3). Subsequent annual OM&M Status Reports will follow this same general report format, in substantial accordance with NR 724, Wisconsin Administrative Code (WAC).

INVESTIGATION AND RESPONSE ACTION HISTORY

A summary of prior environmental investigations and response action is briefly stated below. A chronology summary of reports associated with this work is enclosed in Appendix B.

Timeframe	Description of Activity
1988 – 1992	Subsurface and sediment investigations performed and documented.
1992 – 1994	Feasibility study, pilot testing, interim remediation of soil and groundwater by shallow excavation, combined with an in-situ stabilization process.

23713 W. Paul Road, Unit D • Pewaukee, WI 53072 • (262) 523-9000 • Fax (262) 523-9001
www.naturalrt.com

FIGURES

TABLES

Weissbach, Annette E

Reference 45

From: Weissbach, Annette E
Sent: Monday, February 07, 2005 10:14 AM
To: 'Shirley Scharff'
Cc: Weber, Richard; Brian Bartoszek
Subject: RE: Response to Comments on O&M report for Manitowoc site

thanks for the quick response Shirley. What wording will be used on the signs? We should make sure that the state Department of Health is in agreement with your wording choice. Please send me a photo or sketch and I'll forward it on to Madison.

And secondly, your thoughts on "experimenting" with booms tied to the sheet piling is what I had anticipated you would be doing, so your approach makes sense to me.

Annette~

-----Original Message-----
From: Shirley Scharff [mailto:SSCHARF@wpsr.com]
Sent: Thursday, January 27, 2005 1:04 PM
To: Weissbach, Annette E
Cc: Weber, Richard; Brian Bartoszek
Subject: Response to Comments on O&M report for Manitowoc site

Good Afternoon Annette,

We are pleased that you have been able to review NRT's 2004 Operation, Maintenance and Monitoring report for the WPSC Manitowoc MGP site. I have asked NRT to assist me in preparing responses to your specific questions. The responses are shown below in bold after each question. We trust these responses satisfactorily answer your questions, but if not, please feel free to email or call me.

Shirley Scharff
Wisconsin Public Service Corporation
Manager Environmental Programs
Phone: (920) 433-1396
Cell: (920) 680-9409
Fax: (920) 433-4916
sscharf@wpsr.com

>>> "Weissbach, Annette E" <Annette.Weissbach@dnr.state.wi.us>
1/25/2005 4:34:39 PM >>>
Hello Shirley and Rich,

Sorry, I haven't responded sooner than this, I actually reviewed the report in December but haven't gotten around to putting things in writing. Here are a few comments on the report:

It looks as thought the operation efficiency of the system is steadily decreasing. I would recommend pulling the pump and giving it and the screen a good cleaning regardless of the bag filters change out frequency

Local WPSC personnel monitor the system on a routine schedule and it became apparent that the system efficiency was decreasing. The system shut down between maintenance inspections apparently due to increased pressure drop across the bag filter. The decreased system performance

was addressed by increasing the frequency of maintenance visits to minimize system down time. A well drilling company was contracted to shock chlorinate the pumping well on January 12. The following day the system was thoroughly flushed prior to re-attaching it to the carbon and bag filter. As a preventative maintenance measure, periodic chlorination of the well will be performed to keep the system clear of biological growth.

MW2 and MW12 do appear to show increasing PAH concentrations; especially MW12. The next report should discuss the cause and significance of these increases. If the next sampling round shows continued increases, the monitoring schedule may have to be adjusted to more frequent sampling.

In response to your concern regarding PAH concentrations in wells MW-2 and MW-12, NRT reviewed the data reported in the last OM&M report dated November 2004 (Table 3). There isn't a clear increase in concentrations in well MW-2 that would merit an increase in monitoring frequency. The values have been fluctuating within the same general magnitude. As documented in the report, we will continue to recommend annual monitoring and review of trends.

For well MW-12, there was an increase in total PAHs (50 ppm) in May 2004 compared to the most recent monitoring event in June 2002 (6.8 ppm). One such increase does not constitute a trend; additional data is needed to determine whether this is an anomaly or a trend. The well had not been monitored in June 2003 or February 2004 due to it being covered with asphalt and water/ice during those monitoring events. Again, we will continue to perform annual monitoring and review of trends.

I am in general agreement with your recommendations for future activities, however, a greater effort needs to be made to find MW-15T.

NRT again looked for well MW-15T in November 2004 when they were on site for the semi-annual water level measurements. NRT worked with a WPSC surveyor who set up an instrument in an attempt to pin-point the location where it should be based on scaling from site maps (the old well construction detail by previous consultants did not have coordinates for its location). A metal detector was also used but to no avail. It is my belief that we have made a reasonable effort to find the well. MW-16T is sufficient for water level monitoring, therefore, it's not essential to also measure water levels at well MW-15T for determining groundwater trends at the site.

Lastly, on November 17th 2004, I sent you a letter about the need for an interim remedy regarding the oil sheen at the site. At your earliest convenience I would appreciate receiving an update on your efforts and the submittal of a plan outlining what WPS intends to do at the site.

The WPSC printing department has made permanent signs to be posted on the railing along the river and should be installed within the next few weeks. The signs will be placed at 5 locations along the rail on either side facing inland and toward the river (10 total).

WPSC would like to "experiment" prior to installing a costly boom that could be destroyed by boats utilizing the turning basin. Based on previous site visits, it appeared the current or wind eventually moved the sheen to either end of the wall rather than out in the river. We propose to attach a boom to the sheet pile wall at each end to see how they hold up. The boom would be given enough slack for it to free float approximately 20 ft from the wall at maximum. By installing booms off

the end, we may be able to avoid destruction by the boats while at the same time capture some of the floating sheen. Appropriate approvals from the WDNR warden, the City, and possibly US Army Corp. of Engineers would have to be obtained prior to installing the boom.

I look forward to hearing from you,

Annette Weissbach
Hydrogeologist/Project Manager
Remediation & Redevelopment Program - Northeast Region
Department of Natural Resources
PO Box 19448 1125 N. Military Avenue
Green Bay WI 54307-0448
tel. 920.492.5865 fax. 920-492.5859
Annette.weissbach@dnr.state.wi.us
Remediation and Redevelopment website: <http://dnr.wi.gov/org/aw/rr>
http://dnr.wi.gov/org/aw/rr

Reference 46

Health Consultation

WISCONSIN FUEL AND LIGHT
FORMER MANUFACTURED GAS PLANT

CITY OF MANITOWOC, MANITOWOC COUNTY, WISCONSIN

EPA FACILITY ID: WID007946510

MARCH 11, 2005

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

NATURAL
RESOURCE
TECHNOLOGY

Reference 47

Ms. Mary Logan
United States Environmental Protection Agency
77 W. Jackson Boulevard
Chicago, IL 60604-3590

October 7, 2005
(1530)

Ms. Annette Weissbach
Wisconsin Department of Natural Resources-Northeast Region
P.O. Box 10448
Green Bay, WI 54307-0448

WI DNR
RECEIVED
OCT 11 2005
NER WASTE

RE: Operation, Maintenance and Monitoring Status Report
Reporting Period – September 1, 2004 to August 31, 2005
Former Wisconsin Fuel & Light Manufactured Gas Plant
402 North Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949, BRRTS # 02-36-000219

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

Dear Ms. Logan and Ms. Weissbach:

On behalf of Wisconsin Public Service Corporation (WPSC), Natural Resource Technology, Inc. (NRT) has prepared this annual Operation, Maintenance and Monitoring (OM&M) Status Report for the Former Wisconsin Fuel & Light (WF&L) Manufactured Gas Plant site in Manitowoc, Wisconsin (Figure 1). The report narrative includes a brief summary of prior work, a status update for the active groundwater extraction and pretreatment system, and a groundwater conditions update. Enclosed in Appendix A is a completed Wisconsin Department of Natural Resources (WDNR) Form 4400-194: Operation, Maintenance, Monitoring and Optimization Reporting, along with various other appendices, figures, and tables to support the narrative. As previously requested by WDNR, the enclosed documents also include analytical test results by others during the period of 1996 through 2000 (Appendix C) before the site was purchased by WPSC, as well as geologic cross-sections (Figures 2 and 3).

INVESTIGATION AND RESPONSE ACTION HISTORY

A summary of prior environmental investigations and response actions is briefly stated below. A chronologic summary of reports associated with this work is enclosed in Appendix B.

Timeframe	Description of Activity
1988 – 1992	Subsurface and sediment investigations performed and documented.
1992 – 1994	Feasibility study, pilot testing, interim remediation of soil and groundwater by shallow excavation, combined with an in-situ stabilization process.
1995 – 1997	Supplemental investigations, groundwater control study and installation of extraction well and treatment system.
1997 – 2001	Operation of groundwater control system.
2001 – Current	WPSC purchase of property from WF&L. System evaluation, modifications and continued operation and monitoring.

Reference 48

Public Service

This report can be reviewed in its entirety
at the WDNR Green Bay office located at
2984 Shawano Avenue in Green Bay

WISCONSIN PUBLIC SERVICE CORPORATION

SEDIMENT SITE SUMMARIES FOR FORMER MANUFACTURED GAS PLANT SITES

Manitowoc

PROJECT NO: 1515

NATURAL RESOURCE TECHNOLOGY

Site specific materials were sent to Project Managers for each site as they did not receive the information provided to EPA.
AS. Walden
11/17/05

Reference 49

From: Hogler, Steve
Sent: Thursday, March 23, 2006 10:40 AM
To: Weissbach, Annette E
Subject: East and Manitowoc Rivers

Attachments: Manitowoc-Twin Rivers Report.doc; Manitowc River Summary.doc; East Twin River summary.doc

Annette,
I have attached a couple of shortened versions of report that I have written on the East Twin River and Manitowoc River fisheries.

Manitowoc-Twin Rivers Report.d... | Manitowc River Summary.doc (14... | East Twin River summary.doc (1...

In addition to these reports, we have also surveyed the lower sections of the Manitowoc and East Twin Rivers. In general the deeper (lower) section of the East Twin River Fishery is dominated by gizzard shad and alewife. Other captured species included carp, bullhead, redhorse, catfish and sucker. Although we have not surveyed the lower Manitowoc recently, I suspect that it would have similar species to the East Twin.

Let me know if you have any other questions.

Steve

Steve Hogler
Fisheries Biologist
2220 E. CTH V
Mishicot, WI 554228
Telephone: (920) 755-4982
FAX. (920) 755-4981

email: steven.hogler@dnr.state.wi us

This report can be reviewed in its entirety at the WDNR Green Bay office located at 2984 Shawano Avenue in Green Bay

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

Reference 50

DATE: June 26, 2006

TO: Annette Weissbach - NER

FROM: Amy Walden – RR/3 AWalden

SUBJECT: Endangered Resources associated with the Manitowoc WSPC Manufactured Gas Site, 402 N. 10th Street, Manitowoc, WI

As part of the preparation of a preliminary assessment report for the Manitowoc WSPC Manufactured Gas Site, a search for endangered resources was performed with the DNR's National Heritage Inventory (NHI) Portal. The search covered a 2- mile distance from the site as well as 15 miles downstream.

The search indicated, there are three state threatened species, greater redhorse, seaside crowfoot, and sticky false-asphodel that may potentially be affected by activities associated with remediation of sediments on the Manitowoc River and associated uplands.

Species of special concern to the State include: dragon wormwood, Indian cucumber root, Northern yellow lady's slipper, and slender bog arrowgrass. In addition, there are one federally threatened species, the bald eagle, and three state threatened species, red-shoulder hawk, greater redhorse and Ellipse mussel associated with the Manitowoc River. There are two state natural areas within the 15- mile distance of the site, housing 7 rare plant communities, 15 rare plant species and 9 rare animals.

The remediation project area will need on-site verification to confirm the presence or absence of species habitat or individual species listed above, prior to any remedial activities to prevent or minimize habitat disturbance or species "takings".

For evaluation of the site with the Superfund Site Assessment Quickscore program, there is one federally threatened species, five state endangered or threatened species and two state natural areas.

Locational information regarding these species is confidential to protect the species from disturbance or collection.

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State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary
Ronald W. Kazmierczak, Regional Director

Northeast Region Headquarters
1125 N. Military Ave., P.O. Box 10448
Green Bay, Wisconsin 54307-0448
Telephone 920-492-5800
FAX 920-492-5913
TTY 711

November 17, 2004

Reference 51

Shirley Scharff
Wisconsin Public Service Corporation
Manager Environmental Programs
700 N. Adams Street
PO Box 19002
Green Bay, WI 54307-9002

Subject: Public Health Consultation
Former Manufactured Gas Plant, 402 North 10th Street, Manitowoc WI
BRRTS: 02-36-000219

Dear Ms. Scharff:

Enclosed please find a copy of a report prepared by the Wisconsin Department of Health and Family Services (DHFS) in September 2004. The Document is labeled draft as DHFS is still awaiting formal response from the Agency for Toxic Substances and Disease Registry (ATSDR). The Department of Natural Resources requested the health evaluation of the site. The report was issued in response to the presence of coal tar sheens observed at the former gas plant. In essence the DHFS report states that:

- *There is a need to take some kind of interim action at the site.*
- The hydrocarbon sheen is a potential health hazard.
- The hazard from release of the coal tar to the river's surface will continue as long as the contaminant mass remains.

As you and I have discussed over the last several months, the Department hereby requests that WPS prepare a plan to implement an interim action to remedy the oil sheen and place signage at the site cautioning the public about the presence of the coal tar deposit. At a minimum, the Interim Action Plan should include the following:

- Language/content of the signs (attached are examples of signage used at other sites with contaminated sediment)
- Location of the signs
- Other measures to be implemented to collect oil sheen near the site
- Schedule of implementation

You replied on 7/18/2006 7:19 AM.

Weissbach, Annette E

From: Hogler, Steve **Sent:** Mon 7/17/2006 7:45 AM
To: Weissbach, Annette E
Cc:
Subject: RE: West Twin and Manitowoc Rivers fisheries questions
Attachments:

See comments in blue.

Steve Hogler
Fisheries Biologist
2220 E CTH V
Mishicot, WI 554228
Telephone (920) 755-4982
FAX (920) 755-4981

email steven.hogler@dnr.state.wi.us

From: Weissbach, Annette E
Sent: Sunday, July 16, 2006 9:05 PM
To: Hogler, Steve
Subject: West Twin and Manitowoc Rivers fisheries questions

Hi Steve, I have a couple more questions regarding the West Twin and Manitowoc Rivers. I'm still writing these reports about the Manufactured Gas Plants in Manitowoc and Two Rivers that we talked about a few months ago. My two sites are within a mile of the Lake: the Manitowoc site is at the turning basin in the heart of downtown Manitowoc and the Two Rivers site is about 1000 feet north of the Veterans' Park boat launch on the West Twin.

Do you know if there are any fish advisories in the lower Manitowoc River or West Twin? Yes there are *consumption advisories of a number of fish species in both rivers.* Is there a quick website you can refer me to, so you don't have to spell it all out? You should be able to pick a fish consumption advisory at the Regional Office or it should be listed on the Fish portion of the DNR website.

Are these rivers used for commercial fishing, how about just outside the Two Rivers or Manitowoc harbors? There are no commercial fishers that use the rivers for fishing, but some do set trap nets for whitefish fairly close to the harbors in Lake Michigan.

Do anglers "catch and release" or consume their catch (either in the rivers, or near shore Lake Michigan)? Anglers do both, but I suspect most catch and keep their fish. They can fish in the rivers, harbors or just off shore for a variety of species of fish including trout, salmon, smallmouth bass, northern pike, yellow perch, bullhead, carp, catfish, panfish, etc.

Thanks in advance for your help!

Annette Weissbach
(☎) phone: (920) 662-5165

"The ultimate test of a persons conscience may be their willingness to sacrifice something today

Coastal Wetlands of Wisconsin's Great Lakes
A Data Compilation and Assessment

http://www.dnr.state.wi.us/org/land/er/publications/cw/#Projects

Excerpts relevant to Manitowoc and Two Rivers downloaded July 16, 2006

Project Description

The state of Wisconsin is bordered by Lake Superior to the northwest and Lake Michigan to the east. The 820 miles of combined shoreline make up a complex arrangement of ecosystems that contain a rich variety of natural features. Wetlands near the coasts of both lakes provide rich habitat for plants and animals and greatly influence the larger ecosystem processes of the Great Lakes Ecosystem. As transition zones (or ecotones) between land and water, coastal wetlands are often rich in species diversity and provide critical habitat for migratory and nesting birds, spawning fish, and rare plants. However, various types of development and recreation continue to impact coastal wetlands and limit their capacities to perform important ecosystem functions.

Numerous inventories and reports have been completed pertaining to coastal wetlands throughout Wisconsin. For example, the Bureau of Endangered Resources (BER) has completed a number of important inventory and data assessment projects over the last decade aimed at improving our understanding of coastal ecosystems and coastal wetland sites, in particular. However, at the time when this project was initiated (1999) a comprehensive synthesis of coastal wetland information for the Great Lakes had not been completed. Moreover, significant inventory gaps existed throughout the coastal zone in Wisconsin.

The focus of this project was to conduct an assessment of existing coastal wetland data to determine ecologically significant coastal wetland sites within the Lake Michigan and Lake Superior basins. The goals were to identify inventory gaps for guiding future inventory and planning efforts by the Bureau of Endangered Resources and others. The project was implemented in three phases, each one building incrementally upon the previous phase, as follows:

Phase 1:

The first year of the project was, primarily, a survey of existing studies and resulted in the identification of 64 Primary Sites within the coastal zones of Lakes Michigan and Superior, including 28 sites near Lake Superior and 36 sites near Lake Michigan. The significance of the sites was determined based on the current level of information available. However, it was acknowledged that large data gaps existed, especially for Lake Michigan coastal wetlands. These gaps were identified focusing on NHI-related data (rare plants, animals, natural communities, and other natural features) and documented as part of the final report (Merryfield 2000) for this phase of the project. Phase I was completed in 2000.

Choose wisely

A health guide for eating fish in Wisconsin

Reference 54

This reference can be found/reviewed in its entirety at the WDNR Northeast Regional Headquarters office at 2984 Shawano Ave, Green Bay WI

Reference 55

Looking north along the Lake Michigan shoreline in Two Rivers' Source Water area, Photograph courtesy of E.J. Epstein.

Source Water Assessment for Two Rivers Waterworks

Two Rivers, Wisconsin

March 27, 2003

A report by the
Wisconsin Department of Natural Resources
Bureau of Drinking Water and Groundwater

WISCONSIN
DEPT. OF NATURAL RESOURCES

Reference 56

EPA Region 5 Records Ctr.

255950

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 5

IN THE MATTER OF: WPSC Green Bay MGP Green Bay, WI WPSC Manitowoc MGP Manitowoc, WI WPSC Marinette MGP Marinette, WI WPSC Oshkosh MGP Oshkosh, WI WPSC Stevens Point MGP Stevens Point, WI WPSC Two Rivers MGP Two Rivers, WI	ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES U.S. EPA Region 5 CERCLA Docket No. V-W- '06 -C-847 Proceeding Under Sections 104, 107 and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §§ 9604, 9607 and 9622.

Respondent: Wisconsin Public Service Corporation

This reference can be found/reviewed in its entirety at the WDNR Green Bay office located at 2894 Shawano Avenue in Green Bay

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SETTLEMENT AGREEMENT AND ADMINISTRATIVE ORDER ON CONSENT FOR REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES AT SIX WPSC MGP SITES

I. JURISDICTION AND GENERAL PROVISIONS

1. This Administrative Settlement Agreement and Order on Consent ("Settlement Agreement") is entered into voluntarily by the United States Environmental Protection Agency ("U.S. EPA") and Wisconsin Public Service Corporation, ("Respondent"). The Settlement Agreement concerns the preparation and performance of a remedial investigation and feasibility study ("RI/FS") at each of the six sites: WPSC Green Bay MGP; WPSC Manitowoc MGP; WPSC Marinette MGP; WPSC Oshkosh MGP; WPSC Stevens Point MGP; and WPSC Two Rivers MGP, located at Green Bay, WI; Manitowoc, WI; Marinette, WI; Oshkosh, WI; Stevens Point, WI and Two Rivers, WI, respectively ("Sites"), and the reimbursement for interim and future response costs incurred by U.S. EPA in connection with the RI/FS studies.

2. This Settlement Agreement is issued under the authority vested in the President of the United States by Sections 104, 107 and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §§ 9604, 9607 and 9622 ("CERCLA"). This authority was delegated to the Administrator of U.S. EPA on January 23, 1987, by Executive Order 12580, 52 Fed. Reg. 2926 (Jan. 29, 1987), and further delegated to Regional Administrators on May 11, 1994, by U.S. EPA Delegation Nos. 14-14-C and 14-14-D. This authority was further redelegated by the Regional Administrator, U.S. EPA, Region 5 to the Director, Superfund Division, U.S. EPA, Region 5 by U.S. EPA Delegation Nos. 14-14-C and 14-14-D on May 2, 1996.

3. In accordance with Section 104(b)(2) and Section 122(j)(1) of CERCLA, 42 U.S.C. §§ 9604(b)(2) and 9622(j)(1), U.S. EPA notified the Department of the Interior, the National Oceanic and Atmospheric Administration, and the Wisconsin Department of Natural Resources ("WDNR") on February 9, 2006, of negotiations with potentially responsible parties regarding the release of hazardous substances that may have resulted in injury to the natural resources under Federal trusteeship. In accordance with Section 121(f)(1)(F), U.S. EPA has notified the State of Wisconsin (the "State") on January 30, 2006 of negotiations with potentially responsible parties regarding the implementation of the remedial investigation and feasibility study for the Sites.

4. U.S. EPA and Respondent recognize that this Settlement Agreement has been negotiated in good faith and that the actions undertaken by the Respondent in accordance with this Settlement Agreement do not constitute an admission of any liability. Respondent does not admit, and retains the right to controvert in any subsequent proceedings other than proceedings to implement or enforce this Settlement Agreement, the validity of the findings of fact, conclusions of law and determinations in Sections V and VI of this Settlement Agreement. Respondent agrees to comply with and be bound by the terms of this Settlement Agreement and further agrees that they will not contest the basis or validity of this Settlement Agreement or its terms.

The Undersigned Party enters into this Administrative Settlement Agreement and Order on Consent for Remedial Investigations and Feasibility Studies in the matter of the six WPSC Sites: WPSC Green Bay; WPSC Manitowoc; WPSC Marinette; WPSC Oshkosh; WPSC Stevens Point; and WPSC Two Rivers, in Wisconsin.

Agreed this 28 day of April, 2006.

For Respondent WISCONSIN PUBLIC SERVICE CORPORATION

Signature: Connie Lawniczak

Name: Connie Lawniczak

Title: *Director of Environmental Services*

Address: Post Office Box 19001
Green Bay, WI 54307-9001

Administrative Settlement Agreement and Order on Consent for Remedial Investigations and Feasibility Studies in the matter of the six WPSC Sites: WPSC Green Bay; WPSC Manitowoc; WPSC Marinette; WPSC Oshkosh; WPSC Stevens Point; and WPSC Two Rivers, in Wisconsin.

It is so ORDERED AND AGREED this 5th day of May, 2006.

BY: _____ DATE: 5/5/06

for Richard C. Karl, Director
Superfund Division
U.S. Environmental Protection Agency
Region 5

EFFECTIVE DATE: May 5, 2006

Reference 57

Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
700 North Adams Street
P.O Box 19002
Green Bay, WI 54307-9002

November 30, 2005

Received
JUL 27 2006
REMEDIATION & REDEVELOPMENT

Ms. Mary P. Logan
Remedial Project Manager
United States Environmental
Protection Agency-Region V
77 West Jackson Boulevard (SR-6J)
Chicago, IL 60604-3590

Re: Former MGP Sites - Historic Site Data

Dear Ms. Logan:

We understand that the Wisconsin Department of Natural Resources ("WDNR") is conducting preliminary assessments at the former manufacturing gas plant sites we are seeking to transfer to U.S. EPA's Superfund Alternatives Program. In that regard, U.S. EPA and WDNR need confirmation from Wisconsin Public Service Corporation that it will not contest any of the data we have developed in the work we previously conducted at these sites.

This letter confirms that U.S. EPA and WDNR may use the existing data obtained by WPSC in its work at these sites and that WPSC supports the validity of the data and will not contest it.

With respect to these sites, we have developed a draft administrative order on consent based on the January 2004 model, as modified by the subsequent 2005 revisions that address the United States Supreme Court's *Aviall* decision. I understand from your recent email that EPA is also working on a draft. We are prepared to draft a scope of work as well, but as it will cover multiple sites, which are at different stages of investigation/remediation, we thought it best to discuss it with you and develop an outline of our approach for your review.

We will be at U.S. EPA on December 6, 2005, to go over the Sheboygan Camp Marina documents and schedule. If you have time that day, we would like to meet with you to discuss how best to approach the statement of work.

If you have any questions, please call Shirley Scharff at (920) 433-1396.

Very truly yours,

Edward N. Newman
Director Environmental Services

MILW_1923275.1

TABLES

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	1991	Table 6: Summary of laboratory analytical results of groundwater samples (Reference 7) 10 pages
	1994	Table 4: Summary of analytical data for groundwater results Wisconsin Fuel and Light, Manitowoc facility (Reference 20) 12 pages
	1996, 1997, 1998, 1999	Table 3: Summary of detections in groundwater monitoring program, Wisconsin Fuel and Light (Reference 47) 20 pages
	2000-2005	Table 3: Groundwater monitoring well analytical results PVOC and cyanide (Reference 47) 3 pages
	2000-2005	Table 4: Groundwater monitoring well analytical results PAHs (Reference 47) 4 pages
	1997-2005	Table 6: Pretreatment system analytical results (Reference 47) 4 pages
Table B Sediments	1991	Table 4: Summary of laboratory analytical results of Manitowoc river sediments, Wisconsin Fuel and Light Company (Reference 7) 8 pages
	2000	Appendix A, June 2000 survey of sediment contamination on the Manitowoc River (Reference 32) 6 pages
	2003	Manitowoc River Table 1 Field observations, pole and ponar grab samples, Table 2 BTEX, cyanide, metals, PCBs and inorganic compounds Table 3 PAHs Manitowoc River, Former Wisconsin Fuel and Light MGP (Reference 39) 3 pages
Table C Soils	1988	Table 4 Manitowoc site comparison of detected soil quality to typical background concentrations… (Reference 2) 4 pages
	1991	Table 3 Summary of laboratory analytical results of soil samples WI Fuel and Light Company (Reference 7) 6 pages
	1995	Table 3 Soil data summary Wisconsin Fuel and Light (Reference 21) 4 pages
	1996	Table 3 Soil data summary, Wisconsin Fuel and Light (Reference 23) 6 pages

**within narrative*

Manitowoc Site
Comparison of Monitoring Well Ground Water Concentrations
to Selected WDNR Ground Water Quality Standards (WDNR Ch. NR 140)
(Effective Date - November 1985)*

Substance	Well No./Screen Depth	Monitored Ground Water Concentration* (mg/l)	Public Health Ground Water** Quality Standards (mg/l)		Public Welfare Ground Water** Quality Standards (mg/l)	
			Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit
Antimony	MW-5 (26.5-29.5 ft)	0.0038				
Selenium	MW-1 (21.0-24.0 ft)	0.0021	0.010	0.001		
Arsenic	MW-2 (21.0-24.0 ft)	0.006	0.050	0.005		
	MW-4 (16.5-19.5 ft)	0.006	0.050	0.005		
Total Cyanide	MW-2 (21.0-24.0 ft)	0.220	0.460	0.092		
	MW-3 (16.75-19.75 ft)	0.140	0.460	0.092		
	MW-5 (26.5-29.5 ft)	0.130	0.460	0.092		
Sulfate	MW-1 (26.5-29.5 ft)	68.0			250.0	125.0
	MW-2 (21.0-24.0 ft)	162.0			250.0	125.0
	MW-4 (16.5-19.5 ft)	90.0			250.0	125.0
	MW-5 (26.5-29.5 ft)	97.0			250.0	125.0
Nickel	MW-5 (26.5-29.5 ft)	0.010				
Zinc	MW-1 (26.5-29.5 ft)	4.0			5.0	2.5
	MW-2 (21.0-24.0 ft)	5.3			5.0	2.5
	MW-3 (16.75-19.75 ft)	3.3			5.0	2.5
	MW-4 (16.5-19.5 ft)	3.5			5.0	2.5
	MW-5 (26.5-29.5 ft)	8.4			5.0	2.5
Benzene	MW-3 (16.75-19.75 ft)	0.35	0.00067	0.000067		
	MW-4 (16.5-19.5 ft)	0.34	0.00067	0.000067		
Ethylbenzene	MW-2 (21.0-24.0 ft)	0.002				
	MW-3 (16.75-19.75 ft)	0.012				
	MW-4 (16.5-19.5 ft)	0.260				

Manitowoc Site
Comparison of Monitoring Well Ground Water Concentrations
to Selected WDNR Ground Water Quality Standards (WDNR Ch. NR 140)
(Effective Date - November 1985)*

Substance	Well No./Screen Depth	Monitored Ground Water Concentration* (mg/l)	Public Health Ground Water** Quality Standards (mg/l)		Public Welfare Ground Water** Quality Standards (mg/l)	
			Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit
Toluene	MW-2 (21.0-24.0 ft)	0.008	0.343	0.0686		
	MW-4 (16.5-19.5 ft)	0.340	0.343	0.0686		
Acenaphthene	MW-3 (16.75-19.75 ft)	0.005				
	MW-5 (26.5-29.5 ft)	0.013				
Acenaphthylene	MW-5 (26.5-29.5 ft)	0.005				
Anthracene	MW-5 (26.5-29.5 ft)	0.002				
Bis-(2-Ethyl Hexyl) Phthalate	MW-2 (21.0-24.0 ft)	0.003				
	MW-3 (16.75-19.75 ft)	0.010				
Di-buytl Phthalate	MW-2 (21.0-24.0 ft)	0.001				
	MW-3 (16.75-19.75 ft)	0.001				
	MW-5 (26.5-29.5 ft)	0.001				
Naphthalene	MW-3 (16.75-19.75 ft)	0.014				
	MW-4 (16.5-19.5 ft)	5.5				
	MW-5 (26.5-29.5 ft)	0.340				
Fluoranthene	MW-5 (26.5-29.5 ft)	0.002				
Fluorene	MW-5 (26.5-29.5 ft)	0.008				
Phenanthrene	MW-5 (26.5-29.5 ft)	0.007				

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* Only those substances that are present at or above the detection limit are shown on this table.
** Substances without either public health or public welfare ground water quality standards do not have standards listed on this table.

Site Investigation
Former Coal Gas Manufacturing Plant
Manitowoc, Wisconsin

prepared for

WISCONSIN FUEL & LIGHT COMPANY

Wisconsin Fuel and Light Company

November, 1988

20969

EDI Engineering & Science
Environmental Engineering, Geology, Biology and Chemistry
a subsidiary of WW Engineering & Science

Grand Rapids, Michigan (616) 942-9600 Livonia, Michigan (313) 591-0522

Table 6

Summary of Laboratory Analytical Results of Groundwater Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units in mg/l)

Site id:	Public Health Ground Water Quality Standards		Public Welfare Ground Water Quality Standards		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	SB-16
Sample id:					E04510	E04511	E04512	E04513	E04514	E04515	E05069
Sample date:	Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit	10/31/91	10/30/91	10/29/91	10/29/91	10/30/91	10/30/91	11/06/91
Volatile Fraction											
1,1,1-Trichloroethane	0.2	0.04			<.001	<.001	<.1	<.02	<.001	<.001	<.001
1,1,2,2-Tetrachloroethane					<.001	<.001	<.1	<.02	<.001	<.001	<.001
1,1,2-Trichloroethane	0.0006	0.00006			<.001	<.001	<.1	<.02	<.001	<.001	<.001
1,1-Dichloroethane	0.85	0.085			<.001	<.001	<.1	<.02	<.001	<.001	<.001
1,1-Dichloroethylene	0.007	0.000024			<.001	<.001	<.1	<.02	<.001	<.001	<.001
1,2-Dichlorobenzene	1.25	0.125			<.001	<.001	<.005	<.005	<.005	<.005	<.005
1,2-Dichloroethane	0.005	0.00005			<.001	<.001	<.1	<.02	<.001	<.001	<.001
1,2-Dichloropropane					<.001	<.001	<.1	<.02	<.001	<.001	<.001
1,3-Dichlorobenzene	1.25	0.125			<.001	<.001	<.005	<.005	<.005	<.005	<.005
1,4-Dichlorobenzene	0.075	0.015			<.01	<.01	<.01	<.01	<.01	<.01	<.01
2-Chloroethylvinyl ether					<.001	<.001	<.1	<.02	<.001	<.001	<.001
Benzene	0.005	0.000067			<.001	<.001	5.4	.64	<.001	<.001	<.001
Bromodichloromethane	0.179	0.036			<.001	<.001	<.1	<.02	<.001	<.001	<.001
Bromoform					<.001	<.001	<.1	<.02	<.001	<.001	<.001
Bromomethane					<.001	<.001	<.1	<.02	<.001	<.001	<.001
Carbon tetrachloride	0.005	0.0005			<.001	<.001	<.1	<.02	<.001	<.001	<.001
Chlorobenzene					<.001	<.001	<.1	<.02	<.001	<.001	<.001
Chloroethane					<.001	<.001	<.1	<.02	<.001	<.001	<.001
Chloroform	0.006	0.0006			<.001	<.001	<.1	<.02	<.001	<.001	<.001
Chloromethane					<.001	<.001	<.1	<.02	<.001	<.001	<.001
cis-1,3-Dichloropropene					<.001	<.001	<.1	<.02	<.001	<.001	<.001
Dichlorodifluoromethane					<.001	<.001	<.1	<.02	<.001	<.001	<.001
Ethylbenzene	1.36	0.272			<.001	<.001	<.1	<.02	<.001	<.001	<.001
Methylene chloride	0.15	0.015			.054	<.001	<.1	<.02	<.001	<.001	<.001
Tetrachloroethylene	0.001	0.0001			<.001	<.001	<.1	<.02	<.001	<.001	<.001

< = Parameter not detected. The value presented indicates the detection limit.

Table 6

Summary of Laboratory Analytical Results of Groundwater Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units in mg/l)

Site id:	Public Health Ground Water Quality Standards		Public Welfare Ground Water Quality Standards		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	SB-16
Sample id:					E04510	E04511	E04512	E04513	E04514	E04515	E05069
Sample date:	Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit	10/31/91	10/30/91	10/29/91	10/29/91	10/30/91	10/30/91	11/06/91
Volatile Fraction (cnt.)											
Toluene	0.343	0.0686			<.001	<.001	<.1	<.02	<.001	<.001	<.001
trans-1,2-Dichloroethylene	0.1	0.02			<.001	<.001	<.1	<.02	<.001	<.001	<.001
trans-1,3-Dichloropropene					<.001	<.001	<.1	<.02	<.001	<.001	<.001
Trichloroethylene	0.005	0.00018			<.001	<.001	<.1	<.02	<.001	<.001	.003
Trichlorofluoromethane					<.001	<.001	<.1	<.02	<.001	<.001	<.001
Vinyl chloride	0.0002	0.0000015			<.001	<.001	<.1	<.02	<.001	<.001	<.001
Xylene	0.62	0.124			<.001	<.001	<.1	<.02	<.001	<.001	<.001
Chlorodibromomethane					<.001	<.001	<.1	<.02	<.001	<.001	<.001

< = Parameter not detected. The value presented indicates the detection limit.

Table 6

Summary of Laboratory Analytical Results of Groundwater Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units in mg/l)

Site id: / Sample id: / Sample date:	Public Health Ground Water Quality Standards		Public Welfare Ground Water Quality Standards		SB-18 E05070 11/07/91	SB-19 E05071 11/07/91	Trip Blk E05072 11/07/91	Trip Blk E04516 10/30/91	Trip Blk E04517 10/30/91	Trip Blk E04518 10/30/91
	Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit						
Volatile Fraction										
1,1,1-Trichloroethane	0.2	0.04			<.005	<.1	--	--	--	--
1,1,2,2-Tetrachloroethane					<.005	<.1	--	--	--	--
1,1,2-Trichloroethane	0.0006	0.00006			<.005	<.1	--	--	--	--
1,1-Dichloroethane	0.85	0.085			<.005	<.1	--	--	--	--
1,1-Dichloroethylene	0.007	0.000024			<.005	<.1	--	--	--	--
1,2-Dichlorobenzene	1.25	0.125			<.005	<.005	--	--	--	--
1,2-Dichloroethane	0.005	0.00005			<.005	<.1	--	--	--	--
1,2-Dichloropropane					<.005	<.1	--	--	--	--
1,3-Dichlorobenzene	1.25	0.125			<.005	<.005	--	--	--	--
1,4-Dichlorobenzene	0.075	0.015			<.01	<.01	--	--	--	--
2-Chloroethylvinyl ether					<.005	<.1	--	--	--	--
Benzene	0.005	0.000067			.12	1.6	<.001	<.001	<.001	<.001
Bromodichloromethane	0.179	0.036			<.005	<.1	--	--	--	--
Bromoform					<.005	<.1	--	--	--	--
Bromomethane					<.005	<.1	--	--	--	--
Carbon tetrachloride	0.005	0.0005			<.005	<.1	--	--	--	--
Chlorobenzene					<.005	<.1	--	--	--	--
Chloroethane					<.005	<.1	--	--	--	--
Chloroform	0.006	0.0006			<.005	<.1	--	--	--	--
Chloromethane					<.005	<.1	--	--	--	--
cis-1,3-Dichloropropene					<.005	<.1	--	--	--	--
Dichlorodifluoromethane					<.005	<.1	--	--	--	--
Ethylbenzene	1.36	0.272			<.005	5.906	<.001	<.001	<.001	<.001
Methylene chloride	0.15	0.015			<.005	<.002	--	--	--	--
Tetrachloroethylene	0.001	0.0001			<.005	<.1	--	--	--	--

< = Parameter not detected. The value presented indicates the detection limit.
-- = Parameter not analyzed.

Table 6

Summary of Laboratory Analytical Results of Groundwater Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units in mg/l)

Site id:	Public Health Ground Water Quality Standards		Public Welfare Ground Water Quality Standards		SB-18	SB-19	Trip Blk	Trip Blk	Trip Blk	Trip Blk
Sample id:					E05070	E05071	E05072	E04516	E04517	E04518
Sample date:	Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit	11/07/91	11/07/91	11/07/91	10/30/91	10/30/91	10/30/91
Volatile Fraction (cnt.)										
Toluene	0.343	0.0686			<.005	2	<.001	<.001	<.001	<.001
trans-1,2-Dichloroethylene	0.1	0.02			<.005	<.1	--	--	--	--
trans-1,3-Dichloropropene					<.005	<.1	--	--	--	--
Trichloroethylene	0.005	0.00018			<.005	<.1	--	--	--	--
Trichlorofluoromethane					<.005	<.1	--	--	--	--
Vinyl chloride	0.0002	0.0000015			<.005	<.1	--	--	--	--
Xylene	0.62	0.124			.035	12	<.001	<.001	<.001	<.001
Chlorodibromomethane					<.005	<.1	--	--	--	--

< = Parameter not detected. The value presented indicates the detection limit.
-- = Parameter not analyzed.

Table 6

Summary of Laboratory Analytical Results of Groundwater Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units in mg/l)

Site id:	Public Health Ground Water Quality Standards		Public Welfare Ground Water Quality Standards		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	SB-16
Sample id:					E04510	E04511	E04512	E04513	E04514	E04515	E05069
Sample date:	Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit	10/31/91	10/30/91	10/29/91	10/29/91	10/30/91	10/30/91	11/06/91
Base-Neutral Compounds											
Acenaphthene					<.005	<.005	.021	.077	<.005	<.005	<.005
Acenaphthylene					<.005	<.005	<.005	.023	<.005	<.005	<.005
Anthracene					<.005	<.005	<.005	.028	<.005	<.005	<.005
Benzo(a)anthracene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Benzo(a)pyrene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Benzo(b and/or k)fluoranthene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Benzo(ghi)perylene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Benzyl alcohol					<.05	<.05	<.05	<.05	<.05	<.05	<.05
Bis(2-chloroethoxy)methane					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Bis(2-chloroethyl)ether					<.01	<.01	<.01	<.01	<.01	<.01	<.01
Bis(2-chloroisopropyl)ether					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Bis(2-ethylhexyl)phthalate					<.01	<.01	<.01	<.01	<.01	<.01	<.01
4-Bromophenyl phenyl ether					<.01	<.01	<.01	<.01	<.01	<.01	<.01
Butyl benzyl phthalate					<.01	<.01	<.01	<.01	<.01	<.01	<.01
4-Chloroaniline					<.05	<.05	<.05	<.05	<.05	<.05	<.05
2-Chloronaphthalene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
4-Chlorophenyl phenyl ether					<.01	<.01	<.01	<.01	<.01	<.01	<.01
Chrysene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Di-n-butyl phthalate					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Di-n-octyl phthalate					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Dibenz(a,h)anthracene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Dibenzofuran					<.005	<.005	<.005	<.005	<.005	<.005	<.005
1,2-Dichlorobenzene					<.001	<.001	<.005	<.005	<.005	<.005	<.005
1,3-Dichlorobenzene					<.001	<.001	<.005	<.005	<.005	<.005	<.005
1,4-Dichlorobenzene					<.01	<.01	<.01	<.01	<.01	<.01	<.01

< = Parameter not detected. The value presented indicates the detection limit.

Table 6

Summary of Laboratory Analytical Results of Groundwater Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units in mg/l)

Site id: / Sample id: / Sample date:	Public Health Ground Water Quality Standards		Public Welfare Ground Water Quality Standards		MW-1 E04510 10/31/91	MW-2 E04511 10/30/91	MW-3 E04512 10/29/91	MW-4 E04513 10/29/91	MW-5 E04514 10/30/91	MW-6 E04515 10/30/91	SB-16 E05069 11/06/91
	Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit							
Base-Neutral Compounds											
3,3'-Dichlorobenzidine					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Diethylphthalate					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Dimethylphthalate					<.005	<.005	<.005	<.005	<.005	<.005	<.005
2,4-Dinitrotoluene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
2,6-Dinitrotoluene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Fluoranthene					<.005	<.005	<.005	.018	<.005	<.005	<.005
Fluorene					<.01	<.01	<.01	.048	<.01	<.01	<.01
Hexachlorobenzene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Hexachlorobutadiene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Hexachlorocyclopentadiene					<.05	<.05	<.05	<.05	<.05	<.05	<.05
Hexachloroethane					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Indeno(1,2,3-cd)pyrene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Isophorone					<.005	<.005	<.005	<.005	<.005	<.005	<.005
2-Methylnaphthalene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
n-Nitrosodi-n-propylamine					<.01	<.01	<.01	<.01	<.01	<.01	<.01
N-Nitrosodiphenylamine					<.01	<.01	<.01	<.01	<.01	<.01	<.01
Naphthalene					<.005	<.005	.74	.14	<.005	<.005	<.005
2-Nitroaniline					<.005	<.005	<.005	<.005	<.005	<.005	<.005
3-Nitroaniline					<.01	<.01	<.01	<.01	<.01	<.01	<.01
4-Nitroaniline					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Nitrobenzene					<.005	<.005	<.005	<.005	<.005	<.005	<.005
Phenanthrene					<.005	<.005	<.005	.078	<.005	<.005	<.005
Pyrene					<.005	<.005	<.005	.024	<.005	<.005	<.005

< = Parameter not detected. The value presented indicates the detection limit.

Table 6

Summary of Laboratory Analytical Results of Groundwater Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units in mg/l)

Site id: / Sample id: / Sample date:	Public Health Ground Water Quality Standards		Public Welfare Ground Water Quality Standards		SB-18 E05070 11/07/91	SB-19 E05071 11/07/91	Trip Blk E05072 11/07/91	Trip Blk E04516 10/30/91	Trip Blk E04517 10/30/91	Trip Blk E04518 10/30/91
	Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit						
Base-Neutral Compounds										
Acenaphthene					.022	.043	--	--	--	--
Acenaphthylene					.013	.042	--	--	--	--
Anthracene					<.005	.018	--	--	--	--
Benzo(a)anthracene					<.005	.014	--	--	--	--
Benzo(a)pyrene					<.005	.026	--	--	--	--
Benzo(b and/or k)fluoranthene					<.005	.026	--	--	--	--
Benzo(ghi)perylene					<.005	<.005	--	--	--	--
Benzyl alcohol					<.05	<.05	--	--	--	--
Bis(2-chloroethoxy)methane					<.005	<.005	--	--	--	--
Bis(2-chloroethyl)ether					<.01	<.01	--	--	--	--
Bis(2-chloroisopropyl)ether					<.005	<.005	--	--	--	--
Bis(2-ethylhexyl)phthalate					.102	<.01	--	--	--	--
4-Bromophenyl phenyl ether					<.01	<.01	--	--	--	--
Butyl benzyl phthalate					<.01	<.01	--	--	--	--
4-Chloroaniline					<.05	<.05	--	--	--	--
2-Chloronaphthalene					<.005	<.005	--	--	--	--
4-Chlorophenyl phenyl ether					<.01	<.01	--	--	--	--
Chrysene					<.005	<.005	--	--	--	--
Di-n-butyl phthalate					<.005	<.005	--	--	--	--
Di-n-octyl phthalate					<.005	<.005	--	--	--	--
Dibenz(a,h)anthracene					<.005	<.005	--	--	--	--
Dibenzofuran					<.005	<.005	--	--	--	--
1,2-Dichlorobenzene					<.005	<.005	--	--	--	--
1,3-Dichlorobenzene					<.005	<.005	--	--	--	--
1,4-Dichlorobenzene					<.01	<.01	--	--	--	--

< = Parameter not detected. The value presented indicates the detection limit.
-- = Parameter not analyzed.

Table 6

Summary of Laboratory Analytical Results of Groundwater Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units in mg/l)

Site id: / Sample id: / Sample date:	Public Health Ground Water Quality Standards		Public Welfare Ground Water Quality Standards		SB-18 E05070 11/07/91	SB-19 E05071 11/07/91	Trip Blk E05072 11/07/91	Trip Blk E04516 10/30/91	Trip Blk E04517 10/30/91	Trip Blk E04518 10/30/91
	Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit						
Base-Neutral Compounds										
3,3'-Dichlorobenzidine					<.005	<.005	--	--	--	--
Diethylphthalate					<.005	<.005	--	--	--	--
Dimethylphthalate					<.005	<.005	--	--	--	--
2,4-Dinitrotoluene					<.005	<.005	--	--	--	--
2,6-Dinitrotoluene					<.005	<.005	--	--	--	--
Fluoranthene					<.005	.043	--	--	--	--
Fluorene					<.01	.034	--	--	--	--
Hexachlorobenzene					<.005	<.005	--	--	--	--
Hexachlorobutadiene					<.005	<.005	--	--	--	--
Hexachlorocyclopentadiene					<.05	<.05	--	--	--	--
Hexachloroethane					<.005	<.005	--	--	--	--
Indeno(1,2,3-cd)pyrene					<.005	<.005	--	--	--	--
Isophorone					<.005	<.005	--	--	--	--
2-Methylnaphthalene					<.005	<.005	--	--	--	--
n-Nitrosodi-n-propylamine					<.01	<.01	--	--	--	--
N-Nitrosodiphenylamine					<.01	<.01	--	--	--	--
Naphthalene					.019	.207	--	--	--	--
2-Nitroaniline					<.005	<.005	--	--	--	--
3-Nitroaniline					<.01	<.01	--	--	--	--
4-Nitroaniline					<.005	<.005	--	--	--	--
Nitrobenzene					<.005	<.005	--	--	--	--
Phenanthrene					.006	.087	--	--	--	--
Pyrene					<.005	.006	--	--	--	--

< = Parameter not detected. The value presented indicates the detection limit.
-- = Parameter not analyzed.

Table 6

Summary of Laboratory Analytical Results of Groundwater Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units in mg/l)

Site id:	Public Health Ground Water Quality Standards		Public Welfare Ground Water Quality Standards		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	SB-16
Sample id:					E04510	E04511	E04512	E04513	E04514	E04515	E05069
Sample date:	Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit	10/31/91	10/30/91	10/29/91	10/29/91	10/30/91	10/30/91	11/06/91
Inorganic Compounds											
Lead, total	0.05	0.005			<.05	<.05	<.05	<.05	<.05	<.05	<.05
Selenium, total	0.01	0.001			.0031	<.002	<.002	<.002	<.002	<.002	<.002
Zinc, total			5	2.5	5.2	9.6	1.1	.14	13	2.4	<.02
Cyanide, total	0.2	0.04			<.05	.47	.2	<.05	<.05	.06	.12
Cyanide, amenable					<.05	*<.05	*<.05	*<.05	*<.05	<.05	.12
Sulfate			250	125	50	110	8.4	84	104	62	91
Grease & oil					2.1	2	<1	1.4	<1	9.5	<1

< = Parameter not detected. The value presented indicates the detection limit.
** = Data is suspect due to sample being analyzed outside of EPA approved hold-time.*

Table 6

Summary of Laboratory Analytical Results of Groundwater Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units in mg/l)

Site id:	Public Health Ground Water Quality Standards		Public Welfare Ground Water Quality Standards		SB-18	SB-19	Trip Blk	Trip Blk	Trip Blk	Trip Blk
Sample id:					E05070	E05071	E05072	E04516	E04517	E04518
Sample date:	Enforcement Standard	Preventive Action Limit	Enforcement Standard	Preventive Action Limit	11/07/91	11/07/91	11/07/91	10/30/91	10/30/91	10/30/91
Inorganic Compounds										
Lead, total	0.05	0.005			<.05	<.05	--	--	--	--
Selenium, total	0.01	0.001			<.002	<.002	--	--	--	--
Zinc, total			5	2.5	<.02	<.02	--	--	--	--
Cyanide, total	0.2	0.04			.48	6.8	--	--	--	--
Cyanide, amenable					.16	3.2	--	--	--	--
Sulfate			250	125	56	7.4	--	--	--	--
Grease & oil					<1	10	--	--	--	--

< = Parameter not detected. The value presented indicates the detection limit.
-- = Parameter not analyzed.

ENVIRONMENTAL SITE INVESTIGATION
FORMER COAL GAS MANUFACTURING PLANT
MANITOWOC, WISCONSIN

Prepared for

WISCONSIN FUEL & LIGHT COMPANY
MANITOWOC, WISCONSIN

Prepared by

WW ENGINEERING & SCIENCE
5555 GLENWOOD HILLS PARKWAY
GRAND RAPIDS, MICHIGAN 49588-0874

JANUARY 1992

PROJECT 22159

Reviewed by:

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Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140 Groundwater Quality Standards		MW-01	MW-02	MW-05	MW-06	MW-07
Sample Identification:				E99934	E99932	E99935	E99933	E99928
Date Sampled:				10/12/94	10/12/94	10/12/94	10/12/94	10/11/94
Sampled By:		Enforcement Standard	Preventative Action Limit	ETCO	ETCO	ETCO	ETCO	ETCO
Analyzed By:				ETCO	ETCO	ETCO	ETCO	ETCO
Comments:				-	-	-	-	-
Parameters	***Units***							
Cyanide, amenable	ug/L	200	40	< 5	< 5	< 5	< 5	**20**
Cyanide, total	ug/L	200	40	**11**	**230**	< 5	**280**	**360**
Sulfate	ug/L	250000	125000	**113000**	**104000**	**130000**	**83000**	**243000**
Arsenic, dissolved	ug/L	50	5	< 1	**6.4**	< 1	< 1	< 1
Barium, dissolved	ug/L	2000	400	**53**	**31**	**100**	**80**	**140**
Cadmium, dissolved	ug/L	5	0.5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium, dissolved	ug/L	100	10	< 50	< 50	< 50	< 50	< 50
Copper, dissolved	ug/L	1300	130	< 10	< 10	< 10	< 10	**16**
Lead, dissolved	ug/L	15	1.5	**3.5**	**1**	< 1	**1.5**	< 1
Mercury, dissolved	ug/L	2	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Nickel, dissolved	ug/L	-	-	< 10	< 10	< 10	< 10	< 10
Selenium, dissolved	ug/L	50	10	< 2	< 2	**2.2**	< 2	< 2
Silver, dissolved	ug/L	50	10	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Zinc, dissolved	ug/L	5000	2500	**1190**	**180**	**2760**	**790**	< 20
USEPA-8260 Scan	***Units***							
Acetone	ug/L	1000	200	< 50	< 50	< 50	< 50	< 50
Benzene	ug/L	5	0.5	< 1	< 1	< 1	< 1	< 1
Dichlorobromomethane	ug/L	215	43	< 1	< 1	< 1	< 1	< 1
Bromoform	ug/L	4.4	0.44	< 1	< 1	< 1	< 1	< 1
Bromomethane	ug/L	-	-	< 1	< 1	< 1	< 1	< 1
Methyl ethyl ketone	ug/L	460	90	< 50	< 50	< 50	< 50	< 50
Carbon disulfide	ug/L	-	-	< 50	< 50	< 50	< 50	< 50
Carbon tetrachloride	ug/L	5	0.5	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	ug/L	-	-	< 1	< 1	< 1	< 1	< 1
Chloroethane	ug/L	400	80	< 1	< 1	< 1	< 1	< 1
2-Chloroethylvinyl ether	ug/L	-	-	< 10	< 10	< 10	< 10	< 10
Chloroform	ug/L	6	0.6	< 1	< 1	< 1	< 1	< 1
Chloromethane	ug/L	-	-	< 1	< 1	< 1	< 1	< 1
Dibromochloromethane	ug/L	215	43	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	ug/L	850	85	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	ug/L	5	0.5	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethylene	ug/L	7	0.7	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethylene	ug/L	70(cis)	7(cis)	< 1	< 1	< 1	< 1	< 1
1,2-Dichloropropane	ug/L	5	0.5	< 1	< 1	< 1	< 1	< 1
cis-1,3-Dichloropropene	ug/L	-	-	< 1	< 1	< 1	< 1	< 1
trans-1,3-Dichloropropene	ug/L	-	-	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	ug/L	700	140	< 1	< 1	< 1	< 1	< 1
2-Hexanone	ug/L	-	-	< 50	< 50	< 50	< 50	< 50
Methyl isobutyl ketone	ug/L	-	-	< 50	< 50	< 50	< 50	< 50
Methylene chloride	ug/L	150	15	< 1	< 1	< 1	< 1	< 1
Styrene	ug/L	-	-	< 1	< 1	< 1	< 1	< 1

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140		MW-01	MW-02	MW-05	MW-06	MW-07
Sample Identification:		Groundwater Quality		E99934	E99932	E99935	E99933	E99928
Date Sampled:		Standards		10/12/94	10/12/94	10/12/94	10/12/94	10/11/94
Sampled By:		Enforcement	Preventative	ETCO	ETCO	ETCO	ETCO	ETCO
Analyzed By:		Standard	Action Limit	ETCO	ETCO	ETCO	ETCO	ETCO
Comments:				-	-	-	-	-
USEPA-8260 Scan (cont.)	***Units***							
1,1,2,2-Tetrachloroethane	ug/L	-	-	< 1	< 1	< 1	< 1	< 1
Tetrachloroethylene	ug/L	5	0.5	< 1	< 1	< 1	< 1	< 1
1,1,1-Trichloroethane	ug/L	200	40	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	ug/L	0.6	0.06	< 1	< 1	< 1	< 1	< 1
Trichloroethylene	ug/L	5	0.5	**13**	< 1	< 1	< 1	< 1
Toluene	ug/L	343	68.6	< 1	< 1	< 1	< 1	< 1
Vinyl acetate	ug/L	-	-	< 1	< 1	< 1	< 1	< 1
Vinyl chloride	ug/L	0.2	0.02	< 1	< 1	< 1	< 1	< 1
Xylene, total	ug/L	620	124	< 3	< 3	< 3	< 3	< 3
BNA-8270 Scan	***Units***							
Acenaphthene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Acenaphthylene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Anthracene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Benzo(a)anthracene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Benzo(a)pyrene	ug/L	0.003	0.0003	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Benzo(b and/or k)fluoranthene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Benzo(ghi)perylene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Benzoic acid	ug/L	-	-	< 50	< 50	< 50	< 50	< 50
Benzyl alcohol	ug/L	-	-	< 50	< 50	< 50	< 50	< 50
Bis(2-chloroethoxy)methane	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Bis(2-chloroethyl)ether	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Bis(2-chloroisopropyl)ether	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Bis(2-ethyl hexyl)phthalate	ug/L	3	0.3	< 5	< 5	< 5	< 5	< 5
4-Bromodiphenyl ether	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Butyl benzyl phthalate	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
p-Chloro-m-cresol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
4-Chloroaniline	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
2-Chloronaphthalene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
2-Chlorophenol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
4-Chlorodiphenyl ether	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Chrysene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Di-n-butyl phthalate	ug/L	-	-	< 5	**5**	< 5	< 5	**8**
Di-n-octyl phthalate	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Dibenz(a,h)anthracene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Dibenzofuran	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
1,2-Dichlorobenzene	ug/L	600	60	< 5	< 5	< 5	< 5	< 5
1,3-Dichlorobenzene	ug/L	1250	125	< 5	< 5	< 5	< 5	< 5
1,4-Dichlorobenzene	ug/L	75	15	< 5	< 5	< 5	< 5	< 5
3,3'-Dichlorobenzidine	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
2,4-Dichlorophenol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Diethyl phthalate	ug/L	-	-	< 5	< 5	< 5	< 5	< 5

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140 Groundwater Quality Standards		MW-01	MW-02	MW-05	MW-06	MW-07
Sample Identification:				E99934	E99932	E99935	E99933	E99928
Date Sampled:				10/12/94	10/12/94	10/12/94	10/12/94	10/11/94
Sampled By:		Enforcement Standard	Preventative Action Limit	ETCO	ETCO	ETCO	ETCO	ETCO
Analyzed By:				ETCO	ETCO	ETCO	ETCO	ETCO
Comments:				-	-	-	-	-
BNA-8270 Scan (cont.)	***Units***							
Dimethyl phthalate	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
2,4-Dimethylphenol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
4,6-Dinitro-o-cresol	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
2,4-Dinitrophenol	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
2,4-Dinitrotoluene	ug/L	0.05	0.005	< 5	< 5	< 5	< 5	< 5
2,6-Dinitrotoluene	ug/L	0.05	0.005	< 5	< 5	< 5	< 5	< 5
Fluoranthene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Fluorene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Hexachlorobenzene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Hexachloro-1,3-butadiene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Hexachlorocyclopentadiene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Hexachloroethane	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Indeno(1,2,3-cd)pyrene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Isophorone	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
2-Methylnaphthalene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
o-Cresol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
p-Cresol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
n-Nitrosodi-n-propylamine	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
n-Nitrosodiphenylamine	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Naphthalene	ug/L	40	8	< 5	< 5	< 5	< 5	< 5
2-Nitroaniline	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
3-Nitroaniline	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
4-Nitroaniline	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
Nitrobenzene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
2-Nitrophenol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
4-Nitrophenol	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
Pentachlorophenol	ug/L	1	0.1	< 20	< 20	< 20	< 20	< 20
Phenanthrene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Phenol	ug/L	6000	1200	< 5	< 5	< 5	< 5	< 5
Pyrene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
1,2,4-Trichlorobenzene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
2,4,5-Trichlorophenol	ug/L	-	-	< 50	< 50	< 50	< 50	< 50
2,4,6-Trichlorophenol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5

PR = Surrogate results are unavailable due to positive results in the sample.
DP = Samples analyzed in duplicate to confirm results.
EB = Equipment Blank
TB = Trip Blank
Bold values exceed the method detection limit.

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140 Groundwater Quality Standards		MW-08	MW-09	MW-10	MW-11	MW-12
Sample Identification:				E99930	E99929	E99925	E99927	E99926
Date Sampled:				10/11/94	10/11/94	10/11/94	10/11/94	10/11/94
Sampled By:		Enforcement Standard	Preventative Action Limit	ETCO	ETCO	ETCO	ETCO	ETCO
Analyzed By:				ETCO	ETCO	ETCO	ETCO	ETCO
Comments:				-	-	-	-	-
Parameters	***Units***							
Cyanide, amenable	ug/L	200	40	**300**	**10**	**30**	**20**	130
Cyanide, total	ug/L	200	40	**1300**	**250**	**220**	**160**	750
Sulfate	ug/L	250000	125000	**320000**	**186000**	**62000**	**126000**	**160000**
Arsenic, dissolved	ug/L	50	5	< 1	**6.3**	**10**	**5**	< 1
Barium, dissolved	ug/L	2000	400	**120**	**190**	**450**	**280**	**130**
Cadmium, dissolved	ug/L	5	0.5	< 0.2	< 0.2	< 0.2	**0.2**	**0.7**
Chromium, dissolved	ug/L	100	10	< 50	< 50	< 50	< 50	< 50
Copper, dissolved	ug/L	1300	130	**16**	< 10	< 10	**11**	< 10
Lead, dissolved	ug/L	15	1.5	**2.8**	< 1	< 1	< 1	**15**
Mercury, dissolved	ug/L	2	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Nickel, dissolved	ug/L	-	-	< 10	< 10	< 10	< 10	< 10
Selenium, dissolved	ug/L	50	10	**3.7**	< 2	< 2	< 2	< 2
Silver, dissolved	ug/L	50	10	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Zinc, dissolved	ug/L	5000	2500	< 20	< 20	< 20	**28**	< 20
USEPA-8260 Scan	***Units***							
Acetone	ug/L	1000	200	< 50	< 50	< 50	< 500	< 50
Benzene	ug/L	5	0.5	< 1	**4.7**	**57**	**1000**	**12**
Dichlorobromomethane	ug/L	215	43	< 1	< 1	< 1	< 10	< 1
Bromoform	ug/L	4.4	0.44	< 1	< 1	< 1	< 10	< 1
Bromomethane	ug/L	-	-	< 1	< 1	< 1	< 10	< 1
Methyl ethyl ketone	ug/L	460	90	< 50	< 50	< 50	< 500	< 50
Carbon disulfide	ug/L	-	-	< 50	< 50	< 50	< 500	< 50
Carbon tetrachloride	ug/L	5	0.5	< 1	< 1	< 1	< 10	< 1
Chlorobenzene	ug/L	-	-	< 1	< 1	< 1	< 10	< 1
Chloroethane	ug/L	400	80	< 1	< 1	< 1	< 10	< 1
2-Chloroethylvinyl ether	ug/L	-	-	< 10	< 10	< 10	< 100	< 10
Chloroform	ug/L	6	0.6	< 1	< 1	< 1	< 10	**1**
Chloromethane	ug/L	-	-	< 1	< 1	< 1	< 10	< 1
Dibromochloromethane	ug/L	215	43	< 1	< 1	< 1	< 10	< 1
1,1-Dichloroethane	ug/L	850	85	< 1	< 1	< 1	< 10	< 1
1,2-Dichloroethane	ug/L	5	0.5	< 1	< 1	< 1	< 10	< 1
1,1-Dichloroethylene	ug/L	7	0.7	< 1	< 1	< 1	< 10	< 1
1,2-Dichloroethylene	ug/L	70(cis)	7(cis)	< 1	< 1	< 1	< 10	< 1
1,2-Dichloropropane	ug/L	5	0.5	< 1	< 1	< 1	< 10	< 1
cis-1,3-Dichloropropene	ug/L	-	-	< 1	< 1	< 1	< 10	< 1
trans-1,3-Dichloropropene	ug/L	-	-	< 1	< 1	< 1	< 10	< 1
Ethylbenzene	ug/L	700	140	< 1	**1.5**	**2**	**380**	**1.8**
2-Hexanone	ug/L	-	-	< 50	< 50	< 50	< 500	< 50
Methyl isobutyl ketone	ug/L	-	-	< 50	< 50	< 50	< 500	< 50
Methylene chloride	ug/L	150	15	< 1	< 1	< 1	< 10	< 1
Styrene	ug/L	-	-	< 1	< 1	< 1	< 10	< 1

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140 Groundwater Quality Standards		MW-08	MW-09	MW-10	MW-11	MW-12
Sample Identification:				E99930	E99929	E99925	E99927	E99926
Date Sampled:				10/11/94	10/11/94	10/11/94	10/11/94	10/11/94
Sampled By:		Enforcement Standard	Preventative Action Limit	ETCO	ETCO	ETCO	ETCO	ETCO
Analyzed By:				ETCO	ETCO	ETCO	ETCO	ETCO
Comments:				-	-	-	-	-
USEPA-8260 Scan (cont.)	***Units***							
1,1,2,2-Tetrachloroethane	ug/L	-	-	< 1	< 1	< 1	< 10	< 1
Tetrachloroethylene	ug/L	5	0.5	< 1	< 1	< 1	< 10	< 1
1,1,1-Trichloroethane	ug/L	200	40	< 1	< 1	< 1	< 10	< 1
1,1,2-Trichloroethane	ug/L	0.6	0.06	< 1	< 1	< 1	< 10	< 1
Trichloroethylene	ug/L	5	0.5	**2.1**	< 1	< 1	< 10	< 1
Toluene	ug/L	343	68.6	< 1	< 1	**1**	**12**	**1.2**
Vinyl acetate	ug/L	-	-	< 1	< 1	< 1	< 10	< 1
Vinyl chloride	ug/L	0.2	0.02	< 1	< 1	< 1	< 10	< 1
Xylene, total	ug/L	620	124	< 3	< 3	< 3	**290**	**3.4**
BNA-8270 Scan	***Units***							
Acenaphthene	ug/L	-	-	< 5	< 5	< 5	**5**	< 5
Acenaphthylene	ug/L	-	-	< 5	< 5	< 5	**5**	< 5
Anthracene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Benzo(a)anthracene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Benzo(a)pyrene	ug/L	0.003	0.0003	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Benzo(b and/or k)fluoranthene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Benzo(ghi)perylene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Benzoic acid	ug/L	-	-	< 50	< 50	< 50	< 50	< 50
Benzyl alcohol	ug/L	-	-	< 50	< 50	< 50	< 50	< 50
Bis(2-chloroethoxy)methane	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Bis(2-chloroethyl)ether	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Bis(2-chloroisopropyl)ether	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Bis(2-ethyl hexyl)phthalate	ug/L	3	0.3	< 5	< 5	< 5	< 5	< 5
4-Bromodiphenyl ether	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Butyl benzyl phthalate	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
p-Chloro-m-cresol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
4-Chloroaniline	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
2-Chloronaphthalene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
2-Chlorophenol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
4-Chlorodiphenyl ether	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Chrysene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Di-n-butyl phthalate	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Di-n-octyl phthalate	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Dibenz(a,h)anthracene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Dibenzofuran	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
1,2-Dichlorobenzene	ug/L	600	60	< 5	< 5	< 5	< 5	< 5
1,3-Dichlorobenzene	ug/L	1250	125	< 5	< 5	< 5	< 5	< 5
1,4-Dichlorobenzene	ug/L	75	15	< 5	< 5	< 5	< 5	< 5
3,3'-Dichlorobenzidine	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
2,4-Dichlorophenol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Diethyl phthalate	ug/L	-	-	< 5	< 5	< 5	< 5	< 5

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140 Groundwater Quality Standards		MW-08	MW-09	MW-10	MW-11	MW-12
Sample Identification:				E99930	E99929	E99925	E99927	E99926
Date Sampled:				10/11/94	10/11/94	10/11/94	10/11/94	10/11/94
Sampled By:		Enforcement Standard	Preventative Action Limit	ETCO	ETCO	ETCO	ETCO	ETCO
Analyzed By:				ETCO	ETCO	ETCO	ETCO	ETCO
Comments:				-	-	-	-	-
BNA-8270 Scan (cont.)	***Units***							
Dimethyl phthalate	ug/L	-	-	< 5	< 5	< 5	< 5	[illegible]
2,4-Dimethylphenol	ug/L	-	-	< 5	< 5	< 5	**11**	< 5
4,6-Dinitro-o-cresol	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
2,4-Dinitrophenol	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
2,4-Dinitrotoluene	ug/L	0.05	0.005	< 5	< 5	< 5	< 5	< 5
2,6-Dinitrotoluene	ug/L	0.05	0.005	< 5	< 5	< 5	< 5	< 5
Fluoranthene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Fluorene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Hexachlorobenzene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Hexachloro-1,3-butadiene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Hexachlorocyclopentadiene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Hexachloroethane	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Indeno(1,2,3-cd)pyrene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Isophorone	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
2-Methylnaphthalene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
o-Cresol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
p-Cresol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
n-Nitrosodi-n-propylamine	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
n-Nitrosodiphenylamine	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Naphthalene	ug/L	40	8	< 5	< 5	< 5	< 5	< 5
2-Nitroaniline	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
3-Nitroaniline	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
4-Nitroaniline	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
Nitrobenzene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
2-Nitrophenol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
4-Nitrophenol	ug/L	-	-	< 20	< 20	< 20	< 20	< 20
Pentachlorophenol	ug/L	1	0.1	< 20	< 20	< 20	< 20	< 20
Phenanthrene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
Phenol	ug/L	6000	1200	< 5	< 5	< 5	**34**	< 5
Pyrene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
1,2,4-Trichlorobenzene	ug/L	-	-	< 5	< 5	< 5	< 5	< 5
2,4,5-Trichlorophenol	ug/L	-	-	< 50	< 50	< 50	< 50	< 50
2,4,6-Trichlorophenol	ug/L	-	-	< 5	< 5	< 5	< 5	< 5

PR = Surrogate results are unavailable due to positive results in the sample.
DP = Samples analyzed in duplicate to confirm results.
EB = Equipment Blank
TB = Trip Blank
Bold values exceed the method detection limit.

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140 Groundwater Quality Standards		MW-13	MW-13	MW-14	EB	TB
Sample Identification:				E99923	E99924	E99931	E99922	E99936
Date Sampled:				10/11/94	10/11/94	10/12/94	10/11/94	10/13/94
Sampled By:		Enforcement Standard	Preventative Action Limit	ETCO	ETCO	ETCO	ETCO	ETCO
Analyzed By:				ETCO	ETCO	ETCO	ETCO	ETCO
Comments:				-	Duplicate	-	@ MW-13	#1
Parameters	***Units***							
Cyanide, amenable	ug/L	200	40	**290**	**320**	**170**	< 5	-
Cyanide, total	ug/L	200	40	**920**	**980**	**680**	< 5	-
Sulfate	ug/L	250000	125000	**174000**	**192000**	**200000**	< 5000	-
Arsenic, dissolved	ug/L	50	5	< 1	< 1	**1.3**	< 1	-
Barium, dissolved	ug/L	2000	400	**100**	**100**	**280**	< 10	-
Cadmium, dissolved	ug/L	5	0.5	< 0.2	**0.2**	< 0.2	< 0.2	-
Chromium, dissolved	ug/L	100	10	< 50	< 50	< 50	< 50	-
Copper, dissolved	ug/L	1300	130	**10**	**14**	< 10	< 10	-
Lead, dissolved	ug/L	15	1.5	< 1	< 1	< 1	**3.2**	-
Mercury, dissolved	ug/L	2	0.2	< 0.2	< 0.2	< 0.2	< 0.2	-
Nickel, dissolved	ug/L	-	-	< 10	< 10	< 10	< 10	-
Selenium, dissolved	ug/L	50	10	< 2	< 2	< 2	< 2	-
Silver, dissolved	ug/L	50	10	< 0.2	< 0.2	< 0.2	< 0.2	-
Zinc, dissolved	ug/L	5000	2500	< 20	< 20	< 20	< 20	-
USEPA-8260 Scan	***Units***							
Acetone	ug/L	1000	200	< 50	< 50	< 1000	DP< 50	< 50
Benzene	ug/L	5	0.5	**88**	**66**	**470**	DP< 1	< 1
Dichlorobromomethane	ug/L	215	43	< 1	< 1	< 20	DP< 1	< 1
Bromoform	ug/L	4.4	0.44	< 1	< 1	< 20	DP< 1	< 1
Bromomethane	ug/L	-	-	< 1	< 1	< 20	DP< 1	< 1
Methyl ethyl ketone	ug/L	460	90	< 50	< 50	< 1000	DP< 50	< 50
Carbon disulfide	ug/L	-	-	< 50	< 50	< 1000	DP< 50	< 50
Carbon tetrachloride	ug/L	5	0.5	< 1	< 1	< 20	DP< 1	< 1
Chlorobenzene	ug/L	-	-	< 1	< 1	< 20	DP< 1	< 1
Chloroethane	ug/L	400	80	< 1	< 1	< 20	DP< 1	< 1
2-Chloroethylvinyl ether	ug/L	-	-	< 10	< 10	< 200	DP< 10	< 10
Chloroform	ug/L	6	0.6	< 1	< 1	< 20	**DP 29**	< 1
Chloromethane	ug/L	-	-	< 1	< 1	< 20	DP< 1	< 1
Dibromochloromethane	ug/L	215	43	< 1	< 1	< 20	DP< 1	< 1
1,1-Dichloroethane	ug/L	850	85	< 1	< 1	< 20	DP< 1	< 1
1,2-Dichloroethane	ug/L	5	0.5	< 1	< 1	< 20	DP< 1	< 1
1,1-Dichloroethylene	ug/L	7	0.7	< 1	< 1	< 20	DP< 1	< 1
1,2-Dichloroethylene	ug/L	70(cis)	7(cis)	< 1	< 1	< 20	DP< 1	< 1
1,2-Dichloropropane	ug/L	5	0.5	< 1	< 1	< 20	DP< 1	< 1
cis-1,3-Dichloropropene	ug/L	-	-	< 1	< 1	< 20	DP< 1	< 1
trans-1,3-Dichloropropene	ug/L	-	-	< 1	< 1	< 20	DP< 1	< 1
Ethylbenzene	ug/L	700	140	< 1	< 1	**410**	DP< 1	< 1
2-Hexanone	ug/L	-	-	< 50	< 50	< 1000	DP< 50	< 50
Methyl isobutyl ketone	ug/L	-	-	< 50	< 50	< 1000	DP< 50	< 50
Methylene chloride	ug/L	150	15	< 1	< 1	< 20	**DP 1.4**	< 1
Styrene	ug/L	-	-	< 1	< 1	**1500**	DP< 1	< 1

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140		MW-13	MW-13	MW-14	EB	T3
Sample Identification:		Groundwater Quality		E99923	E99924	E99931	E99922	E9993[illegible]
Date Sampled:		Standards		10/11/94	10/11/94	10/12/94	10/11/94	10/13/94
Sampled By:		Enforcement	Preventative	ETCO	ETCO	ETCO	ETCO	ETCO
Analyzed By:		Standard	Action Limit	ETCO	ETCO	ETCO	ETCO	ETCO
Comments:				-	Duplicate	-	@ MW-13	#
USEPA-8260 Scan (cont.)	***Units***							
1,1,2,2-Tetrachloroethane	ug/L	-	-	< 1	< 1	< 20	DP< 1	< [illegible]
Tetrachloroethylene	ug/L	5	0.5	< 1	< 1	< 20	DP< 1	< [illegible]
1,1,1-Trichloroethane	ug/L	200	40	< 1	< 1	< 20	DP< 1	< [illegible]
1,1,2-Trichloroethane	ug/L	0.6	0.06	< 1	< 1	< 20	DP< 1	< [illegible]
Trichloroethylene	ug/L	5	0.5	< 1	< 1	< 20	DP< 1	< [illegible]
Toluene	ug/L	343	68.6	< 1	< 1	**1700**	DP< 1	< [illegible]
Vinyl acetate	ug/L	-	-	< 1	< 1	< 20	DP< 1	< [illegible]
Vinyl chloride	ug/L	0.2	0.02	< 1	< 1	< 20	DP< 1	< [illegible]
Xylene, total	ug/L	620	124	**3.3**	**3.3**	**[illegible]**	DP< 3	< [illegible]
BNA-8270 Scan	***Units***							
Acenaphthene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Acenaphthylene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Anthracene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Benzo(a)anthracene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Benzo(a)pyrene	ug/L	0.003	0.0003	< 2.5	< 2.5	PR< 250	< 2.5	-
Benzo(b and/or k)fluoranthene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Benzo(ghi)perylene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Benzoic acid	ug/L	-	-	< 50	< 50	PR< 5000	< 50	-
Benzyl alcohol	ug/L	-	-	< 50	< 50	PR< 5000	< 50	-
Bis(2-chloroethoxy)methane	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Bis(2-chloroethyl)ether	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Bis(2-chloroisopropyl)ether	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Bis(2-ethyl hexyl)phthalate	ug/L	3	0.3	< 5	< 5	PR< 500	< 5	-
4-Bromodiphenyl ether	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Butyl benzyl phthalate	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
p-Chloro-m-cresol	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
4-Chloroaniline	ug/L	-	-	< 20	< 20	PR< 2000	< 20	-
2-Chloronaphthalene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
2-Chlorophenol	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
4-Chlorodiphenyl ether	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Chrysene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Di-n-butyl phthalate	ug/L	-	-	< 5	< 5	PR< 500	**28**	-
Di-n-octyl phthalate	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Dibenz(a,h)anthracene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Dibenzofuran	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
1,2-Dichlorobenzene	ug/L	600	60	< 5	< 5	PR< 500	< 5	-
1,3-Dichlorobenzene	ug/L	1250	125	< 5	< 5	PR< 500	< 5	-
1,4-Dichlorobenzene	ug/L	75	15	< 5	< 5	PR< 500	< 5	-
3,3'-Dichlorobenzidine	ug/L	-	-	< 20	< 20	PR< 2000	< 20	-
2,4-Dichlorophenol	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Diethyl phthalate	ug/L	-	-	< 5	< 5	PR< 500	< 5	-

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140 Groundwater Quality Standards		MW-13	MW-13	MW-14	EB	TB
Sample Identification:				E99923	E99924	E99931	E99922	E99936
Date Sampled:				10/11/94	10/11/94	10/12/94	10/11/94	10/13/94
Sampled By:		Enforcement Standard	Preventative Action Limit	ETCO	ETCO	ETCO	ETCO	ETCO
Analyzed By:				ETCO	ETCO	ETCO	ETCO	ETCO
Comments:				-	Duplicate	-	@ MW-13	#1
BNA-8270 Scan (cont.)	***Units***							
Dimethyl phthalate	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
2,4-Dimethylphenol	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
4,6-Dinitro-o-cresol	ug/L	-	-	< 20	< 20	PR< 2000	< 20	-
2,4-Dinitrophenol	ug/L	-	-	< 20	< 20	PR< 2000	< 20	-
2,4-Dinitrotoluene	ug/L	0.05	0.005	< 5	< 5	PR< 500	< 5	-
2,6-Dinitrotoluene	ug/L	0.05	0.005	< 5	< 5	PR< 500	< 5	-
Fluoranthene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Fluorene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Hexachlorobenzene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Hexachloro-1,3-butadiene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Hexachlorocyclopentadiene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Hexachloroethane	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Indeno(1,2,3-cd)pyrene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Isophorone	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
2-Methylnaphthalene	ug/L	-	-	< 5	< 5	**PR 940**	< 5	-
o-Cresol	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
p-Cresol	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
n-Nitrosodi-n-propylamine	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
n-Nitrosodiphenylamine	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Naphthalene	ug/L	40	8	< 5	< 5	[redacted]	< 5	-
2-Nitroaniline	ug/L	-	-	< 20	< 20	PR< 2000	< 20	-
3-Nitroaniline	ug/L	-	-	< 20	< 20	PR< 2000	< 20	-
4-Nitroaniline	ug/L	-	-	< 20	< 20	PR< 2000	< 20	-
Nitrobenzene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
2-Nitrophenol	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
4-Nitrophenol	ug/L	-	-	< 20	< 20	PR< 2000	< 20	-
Pentachlorophenol	ug/L	1	0.1	< 20	< 20	PR< 2000	< 20	-
Phenanthrene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
Phenol	ug/L	6000	1200	< 5	< 5	PR< 500	< 5	-
Pyrene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
1,2,4-Trichlorobenzene	ug/L	-	-	< 5	< 5	PR< 500	< 5	-
2,4,5-Trichlorophenol	ug/L	-	-	< 50	< 50	PR< 5000	< 50	-
2,4,6-Trichlorophenol	ug/L	-	-	< 5	< 5	PR< 500	< 5	-

PR = Surrogate results are unavailable due to positive results in the sample.
DP = Samples analyzed in duplicate to confirm results.
EB = Equipment Blank
TB = Trip Blank
Bold values exceed the method detection limit.

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140 Groundwater Quality Standards		TB	TB
Sample Identification:				E99937	E99938
Date Sampled:				10/13/94	10/13/94
Sampled By:		Enforcement Standard	Preventative Action Limit	ETCO	ETCO
Analyzed By:				ETCO	ETCO
Comments:				#2	#3
Parameters	***Units***				
Cyanide, amenable	ug/L	200	40	-	-
Cyanide, total	ug/L	200	40	-	-
Sulfate	ug/L	250000	125000	-	-
Arsenic, dissolved	ug/L	50	5	-	-
Barium, dissolved	ug/L	2000	400	-	-
Cadmium, dissolved	ug/L	5	0.5	-	-
Chromium, dissolved	ug/L	100	10	-	-
Copper, dissolved	ug/L	1300	130	-	-
Lead, dissolved	ug/L	15	1.5	-	-
Mercury, dissolved	ug/L	2	0.2	-	-
Nickel, dissolved	ug/L	-	-	-	-
Selenium, dissolved	ug/L	50	10	-	-
Silver, dissolved	ug/L	50	10	-	-
Zinc, dissolved	ug/L	5000	2500	-	-
USEPA-8260 Scan	***Units***				
Acetone	ug/L	1000	200	< 50	< 50
Benzene	ug/L	5	0.5	< 1	< 1
Dichlorobromomethane	ug/L	215	43	< 1	< 1
Bromoform	ug/L	4.4	0.44	< 1	< 1
Bromomethane	ug/L	-	-	< 1	< 1
Methyl ethyl ketone	ug/L	460	90	< 50	< 50
Carbon disulfide	ug/L	-	-	< 50	< 50
Carbon tetrachloride	ug/L	5	0.5	< 1	< 1
Chlorobenzene	ug/L	-	-	< 1	< 1
Chloroethane	ug/L	400	80	< 1	< 1
2-Chloroethylvinyl ether	ug/L	-	-	< 10	< 10
Chloroform	ug/L	6	0.6	< 1	< 1
Chloromethane	ug/L	-	-	< 1	< 1
Dibromochloromethane	ug/L	215	43	< 1	< 1
1,1-Dichloroethane	ug/L	850	85	< 1	< 1
1,2-Dichloroethane	ug/L	5	0.5	< 1	< 1
1,1-Dichloroethylene	ug/L	7	0.7	< 1	< 1
1,2-Dichloroethylene	ug/L	70(cis)	7(cis)	< 1	< 1
1,2-Dichloropropane	ug/L	5	0.5	< 1	< 1
cis-1,3-Dichloropropene	ug/L	-	-	< 1	< 1
trans-1,3-Dichloropropene	ug/L	-	-	< 1	< 1
Ethylbenzene	ug/L	700	140	< 1	< 1
2-Hexanone	ug/L	-	-	< 50	< 50
Methyl isobutyl ketone	ug/L	-	-	< 50	< 50
Methylene chloride	ug/L	150	15	< 1	1
Styrene	ug/L	-	-	< 1	< 1

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140 Groundwater Quality Standards		TB	TB
Sample Identification:				E99937	E99938
Date Sampled:				10/13/94	10/13/94
Sampled By:		Enforcement Standard	Preventative Action Limit	ETCO	ETCO
Analyzed By:				ETCO	ETCO
Comments:				#2	#3
USEPA-8260 Scan (cont.)	***Units***				
1,1,2,2-Tetrachloroethane	ug/L	-	-	< 1	< 1
Tetrachloroethylene	ug/L	5	0.5	< 1	< 1
1,1,1-Trichloroethane	ug/L	200	40	< 1	< 1
1,1,2-Trichloroethane	ug/L	0.6	0.06	< 1	< 1
Trichloroethylene	ug/L	5	0.5	< 1	< 1
Toluene	ug/L	343	68.6	< 1	< 1
Vinyl acetate	ug/L	-	-	< 1	< 1
Vinyl chloride	ug/L	0.2	0.02	< 1	< 1
Xylene, total	ug/L	620	124	< 3	< 3
BNA-8270 Scan	***Units***				
Acenaphthene	ug/L	-	-	-	-
Acenaphthylene	ug/L	-	-	-	-
Anthracene	ug/L	-	-	-	-
Benzo(a)anthracene	ug/L	-	-	-	-
Benzo(a)pyrene	ug/L	0.003	0.0003	-	-
Benzo(b and/or k)fluoranthene	ug/L	-	-	-	-
Benzo(ghi)perylene	ug/L	-	-	-	-
Benzoic acid	ug/L	-	-	-	-
Benzyl alcohol	ug/L	-	-	-	-
Bis(2-chloroethoxy)methane	ug/L	-	-	-	-
Bis(2-chloroethyl)ether	ug/L	-	-	-	-
Bis(2-chloroisopropyl)ether	ug/L	-	-	-	-
Bis(2-ethyl hexyl)phthalate	ug/L	3	0.3	-	-
4-Bromodiphenyl ether	ug/L	-	-	-	-
Butyl benzyl phthalate	ug/L	-	-	-	-
p-Chloro-m-cresol	ug/L	-	-	-	-
4-Chloroaniline	ug/L	-	-	-	-
2-Chloronaphthalene	ug/L	-	-	-	-
2-Chlorophenol	ug/L	-	-	-	-
4-Chlorodiphenyl ether	ug/L	-	-	-	-
Chrysene	ug/L	-	-	-	-
Di-n-butyl phthalate	ug/L	-	-	-	-
Di-n-octyl phthalate	ug/L	-	-	-	-
Dibenz(a,h)anthracene	ug/L	-	-	-	-
Dibenzofuran	ug/L	-	-	-	-
1,2-Dichlorobenzene	ug/L	600	60	-	-
1,3-Dichlorobenzene	ug/L	1250	125	-	-
1,4-Dichlorobenzene	ug/L	75	15	-	-
3,3'-Dichlorobenzidine	ug/L	-	-	-	-
2,4-Dichlorophenol	ug/L	-	-	-	-
Diethyl phthalate	ug/L	-	-	-	-

Table 4
Summary of Analytical Data for Groundwater Results
Wisconsin Fuel & Light
Manitowoc Facility
Manitowoc, Wisconsin
(Units as Given)

Site Identification:		Wisconsin NR-140 Groundwater Quality Standards		TB	TB
Sample Identification:				E99937	E99938
Date Sampled:				10/13/94	10/13/94
Sampled By:		Enforcement Standard	Preventative Action Limit	ETCO	ETCO
Analyzed By:				ETCO	ETCO
Comments:				#2	#3
BNA-8270 Scan (cont.)	***Units***				
Dimethyl phthalate	ug/L	-	-	-	-
2,4-Dimethylphenol	ug/L	-	-	-	-
4,6-Dinitro-o-cresol	ug/L	-	-	-	-
2,4-Dinitrophenol	ug/L	-	-	-	-
2,4-Dinitrotoluene	ug/L	0.05	0.005	-	-
2,6-Dinitrotoluene	ug/L	0.05	0.005	-	-
Fluoranthene	ug/L	-	-	-	-
Fluorene	ug/L	-	-	-	-
Hexachlorobenzene	ug/L	-	-	-	-
Hexachloro-1,3-butadiene	ug/L	-	-	-	-
Hexachlorocyclopentadiene	ug/L	-	-	-	-
Hexachloroethane	ug/L	-	-	-	-
Indeno(1,2,3-cd)pyrene	ug/L	-	-	-	-
Isophorone	ug/L	-	-	-	-
2-Methylnaphthalene	ug/L	-	-	-	-
o-Cresol	ug/L	-	-	-	-
p-Cresol	ug/L	-	-	-	-
n-Nitrosodi-n-propylamine	ug/L	-	-	-	-
n-Nitrosodiphenylamine	ug/L	-	-	-	-
Naphthalene	ug/L	40	8	-	-
2-Nitroaniline	ug/L	-	-	-	-
3-Nitroaniline	ug/L	-	-	-	-
4-Nitroaniline	ug/L	-	-	-	-
Nitrobenzene	ug/L	-	-	-	-
2-Nitrophenol	ug/L	-	-	-	-
4-Nitrophenol	ug/L	-	-	-	-
Pentachlorophenol	ug/L	1	0.1	-	-
Phenanthrene	ug/L	-	-	-	-
Phenol	ug/L	6000	1200	-	-
Pyrene	ug/L	-	-	-	-
1,2,4-Trichlorobenzene	ug/L	-	-	-	-
2,4,5-Trichlorophenol	ug/L	-	-	-	-
2,4,6-Trichlorophenol	ug/L	-	-	-	-

PR = Surrogate results are unavailable due to positive results in the sample.
DP = Samples analyzed in duplicate to confirm results.
EB = Equipment Blank
TB = Trip Blank
Bold values exceed the method detection limit.

INTERIM ENVIRONMENTAL SITE CLOSURE FOR FORMER COAL GAS MANUFACTURING PLANT MANITOWOC, WISCONSIN

Prepared for:

Wisconsin Fuel & Light
Manitowoc, Wisconsin

Prepared by:

EARTH TECH
5555 Glenwood Hills Parkway
Grand Rapids, Michigan 49588-0874

March 1995

22574

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-1	MW-1	MW-1	MW-1(dup
Sample Identification:				63126-1031	71733-5587	81865-9664	81865-966:
Date Sampled:				6/13/96	4/3/97	4/16/98	4/16/98
Sampled By:		Enforcement Standard	Preventive Action Limit	MP	Horizon	Horizon	Horizon
Analyzed By:				Anatech	CT&E	CT&E	CT&E
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	ND0.005	**0.009**	**0.008**	ND0.005
Cyanide, total	mg/L	0.2	0.04	**0.008**	**0.009**	**0.008**	**0.009**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	ND1	ND1	ND1	ND1
Ethylbenzene	ug/L	700	140	ND1	ND1	ND1	ND1
Methyl tertiary butyl ether	ug/L	60	12	ND1	ND1	ND1	ND1
Toluene	ug/L	1000	200	ND1	ND1	ND1	ND1
1,2,4-Trimethylbenzene	ug/L	480	96	ND1	ND1	ND1	ND1
1,3,5-Trimethylbenzene	ug/L	480	96	ND1	ND1	ND1	ND1
Xylene, total	ug/L	10000	1000	ND3	ND3	ND3	ND3
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	ND5	ND5	ND5
Anthracene	ug/L	3000	600	ND5	ND5	ND5	ND5
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	ND5	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	ND5	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	ND5	ND5
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	ND5	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	ND5	ND5	ND5
Carbazole	ug/L	-	-	ND5	ND5	ND5	ND5
Chrysene	ug/L	0.2	0.02	ND5	ND5	ND5	ND5
Dibenzofuran	ug/L	-	-	ND5	ND5	ND5	ND5
2,4-Dimethylphenol	ug/L	-	-	ND5	ND5	ND5	ND5
Fluoranthene	ug/L	400	80	ND5	ND5	**5**	ND5
Fluorene	ug/L	400	80	ND5	ND5	ND5	ND5
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	ND5	ND5
2-Methyl naphthalene	ug/L	-	-	ND5	ND5	ND5	ND5
2-Methylphenol	ug/L	-	-	ND5	ND5	ND5	ND5
3 & 4-Methylphenol	ug/L	-	-	ND10	ND10	ND10	ND10
Naphthalene	ug/L	40	8	ND5	ND5	ND5	ND5
Phenanthrene	ug/L	-	-	ND5	ND5	ND5	ND5
Phenol	ug/L	6000	1200	ND5	ND5	ND5	ND5
Pyrene	ug/L	250	50	ND5	ND5	ND5	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-1	MW-2	MW-2	MW-2
Sample Identification:				219219	63126-1029	71733-5588	81865-9660
Date Sampled:				3/24/99	6/13/96	4/3/97	4/15/98
Sampled By:		Enforcement	Preventive	Horizon	MP	Horizon	Horizon
Analyzed By:		Standard	Action Limit	TriMatrix	Anatech	CT&E	CT&E
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	<0.05	ND0.005	**0.26**	**0.025**
Cyanide, total	mg/L	0.2	0.04	<0.05	**0.083**	**0.26**	**0.290**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	<1.0	ND1	ND1	ND1
Ethylbenzene	ug/L	700	140	<1.0	ND1	ND1	ND1
Methyl tertiary butyl ether	ug/L	60	12	<50	ND1	ND1	ND1
Toluene	ug/L	1000	200	<1.0	ND1	ND1	ND1
1,2,4-Trimethylbenzene	ug/L	480	96	<1.0	ND1	ND1	ND1
1,3,5-Trimethylbenzene	ug/L	480	96	<1.0	ND1	ND1	ND1
Xylene, total	ug/L	10000	1000	<3.0	ND3	ND3	ND3
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	<1.0	ND5	ND5	ND5
Anthracene	ug/L	3000	600	<1.0	ND5	ND5	ND5
Benzo(a)anthracene	ug/L	-	-	**3.4**	ND5	ND5	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	**3.6**	ND5	ND5	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	**4.3**	ND5	ND5	ND5
Benzo(k)fluoranthene	ug/L	-	-	**3.1**	ND5	ND5	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	<5.0	ND5	ND5	ND5
Carbazole	ug/L	-	-	---	ND5	ND5	ND5
Chrysene	ug/L	0.2	0.02	**4.1**	ND5	ND5	ND5
Dibenzofuran	ug/L	-	-	<5.0	ND5	ND5	ND5
2,4-Dimethylphenol	ug/L	-	-	<5.0	ND5	ND5	ND5
Fluoranthene	ug/L	400	80	**9.9**	ND5	ND5	ND5
Fluorene	ug/L	400	80	<1.0	ND5	ND5	ND5
Indeno(123-cd)pyrene	ug/L	-	-	**2.3**	ND5	ND5	ND5
2-Methyl naphthalene	ug/L	-	-	<5.0	ND5	ND5	ND5
2-Methylphenol	ug/L	-	-	<5.0	ND5	ND5	ND5
3 & 4-Methylphenol	ug/L	-	-	<5.0	ND10	ND10	ND10
Naphthalene	ug/L	40	8	<1.0	ND5	ND5	ND5
Phenanthrene	ug/L	-	-	<5.0	ND5	ND5	ND5
Phenol	ug/L	6000	1200	<50	ND5	ND5	ND5
Pyrene	ug/L	250	50	<5.0	ND5	ND5	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-2	MW-5	MW-5	MW-6
Sample Identification:				219207	63126-1032	71733-5586	63126-1027
Date Sampled:				3/23/99	6/13/96	4/3/97	6/13/96
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	MP	Horizon	MP
Analyzed By:				TriMatrix	Anatech	CT&E	Anatech
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	<0.05	ND0.005	ND0.005	**0.062**
Cyanide, total	mg/L	0.2	0.04	**0.29**	ND0.005	**F 0.004**	**0.27**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	<1.0	ND1	ND1	ND1
Ethylbenzene	ug/L	700	140	<1.0	ND1	ND1	ND1
Methyl tertiary butyl ether	ug/L	60	12	<50	ND1	ND1	ND1
Toluene	ug/L	1000	200	<1.0	ND1	ND1	ND1
1,2,4-Trimethylbenzene	ug/L	480	96	<1.0	ND1	ND1	ND1
1,3,5-Trimethylbenzene	ug/L	480	96	<1.0	ND1	ND1	ND1
Xylene, total	ug/L	10000	1000	<3.0	ND3	ND3	ND3
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	**2.8**	ND5	ND5	ND5
Anthracene	ug/L	3000	600	<1.0	ND5	ND5	ND5
Benzo(a)anthracene	ug/L	-	-	<1.0	ND5	ND5	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	<1.0	ND5	ND5	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	<1.0	ND5	ND5	ND5
Benzo(k)fluoranthene	ug/L	-	-	<1.0	ND5	ND5	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	<5.0	ND5	5	ND5
Carbazole	ug/L	-	-	---	ND5	ND5	ND5
Chrysene	ug/L	0.2	0.02	<1.0	ND5	ND5	ND5
Dibenzofuran	ug/L	-	-	<5.0	ND5	ND5	ND5
2,4-Dimethylphenol	ug/L	-	-	<5.0	ND5	ND5	ND5
Fluoranthene	ug/L	400	80	<1.0	ND5	ND5	ND5
Fluorene	ug/L	400	80	<1.0	ND5	ND5	ND5
Indeno(123-cd)pyrene	ug/L	-	-	<1.0	ND5	ND5	ND5
2-Methyl naphthalene	ug/L	-	-	<5.0	ND5	ND5	ND5
2-Methylphenol	ug/L	-	-	<5.0	ND5	ND5	ND5
3 & 4-Methylphenol	ug/L	-	-	<5.0	ND10	ND10	ND10
Naphthalene	ug/L	40	8	<1.0	ND5	ND5	ND5
Phenanthrene	ug/L	-	-	<1.0	ND5	ND5	ND5
Phenol	ug/L	6000	1200	<5.0	ND5	ND5	ND5
Pyrene	ug/L	250	50	<1.0	ND5	ND5	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-6	MW-6	MW-6	MW-7
Sample Identification:				71733-5592	81865-9663	219206	63126-1034
Date Sampled:				4/3/97	4/15/98	3/23/99	6/12/96
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	Horizon	Horizon	MP
Analyzed By:				CT&E	CT&E	TriMatrix	Anatech
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	**0.57**	**D 0.10**	<0.05	**0.24**
Cyanide, total	mg/L	0.2	0.04	**0.57**	**D 1.0**	**0.11**	**0.34**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	ND1	ND1	<1.0	ND1
Ethylbenzene	ug/L	700	140	ND1	ND1	<1.0	ND1
Methyl tertiary butyl ether	ug/L	60	12	ND1	ND1	<50	ND1
Toluene	ug/L	1000	200	ND1	ND1	<1.0	ND1
1,2,4-Trimethylbenzene	ug/L	480	96	ND1	ND1	<1.0	ND1
1,3,5-Trimethylbenzene	ug/L	480	96	ND1	ND1	<1.0	ND1
Xylene, total	ug/L	10000	1000	ND3	ND3	<3.0	ND3
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	ND5	<1.0	ND5
Anthracene	ug/L	3000	600	ND5	ND5	<1.0	ND5
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	<1.0	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	<1.0	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	**B 6**	ND5	<5.0	ND5
Carbazole	ug/L	-	-	ND5	ND5	---	ND5
Chrysene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Dibenzofuran	ug/L	-	-	ND5	ND5	<5.0	ND5
2,4-Dimethylphenol	ug/L	-	-	ND5	ND5	<5.0	ND5
Fluoranthene	ug/L	400	80	ND5	ND5	<1.0	ND5
Fluorene	ug/L	400	80	ND5	ND5	<1.0	ND5
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	<1.0	ND5
2-Methyl naphthalene	ug/L	-	-	ND5	ND5	<5.0	ND5
2-Methylphenol	ug/L	-	-	ND5	ND5	<5.0	ND5
3 & 4-Methylphenol	ug/L	-	-	ND10	ND10	<5.0	ND10
Naphthalene	ug/L	40	8	ND5	ND5	<1.0	ND5
Phenanthrene	ug/L	-	-	ND5	ND5	<1.0	ND5
Phenol	ug/L	6000	1200	ND5	ND5	<5.0	ND5
Pyrene	ug/L	250	50	ND5	ND5	<1.0	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-7	MW-7	MW-7	MW-8
Sample Identification:				71733-5580	81865-9667	219215	63126-1033
Date Sampled:				4/2/97	4/14/98	3/23/99	6/12/96
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	Horizon	Horizon	MP
Analyzed By:				CT&E	CT&E	TriMatrix	Anatech
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	**R 0.40**	**0.120**	**0.09**	**0.48**
Cyanide, total	mg/L	0.2	0.04	**0.40**	**0.390**	**0.46**	**0.49**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	ND1	ND1	<1.0	ND1
Ethylbenzene	ug/L	700	140	ND1	ND1	<1.0	ND1
Methyl tertiary butyl ether	ug/L	60	12	ND1	ND1	<50	ND1
Toluene	ug/L	1000	200	ND1	ND1	<1.0	ND1
1,2,4-Trimethylbenzene	ug/L	480	96	ND1	ND1	<1.0	ND1
1,3,5-Trimethylbenzene	ug/L	480	96	ND1	ND1	<1.0	ND1
Xylene, total	ug/L	10000	1000	ND3	ND3	<3.0	ND3
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	ND5	<1.0	ND5
Anthracene	ug/L	3000	600	ND5	ND5	<1.0	ND5
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	<1.0	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	<1.0	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	ND5	<5.0	ND5
Carbazole	ug/L	-	-	ND5	ND5	---	ND5
Chrysene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Dibenzofuran	ug/L	-	-	ND5	ND5	<5.0	ND5
2,4-Dimethylphenol	ug/L	-	-	ND5	ND5	<5.0	ND5
Fluoranthene	ug/L	400	80	ND5	ND5	<1.0	ND5
Fluorene	ug/L	400	80	ND5	ND5	<1.0	ND5
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	<1.0	ND5
2-Methyl naphthalene	ug/L	-	-	ND5	ND5	<5.0	ND5
2-Methylphenol	ug/L	-	-	ND5	ND5	<5.0	ND5
3 & 4-Methylphenol	ug/L	-	-	ND10	ND10	<5.0	ND10
Naphthalene	ug/L	40	8	ND5	ND5	<1.0	ND5
Phenanthrene	ug/L	-	-	ND5	ND5	<1.0	ND5
Phenol	ug/L	6000	1200	ND5	ND5	<5.0	ND5
Pyrene	ug/L	250	50	ND5	ND5	<1.0	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-8	MW-8	MW-8	MW-9
Sample Identification:				71733-5582	81865-9666	219214	63126-1035
Date Sampled:				4/2/97	4/14/98	3/23/99	6/12/96
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	Horizon	Horizon	MP
Analyzed By:				CT&E	CT&E	TriMatrix	Anatech
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	**R HT 0.33**	**D 0.18**	**0.50**	**0.10**
Cyanide, total	mg/L	0.2	0.04	**HT 0.33**	**D 0.63**	**0.13**	**0.16**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	ND1	ND1	<1.0	**35**
Ethylbenzene	ug/L	700	140	ND1	ND1	<1.0	ND1
Methyl tertiary butyl ether	ug/L	60	12	ND1	ND1	<50	ND1
Toluene	ug/L	1000	200	ND1	ND1	<1.0	ND1
1,2,4-Trimethylbenzene	ug/L	480	96	ND1	ND1	<1.0	ND1
1,3,5-Trimethylbenzene	ug/L	480	96	ND1	ND1	<1.0	ND1
Xylene, total	ug/L	10000	1000	ND3	ND3	<3.0	ND3
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	ND5	<1.0	ND5
Anthracene	ug/L	3000	600	ND5	ND5	<1.0	ND5
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	<1.0	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	<1.0	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	ND5	<5.0	ND5
Carbazole	ug/L	-	-	ND5	ND5	---	ND5
Chrysene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Dibenzofuran	ug/L	-	-	ND5	ND5	<5.0	ND5
2,4-Dimethylphenol	ug/L	-	-	ND5	ND5	<5.0	ND5
Fluoranthene	ug/L	400	80	ND5	ND5	<1.0	ND5
Fluorene	ug/L	400	80	ND5	ND5	<1.0	ND5
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	<1.0	ND5
2-Methyl naphthalene	ug/L	-	-	ND5	ND5	<5.0	ND5
2-Methylphenol	ug/L	-	-	ND5	ND5	<5.0	ND5
3 & 4-Methylphenol	ug/L	-	-	ND10	ND10	<5.0	ND10
Naphthalene	ug/L	40	8	ND5	ND5	<1.0	ND5
Phenanthrene	ug/L	-	-	ND5	ND5	<1.0	ND5
Phenol	ug/L	6000	1200	ND5	ND5	<5.0	ND5
Pyrene	ug/L	250	50	ND5	ND5	<1.0	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-9	MW-9	MW-9	MW-10
Sample Identification:				71733-5581	81865-9668	219216	63126-1039
Date Sampled:				4/2/97	4/14/98	3/23/99	6/12/96
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	Horizon	Horizon	MP
Analyzed By:				CT&E	CT&E	TriMatrix	Anatech
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	**R 0.18**	ND0.005	<0.05	**0.13**
Cyanide, total	mg/L	0.2	0.04	**0.18**	**0.210**	**0.36**	**0.13**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	**24**	ND1	**2.9**	ND1
Ethylbenzene	ug/L	700	140	ND1	ND1	<1.0	ND1
Methyl tertiary butyl ether	ug/L	60	12	ND1	ND1	<50	**11**
Toluene	ug/L	1000	200	ND1	ND1	<1.0	ND1
1,2,4-Trimethylbenzene	ug/L	480	96	ND1	ND1	<1.0	ND1
1,3,5-Trimethylbenzene	ug/L	480	96	ND1	ND1	<1.0	ND1
Xylene, total	ug/L	10000	1000	ND3	ND3	<3.0	**4**
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	ND5	<1.0	ND5
Anthracene	ug/L	3000	600	ND5	ND5	<1.0	ND5
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	<1.0	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	<1.0	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	ND5	<5.0	ND5
Carbazole	ug/L	-	-	ND5	ND5	---	ND5
Chrysene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Dibenzofuran	ug/L	-	-	ND5	ND5	<5.0	ND5
2,4-Dimethylphenol	ug/L	-	-	ND5	ND5	<5.0	ND5
Fluoranthene	ug/L	400	80	ND5	ND5	<1.0	ND5
Fluorene	ug/L	400	80	ND5	ND5	<1.0	ND5
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	<1.0	ND5
2-Methyl naphthalene	ug/L	-	-	ND5	ND5	<5.0	ND5
2-Methylphenol	ug/L	-	-	ND5	ND5	<5.0	ND5
3 & 4-Methylphenol	ug/L	-	-	ND10	ND10	<5.0	ND10
Naphthalene	ug/L	40	8	ND5	ND5	<1.0	ND5
Phenanthrene	ug/L	-	-	ND5	ND5	<1.0	ND5
Phenol	ug/L	6000	1200	ND5	ND5	<5.0	ND5
Pyrene	ug/L	250	50	ND5	ND5	<1.0	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-10	MW-10	MW-10	MW-11
Sample Identification:				71733-5584	81865-9670	219217	63126-1036
Date Sampled:				4/2/97	4/14/98	3/24/99	6/12/96
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	Horizon	Horizon	MP
Analyzed By:				CT&E	CT&E	TriMatrix	Anatech
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	**R 0.078**	**0.034**	<0.05	**0.094**
Cyanide, total	mg/L	0.2	0.04	**0.079**	**0.160**	**0.21**	**0.10**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	**D 1000**	**D 150**	<1.0	**470**
Ethylbenzene	ug/L	700	140	D ND10	D ND5	<1.0	**89**
Methyl tertiary butyl ether	ug/L	60	12	D ND10	D ND5	<50	ND5
Toluene	ug/L	1000	200	D ND10	D ND5	<1.0	**21**
1,2,4-Trimethylbenzene	ug/L	480	96	D ND10	**D 15**	**11**	**47**
1,3,5-Trimethylbenzene	ug/L	480	96	D ND10	D ND5	**1.2**	ND5
Xylene, total	ug/L	10000	1000	**D 320**	**D 53**	<3.0	**83**
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	ND5	<1.0	---
Anthracene	ug/L	3000	600	ND5	ND5	<1.0	---
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	<1.0	---
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	<1.0	---
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	<1.0	---
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	<1.0	---
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	ND5	<5.0	---
Carbazole	ug/L	-	-	ND5	ND5	---	---
Chrysene	ug/L	0.2	0.02	ND5	ND5	<1.0	---
Dibenzofuran	ug/L	-	-	ND5	ND5	<5.0	---
2,4-Dimethylphenol	ug/L	-	-	ND5	ND5	<5.0	---
Fluoranthene	ug/L	400	80	ND5	ND5	<1.0	---
Fluorene	ug/L	400	80	ND5	ND5	<1.0	---
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	<1.0	---
2-Methyl naphthalene	ug/L	-	-	ND5	ND5	<5.0	---
2-Methylphenol	ug/L	-	-	ND5	ND5	<5.0	---
3 & 4-Methylphenol	ug/L	-	-	ND10	ND10	<5.0	---
Naphthalene	ug/L	40	8	ND5	ND5	<1.0	---
Phenanthrene	ug/L	-	-	ND5	ND5	<1.0	---
Phenol	ug/L	6000	1200	**21**	**5**	<5.0	---
Pyrene	ug/L	250	50	ND5	ND5	<1.0	---

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-11B	MW-11P	MW-11	MW-11
Sample Identification:				63126-1037	63126-1038	71733-5583	81865-9669
Date Sampled:				6/12/96	6/12/96	4/2/97	4/14/98
Sampled By:		Enforcement Standard	Preventive Action Limit	MP	MP	Horizon	Horizon
Analyzed By:				Anatech	Anatech	CT&E	CT&E
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	---	---	**R 0.12**	ND0.005
Cyanide, total	mg/L	0.2	0.04	---	---	**0.12**	**0.280**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	---	---	**5**	ND1
Ethylbenzene	ug/L	700	140	---	---	ND1	ND1
Methyl tertiary butyl ether	ug/L	60	12	---	---	ND1	ND1
Toluene	ug/L	1000	200	---	---	ND1	ND1
1,2,4-Trimethylbenzene	ug/L	480	96	---	---	ND1	ND1
1,3,5-Trimethylbenzene	ug/L	480	96	---	---	ND1	ND1
Xylene, total	ug/L	10000	1000	---	---	ND3	ND3
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	ND5	ND5	ND5
Anthracene	ug/L	3000	600	ND5	ND5	ND5	ND5
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	ND5	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	ND5	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	ND5	ND5
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	ND5	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	ND5	ND5	ND5
Carbazole	ug/L	-	-	ND5	**6**	ND5	ND5
Chrysene	ug/L	0.2	0.02	ND5	ND5	ND5	ND5
Dibenzofuran	ug/L	-	-	ND5	ND5	ND5	ND5
2,4-Dimethylphenol	ug/L	-	-	ND5	ND5	ND5	ND5
Fluoranthene	ug/L	400	80	ND5	ND5	ND5	ND5
Fluorene	ug/L	400	80	ND5	ND5	ND5	ND5
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	ND5	ND5
2-Methyl naphthalene	ug/L	-	-	ND5	ND5	ND5	ND5
2-Methylphenol	ug/L	-	-	ND5	ND5	ND5	ND5
3 & 4-Methylphenol	ug/L	-	-	ND10	ND10	ND10	ND10
Naphthalene	ug/L	40	8	ND5	ND5	ND5	ND5
Phenanthrene	ug/L	-	-	ND5	ND5	ND5	ND5
Phenol	ug/L	6000	1200	ND5	**10**	ND5	ND5
Pyrene	ug/L	250	50	ND5	ND5	ND5	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-11	MW-12	MW-12
Sample Identification:				219218	63126-1042	71733-5594
Date Sampled:				3/24/99	6/12/96	4/4/97
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	MP	Horizon
Analyzed By:				TriMatrix	Anatech	CT&E
Parameters	***Units***					
Cyanide, amenable	mg/L	0.2	0.04	<0.05	**0.13**	**0.25**
Cyanide, total	mg/L	0.2	0.04	**0.33**	**0.20**	**0.25**
WI PVOC Scan (USEPA-8020)	***Units***					
Benzene	ug/L	5	0.5	<1.0	**330**	**D 1500**
Ethylbenzene	ug/L	700	140	<1.0	**99**	**D 1700**
Methyl tertiary butyl ether	ug/L	60	12	<50	ND1	D ND20
Toluene	ug/L	1000	200	<1.0	**25**	**D 110**
1,2,4-Trimethylbenzene	ug/L	480	96	<1.0	**95**	**D 310**
1,3,5-Trimethylbenzene	ug/L	480	96	<1.0	**42**	**D 73**
Xylene, total	ug/L	10000	1000	**5.0**	**500**	**D 1600**
USEPA-8270 Scan	***Units***					
Acenaphthylene	ug/L	-	-	<1.0	ND5	**23**
Anthracene	ug/L	3000	600	<1.0	ND5	ND5
Benzo(a)anthracene	ug/L	-	-	<1.0	ND5	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	<1.0	ND5	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	<1.0	ND5	ND5
Benzo(k)fluoranthene	ug/L	-	-	<1.0	ND5	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	<5.0	ND5	ND5
Carbazole	ug/L	-	-	---	ND5	ND5
Chrysene	ug/L	0.2	0.02	<1.0	ND5	ND5
Dibenzofuran	ug/L	-	-	<5.0	ND5	ND5
2,4-Dimethylphenol	ug/L	-	-	<5.0	ND5	**20**
Fluoranthene	ug/L	400	80	<1.0	ND5	ND5
Fluorene	ug/L	400	80	<1.0	ND5	ND5
Indeno(123-cd)pyrene	ug/L	-	-	<1.0	ND5	ND5
2-Methyl naphthalene	ug/L	-	-	<5.0	ND5	**64**
2-Methylphenol	ug/L	-	-	<5.0	ND5	ND5
3 & 4-Methylphenol	ug/L	-	-	<5.0	ND10	ND10
Naphthalene	ug/L	40	8	<1.0	ND5	**D 2400**
Phenanthrene	ug/L	-	-	<1.0	ND5	ND5
Phenol	ug/L	6000	1200	<5.0	ND5	ND5
Pyrene	ug/L	250	50	<1.0	ND5	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-12 (duplicate)	MW-12	MW-12
Sample Identification:				71733-5598	81865-9671	219210
Date Sampled:				4/4/97	4/14/98	3/23/99
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	Horizon	Horizon
Analyzed By:				CT&E	CT&E	TriMatrix
Parameters	***Units***					
Cyanide, amenable	mg/L	0.2	0.04	**0.25**	**D 0.2**	<0.05
Cyanide, total	mg/L	0.2	0.04	**0.25**	**D 1.8**	**0.84**
WI PVOC Scan (USEPA-8020)	***Units***					
Benzene	ug/L	5	0.5	**D 1500**	ND1	<1.0
Ethylbenzene	ug/L	700	140	**D 1600**	ND1	<1.0
Methyl tertiary butyl ether	ug/L	60	12	D ND20	ND1	<50
Toluene	ug/L	1000	200	**D 100**	ND1	<1.0
1,2,4-Trimethylbenzene	ug/L	480	96	**D 310**	ND1	<1.0
1,3,5-Trimethylbenzene	ug/L	480	96	**D 75**	ND1	<1.0
Xylene, total	ug/L	10000	1000	**D 1600**	ND3	<3.0
USEPA-8270 Scan	***Units***					
Acenaphthylene	ug/L	-	-	**D 47**	ND5	<1.0
Anthracene	ug/L	3000	600	D ND25	ND5	<1.0
Benzo(a)anthracene	ug/L	-	-	D ND25	ND5	<1.0
Benzo(a)pyrene	ug/L	0.2	0.02	D ND25	ND5	<1.0
Benzo(b)fluoranthene	ug/L	0.2	0.02	D ND25	ND5	<1.0
Benzo(k)fluoranthene	ug/L	-	-	D ND25	ND5	<1.0
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	D ND25	ND5	<5.0
Carbazole	ug/L	-	-	D ND25	ND5	---
Chrysene	ug/L	0.2	0.02	D ND25	ND5	<1.0
Dibenzofuran	ug/L	-	-	D ND25	ND5	<5.0
2,4-Dimethylphenol	ug/L	-	-	D ND25	ND5	<5.0
Fluoranthene	ug/L	400	80	D ND25	ND5	<1.0
Fluorene	ug/L	400	80	D ND25	ND5	<1.0
Indeno(123-cd)pyrene	ug/L	-	-	D ND25	ND5	<1.0
2-Methyl naphthalene	ug/L	-	-	**D 94**	ND5	<5.0
2-Methylphenol	ug/L	-	-	D ND25	ND5	<5.0
3 & 4-Methylphenol	ug/L	-	-	D ND50	ND10	<5.0
Naphthalene	ug/L	40	8	**D 4100**	ND5	<1.0
Phenanthrene	ug/L	-	-	D ND25	ND5	<1.0
Phenol	ug/L	6000	1200	D ND25	ND5	<5.0
Pyrene	ug/L	250	50	D ND25	ND5	<1.0

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-12D	MW-12D	MW-12D
Sample Identification:				71733-5595	81865-9672	219211
Date Sampled:				4/4/97	4/14/98	3/23/99
Sampled By:		Enforcement	Preventive	Horizon	Horizon	Horizon
Analyzed By:		Standard	Action Limit	CT&E	CT&E	TriMatrix
Parameters	***Units***					
Cyanide, amenable	mg/L	0.2	0.04	**0.42**	ND0.005	**0.07**
Cyanide, total	mg/L	0.2	0.04	**0.42**	**0.026**	**0.08**
WI PVOC Scan (USEPA-8020)	***Units***					
Benzene	ug/L	5	0.5	**170**	ND1	<1.0
Ethylbenzene	ug/L	700	140	**55**	ND1	<1.0
Methyl tertiary butyl ether	ug/L	60	12	ND1	**2**	<50
Toluene	ug/L	1000	200	**150**	ND1	<1.0
1,2,4-Trimethylbenzene	ug/L	480	96	**27**	ND1	<1.0
1,3,5-Trimethylbenzene	ug/L	480	96	**8**	ND1	<1.0
Xylene, total	ug/L	10000	1000	**220**	ND3	<3.0
USEPA-8270 Scan	***Units***					
Acenaphthylene	ug/L	-	-	**26**	ND5	<1.0
Anthracene	ug/L	3000	600	ND5	ND5	<1.0
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	<1.0
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	<1.0
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	<1.0
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	<1.0
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	ND5	<5.0
Carbazole	ug/L	-	-	ND5	ND5	---
Chrysene	ug/L	0.2	0.02	ND5	ND5	<1.0
Dibenzofuran	ug/L	-	-	ND5	ND5	<5.0
2,4-Dimethylphenol	ug/L	-	-	**88**	ND5	<5.0
Fluoranthene	ug/L	400	80	ND5	ND5	<1.0
Fluorene	ug/L	400	80	ND5	ND5	<1.0
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	<1.0
2-Methyl naphthalene	ug/L	-	-	**64**	ND5	<5.0
2-Methylphenol	ug/L	-	-	**35**	ND5	<5.0
3 & 4-Methylphenol	ug/L	-	-	**37**	ND10	<5.0
Naphthalene	ug/L	40	8	**D 1000**	ND5	<1.0
Phenanthrene	ug/L	-	-	ND5	ND5	<1.0
Phenol	ug/L	6000	1200	ND5	ND5	<5.0
Pyrene	ug/L	250	50	ND5	ND5	<1.0

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3

Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-12D(dup.)	MW-13	MW-13
Sample Identification:				219212	63126-1041	71733-5593
Date Sampled:				3/23/99	6/12/96	4/4/97
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	MP	Horizon
Analyzed By:				TriMatrix	Anatech	CT&E
Parameters	***Units***					
Cyanide, amenable	mg/L	0.2	0.04	**0.08**	**0.12**	**0.21**
Cyanide, total	mg/L	0.2	0.04	**0.08**	**0.29**	**0.22**
WI PVOC Scan (USEPA-8020)	***Units***					
Benzene	ug/L	5	0.5	<1.0	**280**	**D 450**
Ethylbenzene	ug/L	700	140	<1.0	**420**	**D 350**
Methyl tertiary butyl ether	ug/L	60	12	<50	ND5	D ND5
Toluene	ug/L	1000	200	<1.0	**47**	**D 13**
1,2,4-Trimethylbenzene	ug/L	480	96	<1.0	**11**	**D 70**
1,3,5-Trimethylbenzene	ug/L	480	96	<1.0	**8**	**D 27**
Xylene, total	ug/L	10000	1000	<3.0	**210**	**D 410**
USEPA-8270 Scan	***Units***					
Acenaphthylene	ug/L	-	-	<1.0	ND50	14
Anthracene	ug/L	3000	600	<1.0	ND50	ND5
Benzo(a)anthracene	ug/L	-	-	<1.0	ND50	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	<1.0	ND50	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	<1.0	ND50	ND5
Benzo(k)fluoranthene	ug/L	-	-	<1.0	ND50	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	<5.0	ND50	ND5
Carbazole	ug/L	-	-	---	ND50	ND5
Chrysene	ug/L	0.2	0.02	<1.0	ND50	ND5
Dibenzofuran	ug/L	-	-	<5.0	ND50	ND5
2,4-Dimethylphenol	ug/L	-	-	<5.0	ND50	ND5
Fluoranthene	ug/L	400	80	<1.0	ND50	ND5
Fluorene	ug/L	400	80	<1.0	ND50	ND5
Indeno(123-cd)pyrene	ug/L	-	-	<1.0	ND50	ND5
2-Methyl naphthalene	ug/L	-	-	<5.0	ND50	7
2-Methylphenol	ug/L	-	-	<5.0	ND50	ND5
3 & 4-Methylphenol	ug/L	-	-	<5.0	ND100	ND10
Naphthalene	ug/L	40	8	<1.0	**130**	**D 920**
Phenanthrene	ug/L	-	-	<1.0	ND50	ND5
Phenol	ug/L	6000	1200	<5.0	ND50	ND5
Pyrene	ug/L	250	50	<1.0	ND50	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-13	MW-13	MW-14	MW-14
Sample Identification:				81865-9662	219213	63126-1024	71733-5589
Date Sampled:				4/15/98	3/23/99	6/12/96	4/3/97
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	Horizon	MP	Horizon
Analyzed By:				CT&E	TriMatrix	Anatech	CT&E
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	ND0.005	<0.05	**0.17**	**0.21**
Cyanide, total	mg/L	0.2	0.04	**0.470**	**0.10**	**0.51**	**0.21**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	**D 240**	**3800**	ND500	**D 90**
Ethylbenzene	ug/L	700	140	**D 75**	**6200**	ND500	**D 150**
Methyl tertiary butyl ether	ug/L	60	12	D ND10	<2500	ND500	D ND10
Toluene	ug/L	1000	200	**D 90**	**2300**	**1300**	**D 560**
1,2,4-Trimethylbenzene	ug/L	480	96	**D 120**	**850**	**800**	**D 220**
1,3,5-Trimethylbenzene	ug/L	480	96	**D 58**	**280**	ND500	**D 79**
Xylene, total	ug/L	10000	1000	**D 600**	**5100**	**3500**	**D 1500**
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	<100	---	**D 560**
Anthracene	ug/L	3000	600	ND5	<100	---	**D 210**
Benzo(a)anthracene	ug/L	-	-	ND5	<100	---	**D 150**
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	<100	---	**D 190**
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	<100	---	**D 140**
Benzo(k)fluoranthene	ug/L	-	-	ND5	<100	---	**D 150**
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	<500	---	D ND50
Carbazole	ug/L	-	-	**6**	---	---	**D 110**
Chrysene	ug/L	0.2	0.02	ND5	<100	---	**D 130**
Dibenzofuran	ug/L	-	-	ND5	<500	---	**D 130**
2,4-Dimethylphenol	ug/L	-	-	ND5	<500	---	D ND50
Fluoranthene	ug/L	400	80	ND5	<100	---	**D 420**
Fluorene	ug/L	400	80	ND5	<100	---	**D 220**
Indeno(123-cd)pyrene	ug/L	-	-	ND5	<100	---	**D 60**
2-Methyl naphthalene	ug/L	-	-	ND5	**690**	---	**D 990**
2-Methylphenol	ug/L	-	-	**5**	<500	---	D ND50
3 & 4-Methylphenol	ug/L	-	-	ND10	<500	---	D ND100
Naphthalene	ug/L	40	8	**21**	**15000**	---	**D 4100**
Phenanthrene	ug/L	-	-	ND5	<100	---	**D 630**
Phenol	ug/L	6000	1200	**8**	<500	---	D ND50
Pyrene	ug/L	250	50	ND5	<100	---	**D 370**

Note: Bold values indicate concentrations above the method detection limit.
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The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-14	MW-14	MW-14B	MW-14P
Sample Identification:				81865-9659	219208	63126-1025	63126-1026
Date Sampled:				4/15/98	3/23/99	6/12/96	6/12/96
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	Horizon	MP	MP
Analyzed By:				CT&E	TriMatrix	Anatech	Anatech
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	D ND0.03	<0.05	---	---
Cyanide, total	mg/L	0.2	0.04	**D 0.51**	**0.50**	---	---
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	**D 710**	**920**	---	---
Ethylbenzene	ug/L	700	140	**D 470**	**720**	---	---
Methyl tertiary butyl ether	ug/L	60	12	D ND100	<10000	---	---
Toluene	ug/L	1000	200	**D 3300**	**6000**	---	---
1,2,4-Trimethylbenzene	ug/L	480	96	**D 860**	**1100**	---	---
1,3,5-Trimethylbenzene	ug/L	480	96	**D 260**	**310**	---	---
Xylene, total	ug/L	10000	1000	**D 7300**	**6100**	---	---
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	**D 270**	**2000**	ND250	ND1000
Anthracene	ug/L	3000	600	D ND130	**480**	ND250	ND1000
Benzo(a)anthracene	ug/L	-	-	D ND130	**450**	ND250	ND1000
Benzo(a)pyrene	ug/L	0.2	0.02	D ND130	**330**	ND250	ND1000
Benzo(b)fluoranthene	ug/L	0.2	0.02	D ND130	**380**	ND250	ND1000
Benzo(k)fluoranthene	ug/L	-	-	D ND130	<200	ND250	ND1000
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	D ND130	<1000	ND250	ND1000
Carbazole	ug/L	-	-	**D 150**	---	ND250	ND1000
Chrysene	ug/L	0.2	0.02	D ND130	**340**	ND250	ND1000
Dibenzofuran	ug/L	-	-	D ND130	<1000	ND250	ND1000
2,4-Dimethylphenol	ug/L	-	-	D ND130	<1000	ND250	ND1000
Fluoranthene	ug/L	400	80	D ND130	**1100**	ND250	ND1000
Fluorene	ug/L	400	80	D ND130	**510**	ND250	ND1000
Indeno(123-cd)pyrene	ug/L	-	-	D ND130	<200	ND250	ND1000
2-Methyl naphthalene	ug/L	-	-	**D 670**	**6200**	**400**	**1800**
2-Methylphenol	ug/L	-	-	D ND130	<1000	ND250	ND1000
3 & 4-Methylphenol	ug/L	-	-	D ND250	<1000	ND500	ND2000
Naphthalene	ug/L	40	8	**D 7600**	**43000**	**2800**	**8900**
Phenanthrene	ug/L	-	-	D ND130	**1700**	ND250	ND1000
Phenol	ug/L	6000	1200	D ND130	<1000	ND250	ND1000
Pyrene	ug/L	250	50	D ND130	**1000**	ND250	ND1000

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3

Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-17T	MW-17T	MW-17T	MW-17T
Sample Identification:				63126-1040	71733-5585	81865-9657	219204
Date Sampled:				6/12/96	4/3/97	4/15/98	3/22/99
Sampled By:		Enforcement Standard	Preventive Action Limit	MP	Horizon	Horizon	Horizon
Analyzed By:				Anatech	CT&E	CT&E	TriMatrix
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	**0.010**	ND0.005	**0.006**	<0.05
Cyanide, total	mg/L	0.2	0.04	**0.010**	**F 0.004**	**0.006**	<0.05
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	ND1	ND1	ND1	<1.0
Ethylbenzene	ug/L	700	140	ND1	ND1	ND1	<1.0
Methyl tertiary butyl ether	ug/L	60	12	ND1	ND1	ND1	<50
Toluene	ug/L	1000	200	ND1	ND1	ND1	<1.0
1,2,4-Trimethylbenzene	ug/L	480	96	ND1	ND1	ND1	<1.0
1,3,5-Trimethylbenzene	ug/L	480	96	ND1	ND1	ND1	<1.0
Xylene, total	ug/L	10000	1000	ND3	ND3	ND3	<3.0
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	ND5	ND5	<1.0
Anthracene	ug/L	3000	600	ND5	ND5	ND5	<1.0
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	ND5	<1.0
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	ND5	<1.0
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	ND5	<1.0
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	ND5	<1.0
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	ND5	ND5	<5.0
Carbazole	ug/L	-	-	ND5	ND5	ND5	---
Chrysene	ug/L	0.2	0.02	ND5	ND5	ND5	<1.0
Dibenzofuran	ug/L	-	-	ND5	ND5	ND5	<5.0
2,4-Dimethylphenol	ug/L	-	-	ND5	ND5	ND5	<5.0
Fluoranthene	ug/L	400	80	ND5	ND5	ND5	<1.0
Fluorene	ug/L	400	80	ND5	ND5	ND5	<1.0
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	ND5	<1.0
2-Methyl naphthalene	ug/L	-	-	ND5	ND5	ND5	<5.0
2-Methylphenol	ug/L	-	-	ND5	ND5	ND5	<5.0
3 & 4-Methylphenol	ug/L	-	-	ND10	ND10	ND10	<5.0
Naphthalene	ug/L	40	8	ND5	ND5	ND5	<1.0
Phenanthrene	ug/L	-	-	ND5	ND5	ND5	<1.0
Phenol	ug/L	6000	1200	ND5	ND5	ND5	<5.0
Pyrene	ug/L	250	50	ND5	ND5	ND5	<1.0

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-18T	MW-18T	MW-18T	MW-18T
Sample Identification:				63126-1030	71733-5591	81865-9674	219203
Date Sampled:				6/13/96	4/3/97	4/14/98	3/22/99
Sampled By:		Enforcement Standard	Preventive Action Limit	MP	Horizon	Horizon	Horizon
Analyzed By:				Anatech	CT&E	CT&E	TriMatrix
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	**0.010**	**0.007**	ND0.005	<0.05
Cyanide, total	mg/L	0.2	0.04	**0.010**	**0.008**	ND0.005	<0.05
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	ND1	ND1	ND1	<1.0
Ethylbenzene	ug/L	700	140	ND1	ND1	ND1	<1.0
Methyl tertiary butyl ether	ug/L	60	12	ND1	ND1	ND1	<50
Toluene	ug/L	1000	200	ND1	ND1	ND1	<1.0
1,2,4-Trimethylbenzene	ug/L	480	96	ND1	ND1	ND1	<1.0
1,3,5-Trimethylbenzene	ug/L	480	96	ND1	ND1	ND1	<1.0
Xylene, total	ug/L	10000	1000	ND3	ND3	ND3	<3.0
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	ND5	ND5	<1.0
Anthracene	ug/L	3000	600	ND5	ND5	ND5	<1.0
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	ND5	<1.0
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	ND5	<1.0
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	ND5	<1.0
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	ND5	<1.0
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	ND5	ND5	<5.0
Carbazole	ug/L	-	-	ND5	ND5	ND5	---
Chrysene	ug/L	0.2	0.02	ND5	ND5	ND5	<1.0
Dibenzofuran	ug/L	-	-	ND5	ND5	ND5	<5.0
2,4-Dimethylphenol	ug/L	-	-	ND5	ND5	ND5	<5.0
Fluoranthene	ug/L	400	80	ND5	ND5	ND5	<1.0
Fluorene	ug/L	400	80	ND5	ND5	ND5	<1.0
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	ND5	<1.0
2-Methyl naphthalene	ug/L	-	-	ND5	ND5	ND5	<5.0
2-Methylphenol	ug/L	-	-	ND5	ND5	ND5	<5.0
3 & 4-Methylphenol	ug/L	-	-	ND10	ND10	ND10	<5.0
Naphthalene	ug/L	40	8	ND5	ND5	ND5	<1.0
Phenanthrene	ug/L	-	-	ND5	ND5	ND5	<1.0
Phenol	ug/L	6000	1200	ND5	ND5	ND5	<5.0
Pyrene	ug/L	250	50	ND5	ND5	ND5	<1.0

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-19T	MW-19T	MW-19T	MW-20T
Sample Identification:				71733-5597	81865-9658	219209	71733-5590
Date Sampled:				4/4/97	4/15/98	3/23/99	4/3/97
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	Horizon	Horizon	Horizon
Analyzed By:				CT&E	CT&E	TriMatrix	CT&E
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	**0.068**	**0.063**	<0.05	**0.082**
Cyanide, total	mg/L	0.2	0.04	**0.069**	**0.150**	<0.05	**0.083**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	**8**	ND1	<1.0	**8**
Ethylbenzene	ug/L	700	140	**16**	ND1	<1.0	ND1
Methyl tertiary butyl ether	ug/L	60	12	ND1	ND1	<50	ND1
Toluene	ug/L	1000	200	**18**	ND1	<1.0	**7**
1,2,4-Trimethylbenzene	ug/L	480	96	**13**	ND1	<1.0	**2**
1,3,5-Trimethylbenzene	ug/L	480	96	**4**	ND1	<1.0	ND1
Xylene, total	ug/L	10000	1000	**38**	ND3	<3.0	**3**
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	ND5	<1.0	ND5
Anthracene	ug/L	3000	600	ND5	ND5	<1.0	ND5
Benzo(a)anthracene	ug/L	-	-	ND5	ND5	<1.0	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Benzo(k)fluoranthene	ug/L	-	-	ND5	ND5	<1.0	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	ND5	<5.0	ND5
Carbazole	ug/L	-	-	ND5	ND5	---	ND5
Chrysene	ug/L	0.2	0.02	ND5	ND5	<1.0	ND5
Dibenzofuran	ug/L	-	-	ND5	ND5	<5.0	ND5
2,4-Dimethylphenol	ug/L	-	-	ND5	ND5	<5.0	ND5
Fluoranthene	ug/L	400	80	ND5	ND5	<1.0	ND5
Fluorene	ug/L	400	80	ND5	ND5	<1.0	ND5
Indeno(123-cd)pyrene	ug/L	-	-	ND5	ND5	<1.0	ND5
2-Methyl naphthalene	ug/L	-	-	ND5	ND5	<5.0	ND5
2-Methylphenol	ug/L	-	-	ND5	ND5	<5.0	ND5
3 & 4-Methylphenol	ug/L	-	-	ND10	ND10	<5.0	ND10
Naphthalene	ug/L	40	8	ND5	ND5	**1.9**	ND5
Phenanthrene	ug/L	-	-	ND5	ND5	<1.0	ND5
Phenol	ug/L	6000	1200	ND5	ND5	<5.0	ND5
Pyrene	ug/L	250	50	ND5	ND5	<1.0	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3
Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-20T	MW-20T	MW-21T	MW-21T
Sample Identification:				81865-9673	219205	71733-5596	81865-9661
Date Sampled:				4/14/98	3/22/99	4/4/97	4/15/98
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	Horizon	Horizon	Horizon
Analyzed By:				CT&E	TriMatrix	CT&E	CT&E
Parameters	***Units***						
Cyanide, amenable	mg/L	0.2	0.04	**0.038**	<0.05	**0.25**	**0.035**
Cyanide, total	mg/L	0.2	0.04	**0.038**	<0.05	**0.26**	**0.450**
WI PVOC Scan (USEPA-8020)	***Units***						
Benzene	ug/L	5	0.5	ND1	<1.0	**3**	ND1
Ethylbenzene	ug/L	700	140	ND1	<1.0	ND1	ND1
Methyl tertiary butyl ether	ug/L	60	12	ND1	<50	ND1	ND1
Toluene	ug/L	1000	200	ND1	<1.0	**6**	ND1
1,2,4-Trimethylbenzene	ug/L	480	96	ND1	<1.0	**2**	ND1
1,3,5-Trimethylbenzene	ug/L	480	96	ND1	<1.0	ND1	ND1
Xylene, total	ug/L	10000	1000	ND3	<3.0	**6**	ND3
USEPA-8270 Scan	***Units***						
Acenaphthylene	ug/L	-	-	ND5	<1.0	ND5	ND5
Anthracene	ug/L	3000	600	ND5	<1.0	ND5	ND5
Benzo(a)anthracene	ug/L	-	-	ND5	<1.0	ND5	ND5
Benzo(a)pyrene	ug/L	0.2	0.02	ND5	<1.0	ND5	ND5
Benzo(b)fluoranthene	ug/L	0.2	0.02	ND5	<1.0	ND5	ND5
Benzo(k)fluoranthene	ug/L	-	-	ND5	<1.0	ND5	ND5
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	ND5	<5.0	ND5	ND5
Carbazole	ug/L	-	-	ND5	---	ND5	ND5
Chrysene	ug/L	0.2	0.02	ND5	<1.0	ND5	ND5
Dibenzofuran	ug/L	-	-	ND5	<5.0	ND5	ND5
2,4-Dimethylphenol	ug/L	-	-	ND5	<5.0	ND5	ND5
Fluoranthene	ug/L	400	80	ND5	<1.0	ND5	ND5
Fluorene	ug/L	400	80	ND5	<1.0	ND5	ND5
Indeno(123-cd)pyrene	ug/L	-	-	ND5	<1.0	ND5	ND5
2-Methyl naphthalene	ug/L	-	-	ND5	<5.0	ND5	ND5
2-Methylphenol	ug/L	-	-	ND5	<5.0	ND5	ND5
3 & 4-Methylphenol	ug/L	-	-	ND10	<5.0	ND10	ND10
Naphthalene	ug/L	40	8	ND5	<1.0	**6**	ND5
Phenanthrene	ug/L	-	-	ND5	<1.0	ND5	ND5
Phenol	ug/L	6000	1200	ND5	<5.0	ND5	ND5
Pyrene	ug/L	250	50	ND5	<1.0	ND5	ND5

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

Table 3

Summary of Detections in Ground Water Monitoring Program
Wisconsin Fuel and Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		Wisconsin NR-140 Ground Water Quality Standards		MW-21T	TW-96-1
Sample Identification:				219220	63126-1028
Date Sampled:				3/23/99	6/13/96
Sampled By:		Enforcement Standard	Preventive Action Limit	Horizon	MP
Analyzed By:				TriMatrix	Anatech
Parameters	***Units***				
Cyanide, amenable	mg/L	0.2	0.04	<0.05	**0.010**
Cyanide, total	mg/L	0.2	0.04	**0.17**	**0.010**
WI PVOC Scan (USEPA-8020)	***Units***				
Benzene	ug/L	5	0.5	<1.0	**2**
Ethylbenzene	ug/L	700	140	<1.0	**10**
Methyl tertiary butyl ether	ug/L	60	12	<50	ND1
Toluene	ug/L	1000	200	<1.0	**27**
1,2,4-Trimethylbenzene	ug/L	480	96	<1.0	**12**
1,3,5-Trimethylbenzene	ug/L	480	96	<1.0	**39**
Xylene, total	ug/L	10000	1000	<3.0	**180**
USEPA-8270 Scan	***Units***				
Acenaphthylene	ug/L	-	-	<1.0	ND100
Anthracene	ug/L	3000	600	<1.0	ND100
Benzo(a)anthracene	ug/L	-	-	<1.0	ND100
Benzo(a)pyrene	ug/L	0.2	0.02	<1.0	ND100
Benzo(b)fluoranthene	ug/L	0.2	0.02	<1.0	ND100
Benzo(k)fluoranthene	ug/L	-	-	<1.0	ND100
Bis(2ethylhexyl) phthalate	ug/L	6	0.6	<5.0	ND100
Carbazole	ug/L	-	-	---	ND100
Chrysene	ug/L	0.2	0.02	<1.0	ND100
Dibenzofuran	ug/L	-	-	<5.0	ND100
2,4-Dimethylphenol	ug/L	-	-	<5.0	ND100
Fluoranthene	ug/L	400	80	<1.0	ND100
Fluorene	ug/L	400	80	<1.0	ND100
Indeno(123-cd)pyrene	ug/L	-	-	<1.0	ND100
2-Methyl naphthalene	ug/L	-	-	<5.0	ND100
2-Methylphenol	ug/L	-	-	<5.0	ND100
3 & 4-Methylphenol	ug/L	-	-	<5.0	ND200
Naphthalene	ug/L	40	8	<1.0	**E200**
Phenanthrene	ug/L	-	-	<1.0	ND100
Phenol	ug/L	6000	1200	<5.0	ND100
Pyrene	ug/L	250	50	<1.0	ND100

Note: Bold values indicate concentrations above the method detection limit.
Shaded values indicate concentrations above the NR 140 Enforcement Standard.
The detection limit in MW-14 was elevated because the ground water sample were heavy impacted by residual coal tar constituents.
D = The sample required a dilution.
R = The data should be considered suspect because some aspects of the test did not meet method requirements.
HT = Sample analyzed past hold time.
ND1= Limit of detection (LOD) 1 ug/l.
ND5= Limit of detection (LOD) 5 ug/l.
ND10= Limit of detection (LOD) 10 ug/l.
ND20= Limit of detection (LOD) 20 ug/l.

NATURAL
RESOURCE
TECHNOLOGY

Ms. Mary Logan
United States Environmental Protection Agency
77 W. Jackson Boulevard
Chicago, IL 60604-3590

October 7, 2005
(1530)

Ms. Annette Weissbach
Wisconsin Department of Natural Resources-Northeast Region
P.O. Box 10448
Green Bay, WI 54307-0448

OCT 1 2005

RE: Operation, Maintenance and Monitoring Status Report
Reporting Period – September 1, 2004 to August 31, 2005
Former Wisconsin Fuel & Light Manufactured Gas Plant
402 North Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949, BRRTS # 02-36-000219

Dear Ms. Logan and Ms. Weissbach:

On behalf of Wisconsin Public Service Corporation (WPSC), Natural Resource Technology, Inc. (NRT) has prepared this annual Operation, Maintenance and Monitoring (OM&M) Status Report for the Former Wisconsin Fuel & Light (WF&L) Manufactured Gas Plant site in Manitowoc, Wisconsin (Figure 1). The report narrative includes a brief summary of prior work, a status update for the active groundwater extraction and pretreatment system, and a groundwater conditions update. Enclosed in Appendix A is a completed Wisconsin Department of Natural Resources (WDNR) Form 4400-194: Operation, Maintenance, Monitoring and Optimization Reporting, along with various other appendices, figures, and tables to support the narrative. As previously requested by WDNR, the enclosed documents also include analytical test results by others during the period of 1996 through 2000 (Appendix C) before the site was purchased by WPSC, as well as geologic cross-sections (Figures 2 and 3).

INVESTIGATION AND RESPONSE ACTION HISTORY

A summary of prior environmental investigations and response actions is briefly stated below. A chronologic summary of reports associated with this work is enclosed in Appendix B.

Timeframe	Description of Activity
1988 – 1992	Subsurface and sediment investigations performed and documented.
1992 – 1994	Feasibility study, pilot testing, interim remediation of soil and groundwater by shallow excavation, combined with an in-situ stabilization process.
1995 – 1997	Supplemental investigations, groundwater control study and installation of extraction well and treatment system.
1997 – 2001	Operation of groundwater control system.
2001 – Current	WPSC purchase of property from WF&L. System evaluation, modifications and continued operation and monitoring.

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APPENDIX C

ANALYTICAL RESULTS SUMMARY TABLES

1996 TO 2001

JUL 0 5 2001

ANNUAL GROUND WATER MONITORING

for the

FORMER WISCONSIN FUEL & LIGHT COMPANY FACILITY
402 NORTH 10TH STREET
MANITOWOC, WISCONSIN

Prepared for:

Wisconsin Public Service Corporation
700 North Adams Street
P.O. Box 19002
Green Bay, Wisconsin 54307-9002

Prepared by:

Horizon Environmental Corporation
4595 Broadmoor, SE, Suite 200
Grand Rapids, Michigan 49512

WFL-0110

May 2001

HORIZON ENVIRONMENTAL

Table 3 - Groundwater Monitoring Well Analytical Results - PVOCs and Cyanide
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

		Petroleum Volatile Organic Compounds (µg/L)							Cyanides (mg/L) (field filtered)		
Sample Date	Sample Location	Benzene	Ethylbenzene	Trimethylbenzene**	Methyl-tert-butyl-ether	Toluene	Xylenes, total	Total BTEXs	Cyanide, total	Cyanide, weak acid dissociable	Cyanide, OIA-1677
Wisconsin Groundwater Quality Standards (NR 140)											
Preventive Action Limit (PAL)		0.5	140	96	12	200	1,000	ns	ns	0.04	0.04
Enforcement Standard (ES)		5	700	480	60	1,000	10,000	ns	ns	0.2	0.2
MW-1	04/11/2000	--	--	--	--	--	--	--	--	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	<0.005	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	0.021 A	<0.0022	--
	05/15/2003	--	--	--	--	--	--	--	--	--	--
	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	<0.0050
	05/18/2005	<0.41	<0.54	<0.97	<0.61	<0.67	<1.8	nd	--	--	--
MW-2	04/11/2000	4.6	5.5	<1.0	<50	3.3	<3.0	13.40	0.18	--	--
	03/27/2001	1.4	40	2.8	<5.0	1.4	3.6	46.40	0.17	--	--
	06/05/2002	0.63 Q	18	1.6 Q	<0.43	0.85 Q	1.6 Q	21.08	0.043 A	0.010	--
	05/15/2003	0.79 Q	19	1.1 Q	<0.58	2.9	5.2	27.89	0.14	0.011	--
	05/24/2004	0.64	40	1.9	<0.36	3.2	7.3	51.14	--	--	0.020
	05/18/2005	<0.41	38	4.4	<0.61	0.94 Q	2.6 Q	41.54	--	--	--
Dup (QC-2)	05/18/2005	<0.41	37	4.3	<0.61	0.94 Q	2.4 Q	40.34	--	--	--
MW-5	04/11/2000	--	--	--	--	--	--	--	--	--	--
	03/27/2001	--	--	--	--	--	--	--	--	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	0.047 A	<0.0022	--
	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.0019 Q	0.0022 Q	--
Dup (Duplicate -1)	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.0032 Q	0.0024 Q	--
	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	<0.0050
	05/18/2005	<0.41	<0.54	<0.97	<0.61	<0.67	<1.8	nd	--	--	--
MW-6	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	0.066	--	--
	03/27/2001	<1.0	4.1	<1.0	<5.0	<1.0	9.9	14	0.095	--	--
	10/25/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	--	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	0.21 A	0.0099	--
	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.19	0.017	--
Dup (Duplicate -2)	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.18	0.014	--
	05/24/2004	Not Sampled at this event									
	05/18/2005	Not Sampled at this event									
MW-7	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	0.008	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	0.18	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	0.47	0.028	--
	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.35	0.032	--
	05/24/2004	Not Sampled at this event									
	05/18/2005	Not Sampled at this event									
MW-8	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	0.47	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	0.35	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	1.8	0.073	--
Dup (QC2)	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	1.3	0.015	--
	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	1.2	0.090	--
	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	0.011
	05/18/2005	<0.41	<0.54	<0.97	<0.61	<0.67	<1.8	nd	--	--	--
MW-9	04/11/2000	3.1	<1.0	<1.0	<50	<1.0	<3.0	3.1	0.42	--	--
	03/27/2001	8.8	<1.0	<1.0	<5.0	<1.0	<3.0	8.8	0.18	--	--
	06/05/2002	0.94 Q	<0.82	<0.92	<0.43	<0.68	<0.77	0.9	0.33 A	0.029	--
Dup (QC-1)	06/05/2002	0.90 Q	<0.82	<0.92	<0.43	<0.68	<0.77	0.9	0.21	0.018	--
	05/15/2003	1.3	<0.60	<0.66	<0.58	<0.58	<1.2	1.3	0.18	0.0091	--
	05/24/2004	0.30 Q	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	0.018
	05/18/2005	<0.41	<0.54	<0.97	<0.61	<0.67	<1.8	nd	--	--	--

Table 3 - Groundwater Monitoring Well Analytical Results - PVOCs and Cyanide
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

		Petroleum Volatile Organic Compounds (µg/L)							Cyanides (mg/L) (field filtered)		
Sample Date	Sample Location	Benzene	Ethylbenzene	Trimethylbenzene**	Methyl-tert-butyl-ether	Toluene	Xylenes, total	Total BTEXs	Cyanide, total	Cyanide, weak acid dissociable	Cyanide, OIA-1677
Wisconsin Groundwater Quality Standards (NR 140)											
Preventive Action Limit (PAL)		0.5	140	96	12	200	1,000	ns	ns	0.04	0.04
Enforcement Standard (ES)		5	700	480	60	1,000	10,000	ns	ns	0.2	0.2
MW-10	04/11/2000	<1.0	<1.0	9	<50	<1.0	<3.0	nd	0.15	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	0.11	--	--
	06/05/2002	<0.45	<0.82	<0.92	4.6	<0.68	<0.77	nd	0.28	0.010	--
	05/15/2003	<0.30	<0.60	13	3.2	<0.58	<1.2	nd	0.30	0.014	--
	05/24/2004	<0.14	<0.40	3.8	3.0	<0.36	<0.74	nd	--	--	0.015
	05/18/2005	<0.41	<0.54	7.5	1.3 Q	<0.67	<1.8	nd	--	--	--
MW-11	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	0.11	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	0.14	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	0.15 A	0.026	--
	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.14	0.016	--
	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	<0.0050
Dup (QC-1)	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	<0.0050
	05/18/2005	*Not Sampled at this event*									
MW-12	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	0.8	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	1.4	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	0.73	0.016	--
	05/15/2003	*Well was not accessible for sampling (covered with asphalt)*									
	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	0.015
	05/18/2005	<0.41	<0.54	<0.97	<0.61	<0.67	<1.8	nd	--	--	--
MW-12D	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	0.039	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	0.036	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	0.11 A	<0.011 N,C	--
	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.021	0.0041Q	--
	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	<0.0050
Dup (QC-2)	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	<0.0050
	05/18/2005	2.3	<0.54	<0.97	<0.61	<0.67	<1.8	2.3	--	--	--
Dup (QC-1)	05/18/2005	5.3	<0.54	<0.97	<0.61	<0.67	<1.8	5.3	--	--	--
MW-13	04/11/2000	1,800	5,800	720	<50	470	3,800	11,870	0.36	--	--
	03/27/2001	1,500	3,300	760	<5.0	100	2,700	7,600	0.34	--	--
	06/05/2002	2,600	4,800	790	<8.6	1,800	4,300	13,500	0.21 A	<0.0022	--
	05/15/2003	300	200	129	<1.2	21	670	1,191	0.61	0.051	--
	05/24/2004	210	29	94	<0.36	6.3	400	645	--	--	0.0073
	05/18/2005	270	670	138 Q	<12	17 Q	530	1,487	--	--	--
MW-14	04/11/2000	310	600	950	<500	4,000	4,100	9,010	0.11	--	--
	03/27/2001	410	810	1,110	<5.0	4,200	4,200	9,620	0.054	--	--
	06/05/2002	Not sampled due to product being present									
	05/15/2003										
	05/24/2004										
	05/18/2005										
MW-17T	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	<0.005	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	0.054	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	0.0029 Q	<0.0022	--
	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.0060	0.0019	--
	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	<0.0050
	05/18/2005	<0.41	<0.54	<0.97	<0.61	<0.67	<1.8	nd	--	--	--
MW-18T	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	<0.005	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	<0.005	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	<0.0021	<0.0022	--
	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.0058	0.0037 Q	--
	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	<0.0050
	05/18/2005	<0.41	<0.54	<0.97	<0.61	<0.67	<1.8	nd	--	--	--

Table 3 - Groundwater Monitoring Well Analytical Results - PVOCs and Cyanide
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

		Petroleum Volatile Organic Compounds (µg/L)							Cyanides (mg/L) (field filtered)		
Sample Date	Sample Location	Benzene	Ethylbenzene	Trimethylbenzene**	Methyl-tert-butyl-ether	Toluene	Xylenes, total	Total BTEXs	Cyanide, total	Cyanide, weak acid dissociable	Cyanide, OIA-1677*
Wisconsin Groundwater Quality Standards (NR 140)											
Preventive Action Limit (PAL)		*0.5*	*140*	*96*	*12*	*200*	*1,000*	ns	ns	*0.04*	*0.04*
Enforcement Standard (ES)		**5**	**700**	**480**	**60**	**1,000**	**10,000**	ns	ns	**0.2**	**0.2**
MW-19T	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	0.037	--	--
	03/27/2001	<1.0	1.7	<1.0	<5.0	<1.0	<3.0	nd	0.043	--	--
	06/05/2002	*2.4*	<0.82	<0.92	<0.43	<0.68	0.94 Q	3.3	0.029 A	0.0053 Q	--
	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.035	0.0046 Q	--
	05/24/2004	*1.1*	<0.40	<0.40	<0.36	<0.36	0.76 Q	1.9	--	--	<0.0050
	05/18/2005	<0.41	<0.54	<0.97	<0.61	<0.67	<1.8	nd	--	--	--
MW-20T	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	0.040	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	0.061	--	--
	06/05/2002	<0.45	<0.82	<0.92	<0.43	<0.68	<0.77	nd	0.063 A	<0.0022	--
	05/15/2003	<0.30	<0.60	<0.66	<0.58	<0.58	<1.2	nd	0.051	0.0046 Q	--
	05/25/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	<0.0050
	05/18/2005	<0.41	<0.54	<0.97	<0.61	<0.67	<1.8	nd	--	--	--
MW-21T	04/11/2000	<1.0	<1.0	<1.0	<50	<1.0	<3.0	nd	0.061	--	--
	03/27/2001	<1.0	<1.0	<1.0	<5.0	<1.0	<3.0	nd	0.075	--	--
	06/05/2002	<0.45	<0.82	<0.92	1.9	<0.68	<0.77	1.9	0.18	<0.0022	--
	05/15/2003	0.31 Q	<0.60	<0.66	1.6 Q	<0.58	<1.2	0.3	0.37	0.026	--
	05/24/2004	<0.14	<0.40	<0.40	<0.36	<0.36	<0.74	nd	--	--	<0.0050
	05/18/2005	<0.41	<0.54	<0.97	<0.61	<0.67	<1.8	nd	--	--	--

[JTB/AAS-7/1/02][JTB/PAR-07/03][JKY/ -06/04][HMS/JAH-07/05]

Notes:

1) Pre-2002 data from Horizon Environmental reports
2) Concentrations that attain or exceed an NR 140 PAL are *italicized/ underlined*
3) Concentrations that attain or exceed an NR 140 ES are **underlined/ bold**
4) Wells PW-1 and MW-12 were buried by asphalt and well MW-1 was dry during the 5/15/03 sampling event

PVOCs: Petroleum volatile organic compounds.
ns: Standard has not been established.
-- : Analysis was not performed
Dup (QC-1): Field duplicate sample.
**: Standard is for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene combined.
µg/L: Micrograms per liter.
mg/L: Milligrams per liter.
A: Laboratory note - Analyte detected in method blank. N = Spiked sample recovery not within control limits.
C: Laboratory note - Elevated levels due to matrix effects.
Q: Laboratory note - The analyte has been detected between the limit of detection (LOD) and limit of quantitation (LOQ)
D: Laboratory note - Analyte value from diluted analysis
*: In May 2004, cyanide was analyzed using method OIA-1677.

Table 4 - Groundwater Monitoring Well Analytical Results - PAHs
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

Sample Location	Sample Date	POLYNUCLEAR AROMATIC HYDROCARBONS (µg/L)																		
		1-Methyl-naphthalene	2-Methyl-naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a) anthracene	Benzo(a)pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAHs
Wisconsin Groundwater Quality Standards (NR 140)																				
Preventive Action Limit (PAL)		ns	ns	ns	ns	600	ns	0.02	0.02	ns	ns	0.02	ns	80	80	ns	8	ns	50	ns
Enforcement Standard (ES)		ns	ns	ns	ns	3,000	ns	0.2	0.2	ns	ns	0.2	ns	400	400	ns	40	ns	250	ns
MW-1	04/11/2000	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	.	.	--
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	2.4	3	5.8	<5.0	<5.0	<5.0	<2.0	7.7	<5.0	2.3	<5.0	<5.0	6.0	27
	06/05/2002	<0.54	<0.56	2.7	0.48 Q	<8.0 C	29 C	46 C	55 C	40 C	43 C	48 C	11 Q,C	100 C	4.5	34	<0.54	53 C	86 C	553
	05/15/2003	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.
	11/19/2003	<00.36	<0.34	<0.36	<0.38	0.70 Q	5.2	8.2	8.6	6.9	6.5	8.6	2.0	14 D	<0.34	6.1	<0.48	4.6	9.1	79
	02/25/2004	<0.34	<0.32	0.99 Q	0.43 Q	4.0	13 D	19 D	16 D	14 D	17 D	19 D	4.3	45 D	1.6	12 Q, D	2.3	21 D	32 D	222
	05/24/2004	<0.34	<0.32	<0.34	<0.36	0.58 Q	3.7	5.3	5.0	4.3	4.4	4.5	1.3	8.1	<0.32	3.9	<0.45	3.0	6.0	50
	05/18/2005	<0.80	<0.90	<0.78	<0.77	0.75 Q	4.4	10	11	9.8 &	10 &	8.9 &	2.1 Q&	13	<0.87	7.8 &	<0.89	4.7	9.5	92
MW-2	04/11/2000	--	<1.0	1.7	1.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	3.5
	03/27/2001	--	8.6	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	8.6
	06/05/2002	14 D	0.035 Q	5.4 D	4.0 D	0.067	0.15	0.17	0.16	0.12	0.11	0.12	0.046 Q	0.28	0.94 Q,D	0.12	0.18	0.21	0.25	26
	05/15/2003	9.2 D*	0.023 Q*	3.8 D*	2.3 D*	0.055 Q*	0.12	0.14	0.14	0.11	0.10	0.12	0.033 Q	0.23 *	0.65 Q*D	0.100	0.19 B*	0.13 *	0.22 *	18
	02/25/2004	11 D	0.025 Q	4.9 D	2.8 Q, D	0.040 Q	0.083	0.10	0.10	0.091	0.090	0.088	0.024 Q	0.17	0.81 Q, D	0.079	0.20	0.13	0.17	21
	05/24/2004	10 D	0.019 Q	4.8 D	2.8 D	0.42	1.5 D	1.4 D	1.1 D	0.86 Q, D	1.1 Q, D	1.4 D	0.28	3.3 D	0.87 Q, D	0.76 Q, D	0.19	1.4 D	2.7 D	35
	05/18/2005	11 D	<0.45	4.2	2.7	<0.35	1.1 Q	1.2	1.1 Q	0.94 Q&	1.1 Q&	1.1 &	<0.44 &	2.3	0.52 Q	0.77 Q&	0.71 Q	0.74 Q	2.0	31
Dup (OC-2)	05/18/2005	7.2	<0.48	2.9	2.0	0.39 Q	1.5	1.5	1.2 Q	0.88 Q	1.4	1.9	<0.47	3.4	0.47 Q	0.68 Q	0.54 Q	1.20 Q	3.7	31
MW-5	04/11/2000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.
	03/27/2001	--	--	--	--	--	--	.	--	--	--	--	--	--	--	--	--	--	--	.
	06/05/2002	<0.40	<0.42	<0.27	<0.34	<0.30	1.7	2.1	2.5	1.9	1.6	1.8	0.56 Q	4.1	<0.32	1.6	<0.40	1.5	3.1	22
	05/15/2003	0.033 Q*	0.035 Q*	0.20 *	0.053 Q*	0.26 *	1.1 D	1.5 D	2.3 D	1.5 D	1.9 D	2.3 D	0.49	5.1 D*	0.24 *	1.1 Q,D	0.072 Q*B	2.8 D*	3.6 D*	25
Dup (Duplicate -1)	05/15/2003	<0.072	<0.068	<0.072	<0.076	<0.080	0.20	0.26	0.39	0.27	0.30	0.40	<0.064	1.1	<0.068	0.23 Q	0.48	0.57	0.69	4.9
	02/25/2004	<0.17	<0.16	<0.17	<0.18	<0.19	1.0	1.6	1.6	1.4	1.6	1.6	0.39 Q	3.0	<0.16	1.2	0.28 Q	0.87	2.1	17
	05/24/2004	<0.017	0.017 Q	0.068	0.022 Q	0.11	0.62 D	0.89 D	1.2 D	0.83 D	0.95 D	1.1 D	0.23	2.2 D	0.075	0.72 D	0.030 Q	0.92 D	1.6 D	12
	05/18/2005	<8.5	<9.6	<8.2	<8.2	<7.5	25 Q	58	110	75 &	98 &	110 &	18 Q&	190	<9.2	60 &	<9.5	48	120	912
MW-6	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	<0.027	<0.028	<0.018	0.040 Q	<0.020	0.032 Q	0.032 Q	0.029 Q	0.047 Q	0.023 Q	0.027 Q	<0.017	0.069 Q	<0.021	0.020 Q	<0.027	0.033 Q	0.059 Q	0.4
	05/15/2003	<0.018	<0.017	<0.018	0.043 Q	<0.020	0.032 Q	0.041 Q	0.042	0.032 Q	0.033 Q	0.034 Q	<0.016	0.058	<0.017	0.027 Q	0.051 Q	0.029 Q	0.056	0.5
Dup (Duplicate -2)	05/15/2003	0.022 Q	<0.017	<0.018	0.038 Q	<0.020	0.016 Q	0.019 Q	0.020 Q	0.018 Q	<0.019	0.020 Q	<0.016	0.033 Q	<0.017	<0.021	0.15	0.017 Q	0.032 Q	0.4
	02/25/2004	0.018 Q	0.026 Q	<0.017	0.067	<0.019	0.023 Q	0.026 Q	0.024 Q	0.021 Q	0.019 Q	0.022 Q	<0.015	0.045	<0.016	<0.020	0.090	0.029 Q	0.040 Q	0.5
	05/24/2004	Well no longer sampled - water level only																		
	05/18/2005																			
MW-7	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	<0.027	<0.028	<0.018	0.30	0.13	0.39	0.53 D	0.41	0.43	0.32	0.31	0.14	0.40	<0.021	0.36	0.029 Q	0.097	0.53 D	4.4
	05/15/2003	<0.018 *	<0.017 *	<0.018 *	0.11 *	0.13 *	0.22	0.44	0.67 D	0.54 D	0.44	0.54 D	0.12	0.87 D*	<0.017 *	0.43	0.026 Q*B	0.20 *	0.69 D*	5.4
	02/25/2004	<0.017	0.022 Q	0.037 Q	0.24	0.26	1.5 D	3.0 D	4.7 D	3.4 D	3.3 D	4.2 D	0.65 Q, D	9.2 D	0.059	2.8 D	0.097	2.0 D	6.0 D	41
	05/24/2004	Well no longer sampled - water level only																		
	05/18/2005																			

Table 4 - Groundwater Monitoring Well Analytical Results - PAHs
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

Sample Location	Sample Date	POLYNUCLEAR AROMATIC HYDROCARBONS (µg/L)																		
		1-Methyl-naphthalene	2-Methyl-naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a) anthracene	Benzo(a)pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAHs
Wisconsin Groundwater Quality Standards (NR 140)																				
Preventive Action Limit (PAL)		ns	ns	ns	ns	600	ns	0.02	0.02	ns	ns	0.02	ns	80	80	ns	8	ns	50	ns
Enforcement Standard (ES)		ns	ns	ns	ns	3,000	ns	0.2	0.2	ns	ns	0.2	ns	400	400	ns	40	ns	250	ns
MW-8	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	<0.67	<0.70	<0.45	1.0 Q	1.0 Q	3.7	4.0	3.0	2.5	2.5	2.7	0.73 Q	7.0	<0.53	2.1	<0.67	2.0	5.9	38
Dup (OC2)	06/05/2002	<0.54	<0.56	<0.36	1.0 Q	1.0 Q	4.9	5.3	4.1	3.8	3.3	3.7	0.97 Q	9.8	<0.42	3.1	4.9	2.8	8.4	57
	05/15/2003	<0.18 *	<0.17 *	<0.18 *	0.61 *	0.43 Q*	1.5	2.0	1.6	1.5	1.4	1.4	0.34 Q	2.7 *	<0.17 *	1.3	<0.24 *	0.70 *	2.6 *	18
	02/25/2004	--	--	--	--	--	-	--	--	--	--	--	--	--	--	--	--	--	--	-
	05/24/2004	<0.34	<0.32	<0.34	1.0 Q	0.68 Q	2.3	2.8	2.3	2.0	1.8	2.0	0.56 Q	4.4	<0.32	1.8	<0.45	1.2	3.9	27
	05/18/2005	<0.80	<0.91	<0.78	2.0 Q	1.80 Q	5.5	7.8	6.2	5.6 &	6.6 &	6.3 &	1.2 Q&	13	<0.87	4.5 &	<0.89	3.7	12	76
MW-9	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	0.039 Q	<0.028	0.14	0.21	0.22	0.87 D	0.96 D	0.97 D	0.75 D	0.60 D	0.75 D	0.31	2.1 D	0.041 Q	0.65 D	0.12	0.41	1.8 D	11
Dup (OC-1)	06/05/2002	<0.34	<0.35	<0.23	<0.29	0.38 Q	1.8	2.1	2.2	1.8	1.4	1.6	0.51 Q	3.8	<0.26	1.4	<0.34	0.90	3.2	21
	05/15/2003	<1.8 *	<1.7 *	<1.8 *	<1.9 *	2.2 Q*	10	12	12	9.5	11	13	2.4 Q	29 *	<1.7 *	7.7	<2.4 *	10 *	23 *	142
	02/25/2004	<0.091	<0.086	<0.091	<0.096	<0.10	0.21	0.4	0.72	0.54	0.48	0.59	0.098 Q	1.3	<0.086	0.45	<0.12	0.25 Q	0.94	6.0
	05/24/2004	0.11	0.046 Q	0.19	0.29	0.38	1.5 D	2.6 D	3.4 D	2.6 D	2.6 D	2.9 D	0.66 Q, D	5.5 D	0.086	2.2 D	0.35	1.0 D	4.1 D	31
	05/18/2005	<0.16	<0.18	<0.16	0.19 Q	0.29 Q	0.94	1.9	2.5	2.2 &	2.0 &	1.9 &	0.45 Q&	3.1	<0.17	1.7 &	<0.18	0.58	2.4	20
MW-10	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	<0.090	<0.093	0.85	0.38	0.29	0.42	0.43	0.32	0.34	0.23	0.27	0.095 Q	1.0	0.61	0.28	0.090 Q	0.16 Q	1.0	6.8
	05/15/2003	0.28Q*	<0.085 *	0.86 *	0.38 *	0.32 *	0.65	0.80	0.83	0.68	0.64	0.73	0.18 Q	1.3 *	0.47 *	0.56	0.28 Q*B	0.33 *	1.4 *	11
	02/25/2004	0.14	0.17	0.55 Q, D	0.43	0.29	0.93 D	1.4 D	1.7 D	1.4 D	1.3 D	1.5 D	0.33	3.1 D	0.13	1.1 D	0.39	0.75 D	2.4 D	18
Dup (OC-1)	02/25/2004	0.071	0.072	0.40	0.13	0.080	0.13	0.17	0.17	0.16	0.16	0.17 Q	0.039 Q	0.41	0.35	0.14	0.17	0.14	0.33	3.3
	05/24/2004	0.21	0.040 Q	0.77 D	0.29	0.26	0.71 D	1.2 D	1.4 D	1.2 D	1.3 D	1.4 D	0.31	2.8 D	0.37	0.96 D	0.47	0.57 D	2.2 D	16
	05/18/2005	0.45 Q	<0.23	0.66	0.7	0.49 Q	1.2	2.0	2.3	2.1 &	2.0 &	2.1 &	0.39 Q&	3.8	0.31 Q	1.6 &	0.25 Q	0.84	3.2	24
MW-11	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	0.25	<0.028	0.16	0.32	0.11	0.18	0.20	0.16	0.16	0.12	0.15	0.047 Q	0.39	0.050 Q	0.13	0.048 Q	0.090	0.45	3.0
	05/15/2003	0.28 *	0.026 Q*	0.35 *	0.25 *	0.13 *	0.39	0.53 D	0.64 D	0.52 D	0.49	0.49	0.14	0.89 D*	0.12 *	0.46	0.046 Q*B	0.17 *	0.80 D*	6.7
	02/25/2004	0.047 Q	0.035 Q	0.096	0.23	0.069	0.10	0.14	0.15	0.14	0.12	0.13 Q	0.035 Q	0.30	0.10	0.11	0.087	0.11	0.26	2.3
Dup (OC-2)	02/25/2004	0.042 Q	0.036 Q	0.097	0.21	0.12	0.77 D	1.2 D	1.1 D	1.0 D	1.1 D	1.1 D	0.030	2.4 D	0.10	0.85 D	0.097	0.64 D	1.7 D	13
	05/24/2004	0.10	0.019 Q	0.23	0.27	0.14	0.26	0.42	0.46 D	0.45	0.35	0.40	0.12	0.72 D	0.15	0.38	0.033 Q	0.15	0.64 Q	5
Dup (OC-1)	05/24/2004	0.073	<0.016*	0.18 *	0.20 *	0.13 *	0.29	0.45	0.48 D	0.45	0.41	0.43	0.11	0.85 D*	0.12	0.39	0.064 Q	0.16 *	0.68 D*	5
	05/18/2005	Well no longer sampled - will be abandoned																		
MW-12	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	<0.027	<0.028	<0.018	0.025 Q	0.053 Q	0.61 C	0.65 C	0.80 C	0.59 C	0.48	0.53 C	0.21	1.0 D	<0.021	0.49 C	0.056 Q	0.23	1.1 D	6.8
	05/15/2003	Well was not accessible for sampling (covered by asphalt)																		
	02/25/2004	Well was not accessible for sampling (under water from surface runoff)																		
	05/24/2004	<0.34	<0.32	<0.34	<0.36	<0.38	2.7	5.2	6.2	5.3	4.7	4.7	1.4	7.7	<0.32	4.6	<0.45	1.6	5.8	50
	05/18/2005	<0.80	<0.91	<0.78	<0.77	<0.71	4.5	9.5	11	11 &	10 &	8.9 &	2.2 Q&	13	<0.87	8.3 &	<0.89	2.5 Q	10	91

Table 4 - Groundwater Monitoring Well Analytical Results - PAHs
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

Sample Location	Sample Date	POLYNUCLEAR AROMATIC HYDROCARBONS (µg/L)																		
		1-Methyl-naphthalene	2-Methyl-naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a) anthracene	Benzo(a)pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAHs
Wisconsin Groundwater Quality Standards (NR 140)																				
Preventive Action Limit (PAL)		ns	ns	ns	ns	600	ns	0.02	0.02	ns	ns	0.02	ns	80	80	ns	8	ns	50	ns
Enforcement Standard (ES)		ns	ns	ns	ns	3,000	ns	0.2	0.2	ns	ns	0.2	ns	400	400	ns	40	ns	250	ns
MW-12D	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	<0.16	<0.17	<0.11	<0.14	<0.12	0.67	0.76	0.96	0.61	0.63	0.68	0.16 Q	1.9	<0.13	0.59	<0.16	0.55	1.5	9.0
	05/15/2003	<0.018 *	<0.017 *	<0.018 *	0.059 Q*	0.051 Q*	0.52 D	0.92 D	1.2 D	0.93 D	1.1 D	1.1 D	0.28	1.6 D*	<0.017 *	0.73 D	0.065 Q*B	0.34 *	1.2 D*	10
	02/25/2004	Well was not accessible for sampling (interior of flush mount frozen)																		
	05/24/2004	<0.34	<0.32	<0.34	<0.36	<0.38	0.95	2.2	2.9	2.6	2.1	2.0	0.64 Q	3.2	<0.32	2.2	<0.45	0.67 Q	2.5	22
Dup (OC-2)	05/24/2004	<0.017	<0.016*	<0.017*	0.034 Q *	0.049 Q *	0.46	0.90 D	1.1 D	1.0 D	0.92 D	0.85 D	0.28	1.5 D *	<0.016	0.85 D	0.045 Q	0.26 *	1.0 D *	9
	05/18/2005	0.10 Q	<0.091	<0.078	0.11 Q	<0.071	0.45	0.84	1.2	1.0 &	0.88 &	0.8 &	0.22 Q&	1.1	<0.087	0.80 &	0.5	0.21 Q	0.80	9
Dup (OC-1)	05/18/2005	<0.10	<0.11	<0.097	0.12 Q	<0.088	0.51	0.94	1.2	1.0	1.1	0.93	0.21 Q	1.1	<0.11	0.81	<0.11	0.25 Q	0.97	9
MW-13	04/11/2000	--	90	29	3.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.0	<1.0	2,000	<1.0	<5.0	2,125
	03/27/2001	--	210	72	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	3,700	<5.0	<5.0	3,982
	06/05/2002	<430 D	<450 D	<290 D	2.9	0.88 Q	2.4	3.4	4.1	2.9	2.6	2.5	0.63 Q	6.6	5.3	2.5	3,800 C	3.7	5.8	3,846
	05/15/2003	30 D*	0.77 Q*	18 D*	1.2 *	1.2 Q*	4.4	6.2	6.0	5.7	5.0	5.1	1.4	12 D*	2.1 *	4.5	1.6 *	4.3 *	9.7 *	119
	02/25/2004	Well was not accessible for sampling (bailer stuck in well)																		
	05/24/2004	55 D	24 D	17 Q, D	2.0	<0.38	1.4	2.7	2.7	2.7	1.9	1.8	0.72 Q	3.3	2.3	2.3	140 D	1.5	2.7	264
	05/18/2005	190 D	66 QD	51 QD	4.5 Q	<1.8	<2.0	<1.8	<1.8	<2.1 &	<1.9 &	<1.6 &	<2.2 &	2.0 Q	3.5 Q	<1.7 &	920 D	<2.0	<1.6	1,237
MW-14	04/11/2000	--	140,000	3,300	36,000	13,000	9,500	8,600	6,700	4,500	7,700	8,800	1,200	27,000	18,000	4,000	540,000	45,000	23,000	896,300
	03/27/2001	--	140,000	3,300	45,000	13,000	10,000	8,400	8,300	3,300	<4,800	7,400	1,100	28,000	15,000	3,800	510,000	50,000	24,000	870,600
	06/05/2002	Not sampled due to product (DNAPL) being present																		
	05/15/2003																			
	02/25/2004																			
	05/24/2004																			
	05/18/2005																			
MW-17T	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	0.041 Q	0.045 Q	<0.018	<0.023	<0.020	<0.019	<0.012	<0.014	<0.015	<0.013	<0.018	<0.017	<0.028	<0.021	<0.014	0.49	<0.019	<0.020	0.6
	05/15/2003	<0.020 *	<0.019 *	<0.020 *	<0.021 *	0.022 *	<0.013	<0.016	<0.015	<0.018	<0.021	<0.016	<0.018	<0.015 *	<0.019 *	<0.024	<0.027 *	<0.018 *	<0.019 *	nd
	02/25/2004	0.021 Q	0.037 Q	<0.017	0.036 Q	0.053 Q	0.39	0.70 D	1.0 D	0.90 D	0.70 D	0.73 D	0.21	1.2 D	0.022 Q	0.73 D	0.56 D	0.28	0.88 D	8.4
	05/24/2004	<0.017	<0.016	<0.017	<0.018	<0.019	<0.011	<0.013	<0.012	<0.015	<0.018	<0.013	<0.015	<0.012	<0.016	<0.020	<0.023	<0.015	<0.016	nd
	05/18/2005	<0.02	<0.023	<0.019	<0.019	<0.018	<0.020	0.030 Q	0.032 Q	0.031 Q&	0.030 Q&	0.026 Q&	<0.022 &	0.037 Q	<0.022	0.024 Q&	0.046 Q	<0.02	0.033 Q	0.29
MW-18T	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	<0.027	<0.028	<0.018	<0.023	<0.020	<0.019	<0.012	<0.014	<0.015	<0.013	<0.018	<0.017	<0.028	<0.021	<0.014	0.12	<0.019	<0.020	0.1
	05/15/2003	<0.018	<0.017	<0.018	<0.019	<0.020	<0.012	<0.014	<0.013	<0.016	<0.019	<0.014	<0.016	<0.013	<0.017	<0.021	0.100	<0.016	<0.017	0.1
	02/25/2004	<0.017	<0.016	<0.017	<0.018	<0.019	<0.011	<0.013	<0.012	<0.015	<0.018	<0.013	<0.015	<0.012	<0.016	<0.020	0.028 Q	<0.015	<0.016	0.03
	05/24/2004	<0.017	<0.016	<0.017	<0.018	<0.019	<0.011	<0.013	<0.012	<0.015	<0.018	<0.013	<0.015	0.013 Q	<0.016	<0.020	<0.023	<0.015	<0.016	0.01
	05/18/2005	<0.02	<0.023	<0.019	<0.019	<0.018	<0.02	0.019 Q	0.022 Q	<0.021 &	<0.019 &	0.019 Q&	<0.022 &	0.030 Q	<0.022	<0.017 &	<0.022	<0.02	0.025 Q	0.12

Table 4 - Groundwater Monitoring Well Analytical Results - PAHs
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

Sample Location	Sample Date	POLYNUCLEAR AROMATIC HYDROCARBONS (µg/L)																		
		1-Methyl-naphthalene	2-Methyl-naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a) anthracene	Benzo(a)pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAHs
Wisconsin Groundwater Quality Standards (NR 140)																				
Preventive Action Limit (PAL)		ns	ns	ns	ns	*600*	ns	*0.02*	*0.02*	ns	ns	*0.02*	ns	*80*	*80*	ns	*8*	ns	*50*	ns
Enforcement Standard (ES)		ns	ns	ns	ns	**3,000**	ns	**0.2**	**0.2**	ns	ns	**0.2**	ns	**400**	**400**	ns	**40**	ns	**250**	ns
MW-19T	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	<0.16	<0.17	<0.11	0.30 Q	0.19 Q	0.86	1.2	1.1	0.92	0.71	0.69	0.29 Q	1.7	<0.13	0.91	0.44	0.14	1.4	11
	05/15/2003	<0.018 *	<0.017 *	<0.018 *	0.031 Q*	0.022 Q*	0.092	*0.16*	*0.17*	0.15	0.12	*0.12*	0.038 Q	0.19 *	<0.017 *	0.13	0.032 Q*B	0.060 *	0.18 *	1.5
	02/25/2004	<0.017	0.016 Q	<0.017	<0.018	<0.019	0.023 Q	*0.043 Q*	*0.059*	0.054	0.044 Q	*0.044 Q*	<0.015	0.070	<0.016	0.043 Q	0.12	0.020 Q	0.053 Q	0.6
	05/24/2004	0.019 Q	0.026 Q	<0.017	0.068	0.093	0.66 D	1.5 D	2.1 D	1.8 D	1.4 D	1.5 D	0.42	2.2 D	0.024 Q	1.5 D	0.015 Q	0.54 D	1.7 D	16
	05/18/2005	<0.02	<0.023	<0.019	0.040 Q	0.026 Q	0.10	*0.17*	0.21	0.20 &	0.16 &	*0.14 &*	0.041 Q&	0.24	<0.022	0.16 &	0.069 Q	0.075	0.2	1.8
MW-20T	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	<0.027	<0.028	<0.018	<0.023	<0.020	0.022 Q	*0.031 Q*	*0.033 Q*	0.029 Q	0.024 Q	*0.025 Q*	<0.017	0.061 Q	<0.021	0.026 Q	<0.027	0.027 Q	0.063 Q	0.3
	05/15/2003	0.053 Q	0.035 Q	<0.018	<0.019	<0.020	<0.012	0.018 Q	*0.025 Q*	0.023 Q	<0.019	*0.020 Q*	<0.016	0.032 Q	<0.017	<0.021	0.33	0.018 Q	0.028 Q	0.6
	02/25/2004	0.020 Q	0.030 Q	<0.017	0.042 Q	<0.019	0.039	*0.046*	*0.048*	0.040 Q	0.037 Q	*0.049*	<0.015	0.10	<0.016	0.032 Q	0.096	0.065	0.079	0.7
	05/24/2004	<0.017	<0.016	<0.017	0.019 Q	<0.019	0.078	*0.12*	*0.14*	0.12	0.10	*0.11*	0.031	0.21	<0.016	0.10	<0.023	0.078	0.18	1.3
	05/18/2005	<0.020	<0.023	<0.019	<0.019	<0.018	<0.020	*0.027 Q*	*0.035 Q*	0.029 Q	0.027 Q	*0.029 Q*	<0.022	0.046 Q	<0.022	0.022 Q	0.039 Q	0.023 Q	0.037 Q	0.3
MW-21T	04/11/2000	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	nd
	03/27/2001	--	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<5.0	<5.0	<2.0	<5.0	<5.0	<5.0	nd
	06/05/2002	0.058 Q	<0.028	0.36	1.8 D	<0.020	0.027 Q	*0.10*	*0.073*	0.15	<0.047	*0.020 Q*	0.037 Q	0.031 Q	0.18	0.12	0.042 Q	0.035 Q	0.034 Q	3.1
	05/15/2003	0.037 Q	0.027 Q	0.082	0.47	<0.020	0.021 Q	*0.072*	*0.066*	0.11	0.046 Q	*0.030 Q*	0.020 Q	0.046	0.037 Q	0.081	0.18	0.022 Q	0.042 Q	1.4
	02/25/2004	0.032 Q	0.031 Q	0.25	1.1 D	<0.019	0.024 Q	*0.055*	*0.053*	0.068	0.047 Q	*0.037 Q*	<0.015	0.059	0.081	0.052 Q	0.76 D	0.034 Q	0.050 Q	2.7
	05/24/2004	0.018	0.022	0.025	0.066	0.053	0.37	0.58	0.72	0.63	0.59	0.60	0.17	1.0	0.026	0.54	0.038	0.35	0.82	6.6
	05/18/2005	0.030 Q	<0.023	0.180	0.75 D	<0.018	0.049 Q	*0.11*	*0.12*	0.15	0.11	*0.092*	0.031 Q	0.15	0.068 Q	0.11	0.049 Q	0.059 Q	0.11	2.2

[JTB/GRL-08/02][JTB/PAR-07/03][JKL-6/01][HMS/JAH-7/05]

Notes:
1) Pre-2002 data from Horizon Environmental reports.
2) Concentrations that attain or exceed an NR 140 PAL are *italicized/ underlined.*
3) Concentrations that attain or exceed an NR 140 ES are **underlined/ bold.**
4) The 4/11/00 MW-13 sampling also contained: (22 µg/L 2,4-Dimethylphenol)(7.4 µg/L 2-methylphenol).
5) Wells PW-1 and MW-12 were buried by asphalt and well MW-1 was dry during the 5/15/03 sampling event

PAHs: Polynuclear aromatic hydrocarbons.
ns: No standard for this analyte.
Dup (QC-1): Field duplicate sample (field identity shown in parentheses).
µg/L: Micrograms per liter.
-- : Analysis was not performed.
nd: Not detected.

Laboratory Notes:
Q: The analyte has been detected between the limit of detection (LOD) and limit of quantitation (LOQ)
C: Analyte value from diluted analysis, or surrogate result not applicable due to sample dilution
B: Naphthalene present in blank at 0.030 µg/L.
* : Duplicate analysis not within control limits
D: Analyte value from diluted analysis
&: Laboratory Control Spike recovery not within control limit

Table 6 - Pretreatment System Analytical Results - Influent, Intermediate, and Effluent
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

		BTEX Compounds (µg/L)					Additional Volatile Organic Compounds (VOCs, µg/L)								SVOCs (µg/L)							
Sample ID	Collect Date	Benzene	Toluene	Ethylbenzene	Xylene, Total	Total BTEX	cis-1,2-Dichloroethene	1,1-Dichloroethane	Isopropyl-benzene	Methyl Tertiary Butyl Ether	n-Propylbenzene	Styrene	Trimethylbenzenes	Trichloroethene	Acenaphthylene	Anthracene	Fluorene	Phenanthrene	2,4-Dimethylphenol	1-Methylnapthalene	2-methylnaphthalene	Naphthalene
Influent	10/28/1997	420	260	150	290	1120	--	--	--	<250	--	--	71	--	nd	--	--	--	29	--	nd	420
(PW-1)	11/12/1997	750	420	510	550	2230	--	--	--	nd	--	--	nd	--	30	--	--	--	60	--	66	2200
	11/13/1997	420	190	290	360	1260	--	--	--	nd	--	--	nd	--	22	--	--	--	nd	--	nd	1600
	11/20/1997	190	98	140	170	598	--	--	--	nd	--	--	55.2	--	7	--	--	--	nd	--	11	470
	11/25/1997	140	73	93	120	426	--	--	--	nd	--	--	33.2	--	nd	--	--	--	nd	--	nd	400
	12/4/1997	160	110	140	160	570	--	--	--	<250	--	--	<1.0	--	9	--	--	--	nd	--	nd	640
	12/9/1997	200	140	180	200	720	--	--	--	<50	--	--	<1.0	--	9	--	--	--	nd	--	nd	640
	1/15/1998	170	190	120	220	700	--	--	--	<50	--	--	60	--	--	--	--	--	--	--	--	--
	2/17/1998	110	110	74	160	454	--	--	--	<50	--	--	39.4	--	--	--	--	--	--	--	--	--
	3/11/1998	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	--	--	--	--	--	--	--	--
	4/14/1998	94	100	72	170	436	--	--	--	<50	--	--	33.3	--	--	--	--	--	--	--	--	--
	5/19/1998	31	1.8	<1.0	7.6	40.4	--	--	--	<50	--	--	<1.0	--	--	--	--	--	--	--	--	--
	6/11/1998	100	120	74	170	464	--	--	--	<50	--	--	38.2	--	--	--	--	--	--	--	--	--
	1/12/1999	90	99	72	240	501	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9/14/2001	47	52	47	150	296	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4/23/2002	50	65	61	121	297	0.86 Q	<0.48	4.4	<0.67	1.8 Q	42	28.6	27	7.3 Q	--	--	--	<5.2	--	10 Q	210
	10/8/2002	46	66	43	124	279	<4.0	<4.3	<3.3	<4.3	<4.8	41 &	32.8	31	<10	--	--	--	<10	--	16 Q	380
	4/16/2003	44	59	56	108	267	<4.2	<3.8	4.1 Q	<3.0	<4.0	36	29.1 Q	39	<19	<11	<19	<8.4	<12	--	<16	310
	10/17/2003	48	63	65	111	287	<4.2	<3.8	4.4 Q	<3.0	<4.0	37	30.9 Q	36	<19	<20	<17	<16	--	22 Q	<17	310
	5/24/2004	35	38	43	75	191	<4.1	<2.8	3.5 Q	<3.0	<4.1	16	13 Q	40	5.4 Q D*	0.020 Q *	0.22	0.082	--	16 D	5.7 Q D*	170 D
	11/10/2004	38	30	37	118	223	2.5 Q	<1.5	6.8	<1.2	2.0 Q	<1.7	21 Q	54	4.3 Q	<1.8	<2.2	<2.0	--	18	4.1 Q	190 D
	5/18/2005	33	47	58	98	236	<4.1	<3.8	4.2 Q	<3.0	<4.1	27	27 Q	36	2.6 Q	<1.8	<2.2	<2.0	--	17	6.2 Q	30

Table 6 - Pretreatment System Analytical Results - Influent, Intermediate, and Effluent
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

		BTEX Compounds (µg/L)					Additional Volatile Organic Compounds (VOCs, µg/L)								SVOCs (µg/L)							
Sample ID	Collect Date	Benzene	Toluene	Ethylbenzene	Xylene, Total	Total BTEX	cis-1,2-Dichloroethene	1,1-Dichloroethane	Isopropyl-benzene	Methyl Tertiary Butyl Ether	n-Propylbenzene	Styrene	Trimethylbenzenes	Trichloroethene	Acenaphthylene	Anthracene	Fluorene	Phenanthrene	2,4-Dimethylphenol	1-Methylnapthalene	2-methylnaphthalene	Naphthalene
Intermediate	07/13/1998	68	16	<1.0	42	126	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/24/1998	75	20	<1.0	85	180	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/22/1998	72	17	<1.0	120	209	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/02/1998	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/23/1998	6.6	<1.0	<1.0	<3.0	6.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/16/1998	14	2.6	<1.0	6	22.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	01/12/1999	38	3	<1.0	19	60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/11/1999	56	6.2	<1.0	32	94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/24/1999	64	11	<1.0	57	132	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/14/2001	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	04/23/2002	48	<0.82	4.6	40	93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/24/2002	58	16	<0.82	55	129	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/26/2002	60	14	<0.82	83	157	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/08/2002	55	16	1.8 Q	95	168	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/09/2003	13	2.3	<0.6	11.9	27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/17/2003	41	11	<0.6	52	104	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/29/2003	44	8.7	0.79 Q	52	105	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	04/29/2004	<0.14	<0.36	<0.40	<0.74	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/30/2004	2.3	1.2	1.4	4.3	9.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/25/2004	3.3	1.3	1.0 Q	3.9 Q	9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/28/2004	21	5.7	1.3	22.9	50.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/16/2005	40	29	6.8	75	150.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	04/14/2005	40	8.6	4.6	55	108.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/16/2005	40	3.8	<0.4	64	107.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/10/2005	43	14	11	83	151	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 6 - Pretreatment System Analytical Results - Influent, Intermediate, and Effluent
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

		BTEX Compounds (µg/L)					Additional Volatile Organic Compounds (VOCs, µg/L)								SVOCs (µg/L)							
Sample ID	Collect Date	Benzene	Toluene	Ethylbenzene	Xylene, Total	Total BTEX	cis-1,2-Dichloroethene	1,1-Dichloroethane	Isopropyl-benzene	Methyl Tertiary Butyl Ether	n-Propylbenzene	Styrene	Trimethylbenzenes	Trichloroethene	Acenaphthylene	Anthracene	Fluorene	Phenanthrene	2,4-Dimethylphenol	1-Methylnapthalene	2-methylnaphthalene	Naphthalene
City of Manitowoc Effluent Water Standards (µg/l)																						
		125	ne	ne	ne	250	ne	ne	ne	ne	ne	ne	ne	ne	nd	nd	nd	nd	ne	nd	nd	nd
Effluent	10/28/1997	<1.0	<1.0	<1.0	<30.	nd	--	--	--	<50	--	--	<1.0	--	nd	--	--	--	nd	--	nd	nd
	11/12/1997	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	nd	--	--	--	nd	--	nd	nd
	11/13/1997	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	nd	--	--	--	nd	--	nd	nd
	11/20/1997	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	nd	--	--	--	nd	--	nd	nd
	11/25/1997	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	nd	--	--	--	nd	--	nd	nd
	12/04/1997	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	nd	--	--	--	nd	--	nd	nd
	12/09/1997	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	nd	--	--	--	nd	--	nd	nd
	01/15/1998	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	--	--	--	--	--	--	--	--
	02/17/1998	1.1	1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	--	--	--	--	--	--	--	--
	03/11/1998	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	--	--	--	--	--	--	--	--
	04/14/1998	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	--	--	--	--	--	--	--	--
	05/19/1998	<1.0	<1.0	<1 0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	--	--	--	--	--	--	--	--
	06/11/1998	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	<50	--	--	<1.0	--	--	--	--	--	--	--	--	--
	07/13/1998	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/24/1998	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/22/1998	2.7	<1.0	<1.0	<3.0	2.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/02/1998	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/23/1998	<1.0	<1.0	<1.0	<3 0	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/16/1998	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	01/12/1999	<1.0	<1.0	<1.0	<3.0	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/11/1999	<1.0	<1.0	<1.0	<1.0	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/24/1999	3.9	<1.0	<1.0	<3.0	3.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/14/2001	9.7	<1.0	<1.0	<3.0	9.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	04/23/2002	4.4	<0.47	<0.43	<1.4	4.4	<0.73	<0.48	<0.43	0.68 Q	<0.64	<0.43	<0.60	0.94 Q	<2.6	--	--	--	<2.6	--	<2 6	<2.7
	10/8&14/02	22	<0.84	<0.53	2.0 Q	24	0.88 Q	<0.87	<0.66	1.0 Q	<0.95	<0.62 &	<0.69	7.0	<2.6	--	--	--	<2.6	--	<2.6	<2 7
	04/16/2003	<0.41	<0.67	<0.54	<1.8	nd	<0.83	<0.75	<0.59	<0.61	<0.81	<0.86	<0.97	<0.48	<4.7	<2 8	<4 7	<2.1	<2.9	--	<3.9	<3.8
	10/17/2003	0.92 Q	<0.67	<0.54	<1.8	0.92	<0.83	<0.75	<0.59	<0.61	<0.81	<0.86	<0.97	<0.48	<4.7	<2.8	<4.7	<2.1	<2.9	--	<3.9	<3.8
	05/24/2004	<0.41	<0.67	<0.54	<1.8	nd	<0.83	<0.75	<0.59	<0.61	<0.81	<0.86	<0.97	<0.48	<4.4	<2.6	<4.4	<2 0	<2.8	--	<3.7	<3 6

Table 6 - Pretreatment System Analytical Results - Influent, Intermediate, and Effluent
Wisconsin Public Service - Manitowoc Former Fuel & Light Manufactured Gas Plant Site
402 N. Tenth Street, Manitowoc, Wisconsin
USEPA ID# WIN000509949 / WDNR BRRTS # 02-36-000219, WDNR FID # 436033950

		BTEX Compounds (µg/L)					Additional Volatile Organic Compounds (VOCs, µg/L)								SVOCs (µg/L)							
Sample ID	Collect Date	Benzene	Toluene	Ethylbenzene	Xylene, Total	Total BTEX	cis-1,2-Dichloroethene	1,1-Dichloroethane	Isopropyl-benzene	Methyl Tertiary Butyl Ether	n-Propylbenzene	Styrene	Trimethylbenzenes	Trichloroethene	Acenaphthylene	Anthracene	Fluorene	Phenanthrene	2,4-Dimethylphenol	1-Methylnapthalene	2-methylnaphthalene	Naphthalene
City of Manitowoc Effluent Water Standards (µg/l)																						
		125	ne	ne	ne	250	ne	ne	ne	ne	ne	ne	ne	ne	nd	nd	nd	nd	ne	nd	nd	nd
Effluent (cont)	11/10/2004	<0.41	<0.67	<0.54	<1.8	nd	<0.83	<0.75	<0.59	<0.61	<0.81	<0.86	<0.97	<0.48	<0.50	<1.6	<0.50	<0.50	<0.72	--	<1.9	<0.6
	02/16/2005	1.2	<0.36	<0.40	<0.74	1.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/18/2005	10	<0.67	<0.54	<1.8	10	2.4 Q	<0.75	<0.59	<0.61	<0.81	<0.86	<0.97	6.1	<0.50	<1.6	<0.50	<0.50	<0.72	--	<1.9	<0.60

Notes:

1) Pre-2002 data from Horizon Environmental reports. Possible Data missing.
2) Trimethylbenzenes include 1,2,4- and 1,3,5-trimethylbenzene
3) Only detected compounds shown. Laboratory report should be referenced for full list of analytes.
4) Analytes attaining or exceeding the Preventive Action Limit (PAL) are shown in italics.
5) Analytes attaining or exceeding the Enforcement Standard (ES) are shown in bold.

D: Analyte value from diluted analysis or surrogate result not applicable due to sample dilution.
Q: Analyte detected between the limit of detection (LOD) and limit of quantitation (LOQ).
&: Laboratory Control Spike recovery not within control limits.
ne: City of Manitowoc effluent water standard not established.
nd: Analyte not detected.
--: Not Analyzed or unknown if analyzed

Table 4

Summary of Laboratory Analytical Results of Manitowoc River Sediment Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id: / Sample id: / Sample date: / Depth (feet):		Average Background Concentration *	SD01 E02629 10/03/91 0-2.5	SD02 E02630 10/03/91 0-2.5	SD03 E02631 10/03/91 0-1.2	SD04 E02632 10/03/91 0-2.5	SD05 E02633 10/03/91 0-0.8	SB-21 E04500 10/29/91 12 - 14	SB-22 E04508 10/30/91 0 - 2	SB-22 E04509 10/30/91 4 - 6	SB-22 E04503 10/30/91 10 - 12	SB-24 E04501 10/30/91 8 - 10	SB-25 E04502 10/30/91 6 - 8	SB-26 E04504 10/30/91 4 - 6
Volatile Fraction	**Units**													
Bromodichloromethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Bromoform	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Bromomethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Carbon tetrachloride	mg/kg	--	--	--	--	--	--	<.01	<500	<1	11	<.01	<.01	<.01
Chlorobenzene	mg/kg	--	--	--	--	--	--	<.01	<.01	<1	<.01	<.01	<.01	<.01
Chloroethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
2-Chloroethylvinyl ether	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Chloroform	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Chloromethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Dibromochloromethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
1,2-Dichlorobenzene	mg/kg	--	--	--	--	--	--	<.01	<.01	<1	<.01	<.01	<.01	<.01
1,3-Dichlorobenzene	mg/kg	--	--	--	--	--	--	<.01	<.01	<1	<.01	<.01	<.01	<.01
1,4-Dichlorobenzene	mg/kg	--	--	--	--	--	--	<.01	<.01	<1	<.01	<.01	<.01	<.01
Dichlorodifluoromethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
1,1-Dichloroethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
1,2-Dichloroethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
1,1-Dichloroethylene	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
trans-1,2-Dichloroethylene	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	.016
1,2-Dichloropropane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
cis-1,3-Dichloropropene	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
trans-1,3-Dichloropropene	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Methylene chloride	mg/kg	--	--	--	--	--	--	<.01	<500	<2	<.01	<.02	<.01	<.02
1,1,2,2-Tetrachloroethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Tetrachloroethylene	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
1,1,1-Trichloroethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
1,1,2-Trichloroethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Trichloroethylene	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	.069
Trichlorofluoromethane	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Vinyl chloride	mg/kg	--	--	--	--	--	--	<.01	<500	<1	<.01	<.01	<.01	<.01
Benzene	mg/kg	<.01	<.01	<.01	10	1.2	<.01	.11	32000	45	.12	<.01	<.01	.063
Ethylbenzene	mg/kg	<.01	<.01	<.01	5.2	.6	<.01	.33	17000	16	.09	.028	<.5	.054
Toluene	mg/kg	<.01	<.01	<.01	3.1	<.01	<.01	.076	24000	28	.1	<.01	<.03	.05
Xylene	mg/kg	<.01	<.01	<.01	9.6	.39	.015	.25	39000	33	.18	.09	<.05	.085

< = Parameter not detected. The value presented indicates the detection limit.
** = The average background concentration was calculated from the analytical results of up-stream sediment samples SD-01 and SD-02.*
-- = Not analyzed.

Table 4

Summary of Laboratory Analytical Results of Manitowoc River Sediment Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id:		Average Background Concentration *	SB-26	SB-27	SB-27	SB-28	SB-30	SB-30	SB-31	SB-32	SB-34	SB-34	SB-35	SB-35
Sample id:			E04505	E04506	E04507	E04646	E04647	E04648	E04649	E04650	E05057	E05058	E05059	E05060
Sample date:			10/30/91	10/31/91	10/31/91	10/31/91	10/31/91	10/31/91	11/01/91	11/01/91	11/05/91	11/05/91	11/05/91	11/05/91
Depth (feet):			6 - 8	0 - 2	4 - 6	0 - 2	0 - 2	2 - 4	0 - 2	0 - 2	0 - 2	4 - 6	0 - 2	4 - 6
Volatile Fraction	**Units**													
Bromodichloromethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Bromoform	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Bromomethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Carbon tetrachloride	mg/kg	--	.023	<1	.017	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Chlorobenzene	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Chloroethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
2-Chloroethylvinyl ether	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Chloroform	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Chloromethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Dibromochloromethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
1,2-Dichlorobenzene	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
1,3-Dichlorobenzene	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
1,4-Dichlorobenzene	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Dichlorodifluoromethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
1,1-Dichloroethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
1,2-Dichloroethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
1,1-Dichloroethylene	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
trans-1,2-Dichloroethylene	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
1,2-Dichloropropane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
cis-1,3-Dichloropropene	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
trans-1,3-Dichloropropene	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Methylene chloride	mg/kg	--	<.01	<1	.021	<.25	<.03	<.01	<.25	<.01	<.01	<.01	<.01	<.01
1,1,2,2-Tetrachloroethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Tetrachloroethylene	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
1,1,1-Trichloroethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
1,1,2-Trichloroethane	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Trichloroethylene	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Trichlorofluoromethane	mg/kg	--	.011	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Vinyl chloride	mg/kg	--	<.01	<1	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Benzene	mg/kg	<.01	<.01	29	.085	15	.24	<.01	19	<.01	<.01	<.01	<.01	<.01
Ethylbenzene	mg/kg	<.01	<.01	13	<.01	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Toluene	mg/kg	<.01	.023	18	.088	<.25	<.01	<.01	<.25	<.01	<.01	<.01	<.01	<.01
Xylene	mg/kg	<.01	<.01	24	.15	3.3	<.09	<.01	53	<.01	<.01	<.01	<.01	<.01

< = Parameter not detected. The value presented indicates the detection limit.

** = The average background concentration was calculated from the analytical results of up-stream sediment samples SD-01 and SD-02.*

-- = Not analyzed.

Table 4

Summary of Laboratory Analytical Results of Manitowoc River Sediment Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id:		Average Background Concentration *	SD01	SD02	SD03	SD04	SD05	SB-21	SB-22	SB-22	SB-22	SB-24	SB-25
Sample id:			E02629	E02630	E02631	E02632	E02633	E04500	E04508	E04509	E04503	E04501	E04502
Sample date:			10/03/91	10/03/91	10/03/91	10/03/91	10/03/91	10/29/91	10/30/91	10/30/91	10/30/91	10/30/91	10/30/91
Depth (feet):			0-2.5	0-2.5	0-1.2	0-2.5	0-0.8	12 - 14	0 - 2	4 - 6	10 - 12	8 - 10	6 - 8
PNA Fraction	Units												
Acenaphthene	mg/kg	2.4	<.15	4.8	250	<10	<5	.59	150	130	4.9	1.1	.62
Acenaphthylene	mg/kg	<0.6	<.15	<1	260	<10	<5	.75	690	200	1.2	<.5	<.5
Anthracene	mg/kg	2.4	<.15	4.8	340	65	<5	1.1	500	220	4.5	.96	<.5
Benzo(a)anthracene	mg/kg	3.8	.24	7.3	200	52	5.2	.71	660	140	3.4	1.2	<.5
Benzo(b and/or k)fluoranthene	mg/kg	2.8	.19	5.4	250	67	7.1	.84	380	190	3.1	1.3	<.5
Benzo(a)pyrene	mg/kg	1.8	<.15	3.5	150	41	<5	<.5	330	170	3.6	1.1	<.5
Benzo(ghi)perylene	mg/kg	1.2	<.15	2.4	83	23	<5	<.5	<50	<50	<5	<.5	<.5
Chrysene	mg/kg	1.8	<.15	3.6	190	51	5.6	.86	670	180	3.4	1.3	<.5
Dibenz(a,h)anthracene	mg/kg	<0.6	<.15	<1	<40	<10	<5	<.5	<50	<50	<5	<.5	<.5
Fluoranthene	mg/kg	6.2	.31	12	680	160	14	3.2	1100	500	11	3.2	1.3
Fluorene	mg/kg	1.5	<.3	2.8	290	62	<10	<1	430	170	3.3	<1	<1
Indeno(1,2,3-cd)pyrene	mg/kg	<0.6	<.15	<1	74	20	<5	<.5	<50	<50	<5	<.5	<.5
Naphthalene	mg/kg	<0.6	<.15	<1	2700	300	<5	6.7	650	360	21	1.5	.7
Phenanthrene	mg/kg	8.1	.28	16	1100	260	14	3	1500	1100	14	3.3	1.6
Pyrene	mg/kg	5.6	.28	11	560	140	13	1.7	910	550	9.5	3.4	.99

** = The average background concentration was calculated from the analytical results of up-stream sediment samples SD-01 and SD-02.*

< = Parameter not detected. Value presented indicates the detection limit.

Table 4

Summary of Laboratory Analytical Results of Manitowoc River Sediment Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id: / Sample id: / Sample date: / Depth (feet):		Average Background Concentration *	SB-26 E04504 10/30/91 4 - 6	SB-26 E04505 10/30/91 6 - 8	SB-27 E04506 10/31/91 0 - 2	SB-27 E04507 10/31/91 4 - 6	SB-28 E04646 10/31/91 0 - 2	SB-30 E04647 10/31/91 0 - 2	SB-30 E04648 10/31/91 2 - 4	SB-31 E04649 11/01/91 0 - 2	SB-32 E04650 11/01/91 0 - 2	SB-34 E05057 11/05/91 0 - 2	SB-34 E05058 11/05/91 4 - 6
PNA Fraction	*Units*												
Acenaphthene	mg/kg	2.4	27	<.5	27	<.5	<250	<2.5	<.5	<2.5	2.6	<.5	<.5
Acenaphthylene	mg/kg	<0.6	4.7	<.5	53	1.7	670	<2.5	<.5	3.6	<.5	<.5	<.5
Anthracene	mg/kg	2.4	31	<.5	85	1.7	540	4.7	.68	19	2.4	<.5	<.5
Benzo(a)anthracene	mg/kg	3.8	36	<.5	71	1.2	250	4	.75	21	2.4	<.5	<.5
Benzo(b and/or k)fluoranthene	mg/kg	2.8	35	<.5	72	2.1	<250	5.4	.95	30	3.4	<.5	<.5
Benzo(a)pyrene	mg/kg	1.8	32	<.5	67	2.07	<250	<2.5	<.5	11	1.2	<.5	<.5
Benzo(ghi)perylene	mg/kg	1.2	<5	<.5	18	<2.1	<250	<2.5	<.5	13	1.2	<.5	<.5
Chrysene	mg/kg	1.8	35	<.5	79	1.4	300	3.2	.75	23	2.2	<.5	<.5
Dibenz(a,h)anthracene	mg/kg	<0.6	<5	<.5	26	<.5	<250	<2.5	<.5	4.3	<.5	<.5	<.5
Fluoranthene	mg/kg	6.2	95	<.5	170	3.1	1100	12	2	58	6.9	<.5	<.5
Fluorene	mg/kg	1.5	21	<1	70	1.1	<500	<5	<1	21	1.7	<1	<1
Indeno(1,2,3-cd)pyrene	mg/kg	<0.6	<5	<.5	7.1	<.5	<250	<2.5	<.5	11	1	<.5	<.5
Naphthalene	mg/kg	<0.6	9.1	<.5	69	2.9	5100	3.6	<.5	120	.89	<.5	<.5
Phenanthrene	mg/kg	8.1	92	<.5	110	4.4	1700	16	1.1	75	8.9	<.5	<.5
Pyrene	mg/kg	5.6	130	<.5	150	2	1200	10	2.1	49	6.3	<.5	<.5

** = The average background concentration was calculated from the analytical results of up-stream sediment samples SD-01 and SD-02.*

< = Parameter not detected. Value presented indicates the detection limit.

Table 4

Summary of Laboratory Analytical Results of Manitowoc River Sediment Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id:		Average Background Concentration *	SB-35	SB-35
Sample id:			E05059	E05060
Sample date:			11/05/91	11/05/91
Depth (feet):			0 - 2	4 - 6
PNA Fraction	*Units*			
Acenaphthene	mg/kg	2.4	<.5	<.5
Acenaphthylene	mg/kg	<0.6	<.5	<.5
Anthracene	mg/kg	2.4	<.5	<.5
Benzo(a)anthracene	mg/kg	3.8	<.5	<.5
Benzo(b and/or k)fluoranthene	mg/kg	2.8	<.5	<.5
Benzo(a)pyrene	mg/kg	1.8	<.5	<.5
Benzo(ghi)perylene	mg/kg	1.2	<.5	<.5
Chrysene	mg/kg	1.8	.65	<.5
Dibenz(a,h)anthracene	mg/kg	<0.6	<.5	<.5
Fluoranthene	mg/kg	6.2	.92	<.5
Fluorene	mg/kg	1.5	<1	<1
Indeno(1,2,3-cd)pyrene	mg/kg	<0.6	<.5	<.5
Naphthalene	mg/kg	<0.6	<.5	<.5
Phenanthrene	mg/kg	8.1	.76	<.5
Pyrene	mg/kg	5.6	.85	<.5

** = The average background concentration was calculated from the analytical results of up-stream sediment samples SD-01 and SD-02.*

< = Parameter not detected. Value presented indicates the detection limit.

Table 4

Summary of Laboratory Analytical Results of Manitowoc River Sediment Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id:		Average Background Concentration *	SD01	SD02	SD03	SD04	SD05	SB-21	SB-22	SB-22	SB-22	SB-24	SB-25
Sample id:			E02629	E02630	E02631	E02632	E02633	E04500	E04508	E04509	E04503	E04501	E04502
Sample date:			10/03/91	10/03/91	10/03/91	10/03/91	10/03/91	10/29/91	10/30/91	10/30/91	10/30/91	10/30/91	10/30/91
Depth (feet):			0-2.5	0-2.5	0-1.2	0-2.5	0-.8	12-14	0-2	4-6	10-12	8-10	6-8
Metals	*Units*												
Lead, total	mg/kg	--	--	--	--	--	--	3.3	161	91	<2	36	20
Selenium, total	mg/kg	--	--	--	--	--	--	<4	<4	<4	<4	<4	<4
Zinc, total	mg/kg	--	--	--	--	--	--	8.8	73	53	8.9	16	15
Cyanide, amenable	mg/kg	<.5	<.5	<.5	<.5	.99	<.5	<.5	<.5	1.3	<.5	<.5	<.5
Cyanide, total	mg/kg	1.05	<.5	1.6	4.5	**1.6	<.5	<.5	23	9.6	<.5	<.5	<.5
Sulfate	mg/kg	--	--	--	--	--	--	55	61	72	<50	81	73
Grease & oil	mg/kg	839	488	1190	3070	1470	920	74	5380	2230	90	179	103

** = The Average Background Concentration was calculated from the analytical results of up-stream sediment samples SD-01 and SD-02.*
*** = Matrix Interference*
< = Parameter not detected. Value presented indicates the detection limit.
-- = Analysis not performed.

Table 4

Summary of Laboratory Analytical Results of Manitowoc River Sediment Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id:		Average Background Concentration *	SB-26	SB-26	SB-27	SB-27	SB-28	SB-30	SB-30	SB-31	SB-32	SB-34	SB-34
Sample id:			E04504	E04505	E04506	E04507	E04646	E04647	E04648	E04649	E04650	E05057	E05058
Sample date:			10/30/91	10/30/91	10/31/91	10/31/91	10/31/91	10/31/91	10/31/91	11/01/91	11/01/91	11/05/91	11/05/91
Depth (feet):			4-6	6-8	0-2	4-6	0-2	0-2	2-4	0-2	0-2	0-2	4-6
Metals	*Units*												
Lead, total	mg/kg	--	516	<2	52	2.1	20	79	14	100	49	10	14
Selenium, total	mg/kg	--	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Zinc, total	mg/kg	--	68	9.3	60	16	45	82	9.3	84	71	30	30
Cyanide, amenable	mg/kg	<.5	<.5	<.5	<.5	<.5	.8	<.5	<.5	<.5	<.5	<.5	<.5
Cyanide, total	mg/kg	1.05	<.5	<.5	4.7	<.5	2.2	1.5	<.5	1.2	<.5	<.5	<.5
Sulfate	mg/kg	--	200	<50	118	64	**<500	1010	<50	125	343	85	121
Grease & oil	mg/kg	839	1580	<50	2290	67	867	1850	67	1740	315	73	594

** = The Average Background Concentration was calculated from the analytical results of up-stream sediment samples SD-01 and SD-02.*
*** = Matrix Interference*
< = Parameter not detected. Value presented indicates the detection limit.
-- = Analysis not performed.

Table 4

Summary of Laboratory Analytical Results of Manitowoc River Sediment Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id: / Sample id: / Sample date: / Depth (feet):		Average Background Concentration *	SB-35 E05059 11/05/91 0-2	SB-35 E05060 11/05/91 4-6
Metals	*Units*			
Lead, total	mg/kg	--	304	52
Selenium, total	mg/kg	--	<4	<4
Zinc, total	mg/kg	--	60	19
Cyanide, amenable	mg/kg	<.5	<.5	<.5
Cyanide, total	mg/kg	1.05	<.5	<.5
Sulfate	mg/kg	--	66	<50
Grease & oil	mg/kg	839	152	81

** = The Average Background Concentration was calculated from the analytical results of up-stream sediment samples SD-01 and SD-02.*
< = Parameter not detected. Value presented indicates the detection limit.
-- = Analysis not performed.

ENVIRONMENTAL SITE INVESTIGATION
FORMER COAL GAS MANUFACTURING PLANT
MANITOWOC, WISCONSIN

Prepared for

WISCONSIN FUEL & LIGHT COMPANY
MANITOWOC, WISCONSIN

Prepared by

WW ENGINEERING & SCIENCE
5555 GLENWOOD HILLS PARKWAY
GRAND RAPIDS, MICHIGAN 49588-0874

JANUARY 1992

PROJECT 22159

Reviewed by:

James G. Venn
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Appendix A
Sediment Chemistry Data

core data

Sample ID	Units	TEC	PEC	MW-01A	PEC-Q 01A	MW-01B	PEC-Q01B	MW-01C	PEC-Q01C	MW-02A	PEC-Q02A	MW-02B	PEC-Q02B	MW-02C	PEC-Q02C	MW-02BR	PEC-Q02BR	MW-02CR	PEC-Q02CR
Lab ID				L10006-28	C/PEC	L10006-29	C/PEC	10006-30	C/PEC	L10006-33	C/PEC	L10006-34	C/PEC	L10006-35	C/PEC	L10006-36	C/PEC	L10006-1	C/PEC
Latitude				44.098120		44.098120		44.098120		44.097910		44.097910		44.097910		44.097910		44.097910	
Longitude				-87.669310		-87.669310		-87.669310		-87.662480		-87.662480		-87.662480		-87.662480		-87.662480	
Top Depth	inch			-		6		18		-		6		18		6		18	
Bottom Depth	inch			6		18		48		6		18		40		18		40	
Total Solids	%			40		39		45		34		39		46		39		48	
Total Organic Carbon	mg/kg			26,000		30,000		28,000		21,000		27,000		23,000		24,000		28,000	
Total Cyanide	mg/kg			<0.20		<0.20		<0.20		0.36		0.33		0.26		0.36		0.23	
Ammonia Nitrogen	mg/kg																		
Oil & grease	mg/kg			690		850		820		980		860		760		690		730	
METALS																			
Arsenic	mg/kg	9.8	33.0	1.8	0.055	2.2	0.067	2.2	0.067	2.6	0.079	2.5	0.076	2.7	0.082	2.5	0.076	2.7	0.082
Barium	mg/kg																		
Cadmuim	mg/kg	0.99	4.98	0.38	0.076	0.47	0.094	0.46	0.092	0.56	0.112	0.55	0.110	0.57	0.114	0.56	0.112	0.68	0.137
Chromium	mg/kg	43.4	111	22	0.198	28	0.252	25	0.225	32	0.288	29	0.261	31	0.279	27	0.243	29	0.261
Copper	mg/kg	31.6	149	20	0.134	25	0.168	24	0.161	28	0.188	27	0.181	25	0.168	27	0.181	24	0.161
Iron	mg/kg																		
Lead	mg/kg	35.8	128	16	0.125	16	0.125	20	0.156	30	0.234	25	0.195	33	0.258	27	0.211	100	0.781
Manganese	mg/kg																		
Mercury	mg/kg	0.18	1.06	<0.10		<0.10		<0.10		0.10	0.094	<0.10		<0.10		0.13	0.123	<0.10	
Nickel	mg/kg	22.70	48.60	20.00	0.412	24.00	0.494	0.66	0.014	25.00	0.514	24.00	0.494	24.00	0.494	25.00	0.514	27.00	0.556
Selenium	mg/kg																		
Silver	mg/kg																		
Zinc	mg/kg	121	459	71	0.155	85	0.185	81	0.176	97	0.211	95	0.207	94	0.205	98	0.214	94	0.205
PESTICIDES																			
alpha-BHC	ug/kg																		
gamma-BHC	ug/kg	2.37	4.99	<20		<20		<20		<20		<20		<20		<20		<28	
Heptachlor Epoxide	ug/kg	2.47	16	<20		<20		<20		<20		<20		<20		<20		<28	
4,4'-DDE	ug/kg	3.16	31.3	<20		<20		<20		<20		<20		<20		<20		<28	
Dieldrin	ug/kg	1.9	61.8	<20		<20		<20		<20		<20		<20		<20		<28	
Endrin	ug/kg	2.22	62.4	<20		<20		<20		<20		<20		<20		<20		<28	
4,4'-DDD	ug/kg	4.88	28	<20		<20		<20		<20		<20		<20		<20		<28	
4,4'-DDT	ug/kg	5.28	62.9	<20		<20		<20		<20		<20		<20		<20		<71	
Chlordane	ug/kg	3.24	17.6	<25		<25		<25		<25		<25		<25		<25		<140	
Toxaphene	ug/kg			<170		<170		<170		<170		<170		<170		<170		<350	
PCBs																			
PCB-1016	ug/kg			<100		<100		<100		<100		<100		<100		<100		<350	
PCB-1221	ug/kg			<100		<100		<100		<100		<100		<100		<100		<350	
PCB-1232	ug/kg			<100		<100		<100		<100		<100		<100		<100		<350	
PCB-1242	ug/kg			<100		<100		<100		<100		<100		<100		<100		<350	
PCB-1248	ug/kg			<100		<100		<100		<100		<100		<100		<100		<350	
PCB-1254	ug/kg			<100		<100		<100		<100		<100		<100		<100		<100	
PCB-1260	ug/kg			<100		<100		<100		<100		<100		<100		<100		<100	
Total PCBs	ug/kg	59.8	676	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000
PAHs																			
Naphthalene	ug/kg	176	561	<420		<430		<380		<500		<430		<370		<430		<350	
2-Methylnaphthalene	ug/kg			2,500		<250		<250		<250		<250		<250		<250		<250	
Acenaphthylene	ug/kg			<420		<430		<380		<500		<430		<370		<430		<350	
Acenaphthene	ug/kg			<420		<430		<380		<500		<430		<370		<430		<350	
Fluorene	ug/kg	77.4	536	<420		<430		<380		<500		<430		<370		<430		<350	
Phenanthrene	ug/kg	204	1170	<420		<430		<380		[redacted]		<430		710		<430		730	
Anthracene	ug/kg	57.2	845	<420		<430		<380		<500		<430		<370		<430		<350	
Fluoranthene	ug/kg	423	2230	<420		<430		<380		1,600		<430		1,100		<430		920	
Pyrene	ug/kg	195	1520	<420		<430		<380		1,300		<430		880		<430		760	
Benzo(a)anthracene	ug/kg	108	1050	<420		<430		<380		680		<430		500		<430		430	
Chrysene	ug/kg	166	1290	<420		<430		<380		<500		<430		430		<430		390	
Benzo(b)fluoranthene	ug/kg			<420		<430		<380		740		<430		560		<430		<350	
Benzo(k)fluoranthene	ug/kg			<420		<430		<380		<500		<430		<370		<430		370	
Benzo(a)pyrene	ug/kg	150	1450	<420		<430		<380		680		<430		490		<430		480	
Indeno(1,2,3-cd)pyrene	ug/kg			<420		<430		<380		<500		<430		<370		<430		<350	
Dibenz(a,h)anthracene	ug/kg	33		<420		<430		<380		<500		<430		<370		<430		<350	
Benzo(g,h,i)perylene	ug/kg			<420		<430		<380		<500		<430		<370		<430		<350	
Total PAHs	ug/kg	1610	22800	2,500	0.110	-	0.000	-	0.000	6,300	0.276	-	0.000	4,670	0.205	-	0.000	4,080	0.179
SUM PEC-Q					1.264		1.385		0.892		1.998		1.525		1.805		1.674		2.361
PEC-Q					0.140		0.154		0.099		0.200		0.169		0.201		0.167		0.262
Max PEC-Q					0.412		0.494		0.225		0.514		0.494		0.494		0.514		0.781

= Exceeds Threshold Effects Concentration (TEC) of MacDonald, et al. (2000)

[redacted] = Exceeds Probable Effects Concentration (PEC) of MacDonald, et al. (2000)

Appendix A
Sediment Chemistry Data

core data

Sample ID	Units	TEC	PEC	MW-03A	PEC-Q03A	MW-03B	PEC-Q03B	MW-03C	PEC-Q03C	MW-04A	PEC-Q04A	MW-04B	PEC-Q04B	MW-04C	PEC-Q04C	MW-05A	PEC-Q05A	MW-05B	PEC-Q05B
Lab ID				L10006-25	C/PEC	L10007-26	C/PEC	L10008-27	C/PEC	L10006-2	C/PEC	L10006-3	C/PEC	L10006-4	C/PEC	L10006-5	C/PEC	L10006-6	C/PEC
Latitude				44.096415		44.096415		44.096415		44.097260		44.097260		44.097260		44.098350		44.098350	
Longitude				-87.661830		-87.661830		-87.661830		-87.663100		-87.663100		-87.663100		-87.662493		-87.662493	
Top Depth	inch			-		6		18		-		6		18		-		6	
Bottom Depth	inch			6		18		38		6		18		42		6		18	
Total Solids	%			43		55		56		31		37		51		41		56	
Total Organic Carbon	mg/kg			21,000		26,000		24,000		24,000		29,000		27,000		28,000		26,000	
Total Cyanide	mg/kg			<0.20		0.30		0.57		0.33		0.29		0.30		0.22		0.37	
Ammonia Nitrogen	mg/kg																		
Oil & grease	mg/kg			1100		1600		2000		1100		1000		1200		4000		2500	
METALS																			
Arsenic	mg/kg	9.8	33.0	1.3	0.039	1.3	0.039	1.6	0.048	2.6	0.079	2.6	0.079	3.0	0.091	2.7	0.082	3.3	0.100
Barium	mg/kg																		
Cadmuim	mg/kg	0.99	4.98	0.38	0.076	0.31	0.062	0.43	0.086	0.59	0.118	0.66	0.133	0.76	0.153	0.54	0.108	0.84	0.169
Chromium	mg/kg	43.4	111	26	0.234	23	0.207	28	0.252	31	0.279	32	0.288	29	0.261	28	0.252	31	0.279
Copper	mg/kg	31.6	149	24	0.161	23	0.154	25	0.168	27	0.181	28	0.188	25	0.168	24	0.161	26	0.174
Iron	mg/kg																		
Lead	mg/kg	35.8	128	44	0.344	59	0.461	98	0.766	28	0.219	29	0.227	56	0.438	49	0.383	79	0.617
Manganese	mg/kg																		
Mercury	mg/kg	0.18	1.06	<0.10		<0.10		<0.10		<0.10		<0.10		<0.10		<0.10		0.17	0.160
Nickel	mg/kg	22.70	48.60	23.00	0.473	21.00	0.432	21.00	0.432	28.00	0.576	29.00	0.597	26.00	0.535	26.00	0.535	23.00	0.473
Selenium	mg/kg																		
Silver	mg/kg																		
Zinc	mg/kg	121	459	92	0.200	82	0.179	97	0.211	100	0.218	100	0.218	120	0.261	97	0.211	100	0.218
PESTICIDES																			
alpha-BHC	ug/kg																		
gamma-BHC	ug/kg	2.37	4.99	<20		<20		<20		<44		<37		<27		<33		<24	
Heptachlor Epoxide	ug/kg	2.47	16	<20		<20		<20		<44		<37		<27		<33		<24	
4,4'-DDE	ug/kg	3.16	31.3	<20		<20		<20		<44		<37		<27		<33		<24	
Dieldrin	ug/kg	1.9	61.8	<20		<20		<20		<44		<37		<27		<33		<24	
Endrin	ug/kg	2.22	62.4	<20		<20		<20		<44		<37		<27		<33		<24	
4,4'-DDD	ug/kg	4.88	28	<20		<20		<20		<44		<37		<27		<33		<24	
4,4'-DDT	ug/kg	5.28	62.9	<20		<20		<20		<44		<37		<27		<33		<24	
Chlordane	ug/kg	3.24	17.6	<25		<61		<25		<220		<190		<140		<170		<120	
Toxaphene	ug/kg			<200		<170		<170		<550		<460		<330		<410		<300	
PCBs																			
PCB-1016	ug/kg			<200		<160		<150		<540		<460		<330		<410		<300	
PCB-1221	ug/kg			<200		<160		<150		<540		<460		<330		<410		<300	
PCB-1232	ug/kg			<200		<160		<150		<540		<460		<330		<410		<300	
PCB-1242	ug/kg			<200		<160		<150		<540		<460		<330		<410		<300	
PCB-1248	ug/kg			<200		<160		<150		<540		<460		<330		<410		<300	
PCB-1254	ug/kg			<100		<100		<100		<100		<100		<100		<100		<300	
PCB-1260	ug/kg			<100		<100		<100		<100		<100		<100		<100		<100	
Total PCBs	ug/kg	59.8	676	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000
PAHs																			
Naphthalene	ug/kg	176	561	<390		<3100		[redacted]		<540		<460		<330		<4100		<3000	
2-Methylnaphthalene	ug/kg			700		2,000		9,800		<250		<250		420		2,300		5,700	
Acenaphthylene	ug/kg			<390		<3100		3,300		<540		<460		<330		<4100		<3000	
Acenaphthene	ug/kg			700		4,800		24,000		<540		<460		490		9,500		11,000	
Fluorene	ug/kg	77.4	536	420		[redacted]		[redacted]		<540		<460		340		[redacted]		[redacted]	
Phenanthrene	ug/kg	204	1170	[redacted]		[redacted]		[redacted]		<540		<460		[redacted]		[redacted]		[redacted]	
Anthracene	ug/kg	57.2	845	640		[redacted]		[redacted]		<540		<460		680		[redacted]		[redacted]	
Fluoranthene	ug/kg	423	2230	2,200		[redacted]		[redacted]		<540		<460		1,800		[redacted]		[redacted]	
Pyrene	ug/kg	195	1520	[redacted]		[redacted]		[redacted]		<540		<460		[redacted]		[redacted]		[redacted]	
Benzo(a)anthracene	ug/kg	108	1050	940		[redacted]		[redacted]		<540		<460		880		[redacted]		[redacted]	
Chrysene	ug/kg	166	1290	820		[redacted]		[redacted]		<540		<460		810		[redacted]		[redacted]	
Benzo(b)fluoranthene	ug/kg			760		<3100		10,000		<540		<460		690		6,600		6,000	
Benzo(k)fluoranthene	ug/kg			900		<3100		11,000		<540		<460		820		8,300		6,400	
Benzo(a)pyrene	ug/kg	150	1450	960		[redacted]		[redacted]		<540		<460		980		[redacted]		[redacted]	
Indeno(1,2,3-cd)pyrene	ug/kg			400		3,600		9,900		<540		<460		550		8,900		6,800	
Dibenz(a,h)anthracene	ug/kg	33		<390		<3100		3,300		<540		<460		<330		<4100		<3000	
Benzo(g,h,i)perylene	ug/kg			390		5,600		14,000		<540		<460		600		9,400		7,100	
Total PAHs	ug/kg	1610	22800	13,530	0.593	[redacted]	3.386	[redacted]	12.140	-	0.000	-	0.000	12,260	0.538	[redacted]	7.921	[redacted]	6.298
SUM PEC-Q					2.122		4.921		14.104		1.670		1.729		2.444		9.654		8.489
PEC-Q					0.236		0.547		1.567		0.186		0.192		0.272		1.073		0.849
Max PEC-Q					0.593		3.386		12.140		0.576		0.597		0.538		7.921		6.298

= Exceeds Threshold Effec

[redacted] = Exceeds Probable Effect

Appendix A
Sediment Chemistry Data

core data

Sample ID	Units	TEC	PEC	MW-05C	PEC-Q05C	MW-05AR	PEC-Q05AR	MW-05BR	PEC-Q05BR	MW-05CR	PEC-Q05CR	MW-07A	PEC-Q07A	MW-07B	PEC-Q07B	MW-07C	PEC-Q07C	MW-09A	PEC-Q09A
Lab ID				L10006-7	C/PEC	L10006-8	C/PEC	L10006-9	C/PEC	L10006-10	C/PEC	L10006-11	C/PEC	L10006-12	C/PEC	L10006-13	C/PEC	L10006-14	C/PEC
Latitude				44.098350		44.098350		44.098350		44.098350		44.096210		44.096210		44.096210		44.096917	
Longitude				-87.662493		-87.662493		-87.662493		-87.662493		-87.662125		-87.662125		-87.662125		-87.664845	
Top Depth	inch			18		-		6		18		-		6		18		-	
Bottom Depth	inch			34		6		18		45		6		18				6	
Total Solids	%			57		41		56		55		32		40		53		38	
Total Organic Carbon	mg/kg			21,000		31,000		22,000		22,000		25,000		27,000		24,000		22,000	
Total Cyanide	mg/kg			0.33		0.31		0.88		0.34		0.38		0.30		0.37		0.22	
Ammonia Nitrogen	mg/kg																		
Oil & grease	mg/kg			1800		2700		2700		2200		2800		910		930		1000	
METALS																			
Arsenic	mg/kg	9.8	33.0	2.7	0.082	2.6	0.079	3.4	0.103	2.9	0.088	2.6	0.079	2.8	0.085	2.6	0.079	2.8	0.085
Barium	mg/kg																		
Cadmuim	mg/kg	0.99	4.98	0.74	0.149	0.60	0.120	1.10	0.221	0.85	0.171	0.54	0.108	0.75	0.151	0.63	0.127	0.54	0.108
Chromium	mg/kg	43.4	111	28	0.252	27	0.243	31	0.279	28	0.252	31	0.279	31	0.279	27	0.243	29	0.261
Copper	mg/kg	31.6	149	22	0.148	25	0.168	29	0.195	25	0.168	29	0.195	28	0.188	25	0.168	28	0.188
Iron	mg/kg																		
Lead	mg/kg	35.8	128	62	0.484	35	0.273	69	0.539	68	0.531	27	0.211	34	0.266	48	0.375	39	0.305
Manganese	mg/kg																		
Mercury	mg/kg	0.18	1.06	0.14	0.132	<0.10		0.17	0.160	0.16	0.151	<0.10		<0.10		<0.10		<0.10	
Nickel	mg/kg	22.70	48.60	21.00	0.432	23.00	0.473	20.00	0.412	19.00	0.391	26.00	0.535	26.00	0.535	23.00	0.473	24.00	0.494
Selenium	mg/kg																		
Silver	mg/kg																		
Zinc	mg/kg	121	459	91	0.198	95	0.207	98	0.214	94	0.205	100	0.218	100	0.218	96	0.209	100	0.218
PESTICIDES																			
alpha-BHC	ug/kg																		
gamma-BHC	ug/kg	2.37	4.99	<24		<20		<20		<20		<21		<20		<20		<20	
Heptachlor Epoxide	ug/kg	2.47	16	<24		<20		<20		<20		<21		<20		<20		<20	
4,4'-DDE	ug/kg	3.16	31.3	<24		<20		<20		<20		<21		<20		<20		<20	
Dieldrin	ug/kg	1.9	61.8	<24		<20		<20		<20		<21		<20		<20		<20	
Endrin	ug/kg	2.22	62.4	<24		<20		<20		<20		<21		<20		<20		<20	
4,4'-DDD	ug/kg	4.88	28	<24		<20		<20		<20		<21		<20		<20		<20	
4,4'-DDT	ug/kg	5.28	62.9	<24		<20		<20		<20		<21		<20		<20		<20	
Chlordane	ug/kg	3.24	17.6	<120		<25		<60		<61		<110		<84		<63		<88	
Toxaphene	ug/kg			<300		<170		<170		<170		<170		<210		<170		<220	
PCBs																			
PCB-1016	ug/kg			<300		<100		<150		<160		<270		<210		<160		<220	
PCB-1221	ug/kg			<300		<100		<150		<160		<270		<210		<160		<220	
PCB-1232	ug/kg			<300		<100		<150		<160		<270		<210		<160		<220	
PCB-1242	ug/kg			<300		<100		<150		<160		<270		<210		<160		<220	
PCB-1248	ug/kg			<300		<100		<150		<160		<270		<210		<160		<220	
PCB-1254	ug/kg			<300		<100		<100		<100		<100		<100		<100		<100	
PCB-1260	ug/kg			<100		<100		<100		<100		<100		<100		<100		<100	
Total PCBs	ug/kg	59.8	676	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000
PAHs																			
Naphthalene	ug/kg	176	561	<3000		<410		<3000		<3100		[illegible]		<4200		560		<440	
2-Methylnaphthalene	ug/kg			7,900		6,100		9,200		8,600		8,100		4,400		3,300		670	
Acenaphthylene	ug/kg			<3000		<410		<3000		<3100		2,300		<4200		500		<440	
Acenaphthene	ug/kg			4,100		4,000		6,300		14,000		6,200		4,200		3,200		<440	
Fluorene	ug/kg	77.4	536	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		<4200		[illegible]		<440	
Phenanthrene	ug/kg	204	1170	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Anthracene	ug/kg	57.2	845	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		560	
Fluoranthene	ug/kg	423	2230	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Pyrene	ug/kg	195	1520	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Benzo(a)anthracene	ug/kg	108	1050	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
Chrysene	ug/kg	166	1290	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		1,000	
Benzo(b)fluoranthene	ug/kg			<3000		1,800		6,400		12,000		7,400		5,800		4,400		1,600	
Benzo(k)fluoranthene	ug/kg			<3000		1,800		<3000		4,200		3,000		<4200		1,600		440	
Benzo(a)pyrene	ug/kg	150	1450	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		<4200		[illegible]		1,300	
Indeno(1,2,3-cd)pyrene	ug/kg			3,500		830		4,500		6,500		1,700		<4200		1,100		500	
Dibenz(a,h)anthracene	ug/kg	33		<3000		<410		<3000		<3100		<530		<4200		330		<440	
Benzo(g,h,i)perylene	ug/kg			4,200		780		5,000		6,700		1,500		4,400		1,000		460	
Total PAHs	ug/kg	1610	22800	[illegible]	2.886	[illegible]	1.891	[illegible]	4.605	[illegible]	8.882	[illegible]	4.768	[illegible]	3.487	[illegible]	1.907	13,730	0.602
SUM PEC-Q					4.763		3.455		6.728		10.838		6.392		5.208		3.581		2.261
PEC-Q					0.476		0.384		0.673		1.084		0.710		0.579		0.398		0.251
Max PEC-Q					2.886		1.891		4.605		8.882		4.768		3.487		1.907		0.602

= Exceeds Threshold Effec

[illegible] = Exceeds Probable Effect

Appendix A
Sediment Chemistry Data

core data

Sample ID	Units	TEC	PEC	MW-09B	PEC-Q09B	MW-09C	PEC-Q09C	MW-10A	PEC-Q10A	MW-10B	PEC-Q10B	MW-10AD	PEC-Q10AD	MW-10BD	PEC-Q10BD
Lab ID				L10006-15	C/PEC	L10006-16	C/PEC	L10006-31	C/PEC	L10006-32	C/PEC	L10006-37	C/PEC	L10006-38	C/PEC
Latitude				44.096917		44.096917		44.091660		44.091660		44.091660		44.091660	
Longitude				-87.664845		-87.664845		-87.661810		-87.661810		-87.661810		-87.661810	
Top Depth	inch			6		18		-		6		-		6	
Bottom Depth	inch			18		47		6		18		6		18	
Total Solids	%			46		57		51		75		49		73	
Total Organic Carbon	mg/kg			23,000		20,000		19,000		12,000		18,000		14,000	
Total Cyanide	mg/kg			0.32		0.33		<0.20		<0.20		<0.20		<0.20	
Ammonia Nitrogen	mg/kg														
Oil & grease	mg/kg			1000		1100		1500		980		1600		840	
METALS															
Arsenic	mg/kg	9.8	33.0	2.7	0.082	2.6	0.079	1.3	0.039	0.8	0.024	1.6	0.048	0.8	0.025
Barium	mg/kg														
Cadmuim	mg/kg	0.99	4.98	0.58	0.116	0.58	0.116	0.39	0.078	0.16	0.032	0.56	0.112	0.26	0.052
Chromium	mg/kg	43.4	111	27	0.243	25	0.225	26	0.234	30	0.270	27	0.243	17	0.153
Copper	mg/kg	31.6	149	25	0.168	29	0.195	59	0.396	37	0.248	61	0.409	51	0.342
Iron	mg/kg														
Lead	mg/kg	35.8	128	45	0.352	110	0.859	120	0.938	120	0.938	100	0.781	100	0.781
Manganese	mg/kg														
Mercury	mg/kg	0.18	1.06	<0.15		<0.10		0.10	0.094	<0.10		<0.10		<0.10	
Nickel	mg/kg	22.70	48.60	22.00	0.453	22.00	0.453	18.00	0.370	9.70	0.200	19.00	0.391	11.00	0.226
Selenium	mg/kg														
Silver	mg/kg														
Zinc	mg/kg	121	459	99	0.216	99	0.216	120	0.261	56	0.122	120	0.261	64	0.139
PESTICIDES															
alpha-BHC	ug/kg														
gamma-BHC	ug/kg	2.37	4.99	<20		<20		<20		<20		<20		<20	
Heptachlor Epoxide	ug/kg	2.47	16	<20		<20		<20		<20		<20		<20	
4,4'-DDE	ug/kg	3.16	31.3	<20		<20		<20		<20		<20		<20	
Dieldrin	ug/kg	1.9	61.8	<20		<20		<20		<20		<20		<20	
Endrin	ug/kg	2.22	62.4	<20		<20		<20		<20		<20		<20	
4,4'-DDD	ug/kg	4.88	28	<20		<20		<20		<20		<20		<20	
4,4'-DDT	ug/kg	5.28	62.9	<20		<20		<20		<20		<20		<20	
Chlordane	ug/kg	3.24	17.6	<73		<25		<25		<25		<69		<46	
Toxaphene	ug/kg			<170		<170		<170		<170		<180		<170	
PCBs															
PCB-1016	ug/kg			<190		<100		<100		<100		<180		<120	
PCB-1221	ug/kg			<190		<100		<100		<100		<180		<120	
PCB-1232	ug/kg			<190		<100		<100		<100		<180		<120	
PCB-1242	ug/kg			<190		<100		<100		<100		<180		<120	
PCB-1248	ug/kg			<190		<100		<100		<100		<180		<120	
PCB-1254	ug/kg			<100		<100		<100		<100		<100		<100	
PCB-1260	ug/kg			<100		<100		<100		<100		<100		<100	
Total PCBs	ug/kg	59.8	676	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000	-	0.000
PAHs															
Naphthalene	ug/kg	176	561	<370		380		<330		<330		<350		<330	
2-Methylnaphthalene	ug/kg			<250		<250		2,200		<250		<250		<250	
Acenaphthylene	ug/kg			<370		350		<330		<330		<350		<330	
Acenaphthene	ug/kg			<370		1,300		<330		<330		<350		<330	
Fluorene	ug/kg	77.4	536	<370		[illegible]		<330		460		<350		340	
Phenanthrene	ug/kg	204	1170	[illegible]		[illegible]		970		[illegible]		610		[illegible]	
Anthracene	ug/kg	57.2	845	430		[illegible]		<330		640		<350		450	
Fluoranthene	ug/kg	423	2230	1,800		[illegible]		1,500		1,800		860		[illegible]	
Pyrene	ug/kg	195	1520	1,400		[illegible]		1,200		[illegible]		790		[illegible]	
Benzo(a)anthracene	ug/kg	108	1050	770		[illegible]		600		940		<350		1,000	
Chrysene	ug/kg	166	1290	570		[illegible]		660		1,000		390		960	
Benzo(b)fluoranthene	ug/kg			790		2,600		570		740		<350		580	
Benzo(k)fluoranthene	ug/kg			<370		870		630		890		360		640	
Benzo(a)pyrene	ug/kg	150	1450	780		[illegible]		590		690		<350		530	
Indeno(1,2,3-cd)pyrene	ug/kg			590		1,000		<330		<330		<350		<330	
Dibenz(a,h)anthracene	ug/kg	33		<370		<330		<330		<330		<350		<330	
Benzo(g,h,i)perylene	ug/kg			620		1,000		<330		<330		<350		<330	
Total PAHs	ug/kg	1610	22800	9,050	0.397	[illegible]	1.357	8,920	0.391	10,560	0.463	3,010	0.132	11,500	0.504
SUM PEC-Q					2.026		3.500		2.803		2.297		2.379		2.224
PEC-Q					0.225		0.389		0.280		0.255		0.264		0.247
Max PEC-Q					0.453		1.357		0.938		0.938		0.781		0.781

= Exceeds Threshold Effec

[illegible] = Exceeds Probable Effect

core data

Sample ID		TEC	PEC	MW-01P	PEC-Q 01P	MW-03P	PEC-Q 03P	MW-07P	PEC-Q 07P	MW-07PR	PEC-Q 07PR	MW-08P	PEC-Q 08P	MW-08PD	PEC-Q 08PD	MW-10P	PEC-Q 10P	MW-10PR	PEC-Q 10PR	MW-11P	PEC-Q 11P	MW-12P	PEC-Q 12P	MW-13P	PEC-Q 13P	MW-14P
Lab ID				L10006-17	C/PEC	L10006-18	C/PEC	L10006-19	C/PEC	L10006-20	C/PEC	L10006-21	C/PEC	L10006-22	C/PEC	L10006-23	C/PEC	L10006-24	C/PEC	L10006-43	C/PEC	L10006-44	C/PEC	L10006-45	C/PEC	L10006-46
latitude				44.089120		44.096460		44.096212		44.096212		44.096372		44.096317		44.091650		44.091615		44.090052		44.096072		44.096032		44.095942
longitude				-87.669310		-87.661780		-87.662125		-87.662125		-87.664187		-87.664200		-87.661813		-87.661813		-87.647752		-87.661612		-87.661752		-87.661970
total solids	%			42		30		32		32		33		55		49		45		69		48		38		41
total organic carbon	mg/kg			21,000		33,000		32,000		39,000		21,000		14,000		17,000		23,000		3,200		23,000		28,000		20,000
total cyanide	mg/kg			<0.20		0.38		0.26		0.48		<0.20		0.33		0.40		0.37		<0.20		1.40		1.40		0.66
ammonia nitrogen	mg/kg			27		350		160.0		210.0		14.0		14.0		27.0		33.0		2.2		37.0		6.0		68.0
oil & grease	mg/kg			680		1500		2,500		2,100		1,000		930		1,900		2,300		170		8,800		17,000		12,000
METALS																										
arsenic	mg/kg	9.8	33.0	1.8	0.055	2.8	0.085	2.4	0.073	2.8	0.085	2.6	0.079	1.4	0.042	3.1	0.094	2.3	0.070	0.5	0.015	2.1	0.064	3.5	0.106	2.8
barium	mg/kg			72		100		98		100		92		54		89		87		12		66		83		80
cadmium	mg/kg	0.99	4.98	0.38	0.072	0.53	0.106	0.49	0.098	0.53	0.106	0.55	0.110	0.23	0.046	0.78	0.157	0.58	0.116	0.06	0.012	0.39	0.078	0.52	0.104	0.46
chromium	mg/kg	43.4	111	22	0.198	33	0.297	30	0.270	31	0.279	29	0.261	14	0.126	28	0.252	25	0.225	6	0.050	21	0.189	26	0.234	23
copper	mg/kg	31.6	149	19	0.128	28	0.186	26	0.174	29	0.195	29	0.195	17	0.114	84	0.564	44	0.295	4	0.024	20	0.134	25	0.168	23
iron	mg/kg			17000		23000		23,000		22,000		21,000		12,000		14,000		14,000		4,200		18,000		21,000		18,000
lead	mg/kg	35.8	128	15	0.117	26	0.203	34	0.266	41	0.320	49	0.383	100	0.781	81	0.633	59	0.461	5	0.037	47	0.367	96	0.750	[redacted]
manganese	mg/kg			530		690		620		620		570		270		370		370		130		410		560		410
mercury	mg/kg	0.18	1.06	<0.10		<0.10		<0.10		0.13	0.123	0.10	0.094	<0.10		0.14	0.132	0.24	0.226	< 0.10		0.16	0.151	0.26	0.245	0.12
nickel	mg/kg	22.70	48.60	23.00	0.473	30.00	0.617	28.00	0.576	29.00	0.597	27.00	0.556	17.00	0.350	21.00	0.432	20.00	0.412	5.80	0.119	17.00	0.350	23.00	0.473	18.00
selenium	mg/kg			0.73		0.99		1.00		1.20		0.94		0.49		0.66		0.63		<0.20		0.57		0.89		0.47
silver	mg/kg			<0.50		<0.50		<0.50		<0.50		<0.50		<0.50		<0.50		1.1		<0.50		<0.50		<0.50		<0.50
zinc	mg/kg	121	459	73	0.159	110	0.240	100	0.218	100	0.218	110	0.240	60	0.131	180	0.392	130	0.283	15	0.033	71	0.155	89	0.194	84
PESTICIDE																										
alpha-BHC	ug/kg																									
gamma-BHC	ug/kg	2.37	4.99	<32		<45		<42		<42		<39		<25		<28		<30		<20		<20		<20		<20
Heptachlor Epoxide	ug/kg	2.47	16	<32		<45		<42		<42		<39		<25		<28		<30		<20		<20		<20		<20
Endosulfan I	ug/kg																									
4,4'-DDE	ug/kg	3.16	31.3	<32		<45		<42		<42		<39		<25		<28		<30		<20		<20		<20		<20
Dieldrin	ug/kg	1.9	61.8	<32		<45		<42		<42		<39		<25		<28		<30		<20		<20		<20		<20
Endrin	ug/kg	2.22	62.4	<32		<45		<42		<42		<39		<25		<28		<30		<20		<20		<20		<20
4,4'-DDD	ug/kg	4.88	28	<32		<45		<42		<42		<39		<25		<28		<30		<20		<20		<20		<20
Endosulfan II	ug/kg																									
4,4'-DDT	ug/kg	5.28	62.9	<32		<45		<42		<42		<39		<25		<28		<30		<20		<20		<20		<20
Chlordane	ug/kg	3.24	17.6	<25		<25		<110		<110		<96		<62		<69		<75		<25		<70		<88		<25
Toxaphene	ug/kg			<400		<280		<270		<270		<240		<170		<180		<190		<170		<170		<170		<170
PCBs																										
PCB-1016	ug/kg			<400		<280		<270		<270		<240		<160		<180		<190		<100		<180		<220		<100
PCB-1221	ug/kg			<400		<280		<270		<270		<240		<160		<180		<190		<100		<180		<220		<100
PCB-1232	ug/kg			<400		<280		<270		<270		<240		<160		<180		<190		<100		<180		<220		<100
PCB-1242	ug/kg			<400		<280		<270		<270		<240		<160		<180		<190		<100		<180		<220		<100
PCB-1248	ug/kg			<400		<280		<270		<270		<240		<160		<180		<190		<100		<180		<220		<100
PCB-1254	ug/kg			<100		<100		<270		<270		<100		<100		<100		<100		<100		<180		<220		<100
PCB-1260	ug/kg			<100		<100		<270		<270		<100		510		<100		<100		<100		<180		<220		<100
Total PCBs	ug/kg	59.8	676	0	0.000	0	0.000	-	0.000	-	0.000	-	0.000	510	0.754	-	0.000	-	0.000		0.000		0.000		0.000	
PAHs																										
Naphthalene	ug/kg	176	561	<400		<560		[redacted]		[redacted]		<480		520		<350		<380		<330		[redacted]		[redacted]		[redacted]
2-Methylnaphthalene	ug/kg			1700		360		20,000		12,000		2,200		<250		<250		<250		<250		34,000		74,000		140,000
Acenaphthylene	ug/kg			<400		<560		<5300		<5300		<480		860		<350		<380		<330		38,000		<44000		58,000
Acenaphthene	ug/kg			<400		<560		8,700		9,300		<480		1,900		<350		<380		<330		140,000		390,000		330,000
Fluorene	ug/kg	77.4	536	<400		<560		<5300		[redacted]		<480		[redacted]		<350		<380		<330		[redacted]		[redacted]		[redacted]
Phenanthrene	ug/kg	204	1170	<400		<560		[redacted]		[redacted]		590		[redacted]		<350		[redacted]		<330		[redacted]		[redacted]		[redacted]
Anthracene	ug/kg	57.2	845	<400		<560		<5300		<5300		<480		[redacted]		<350		<380		<330		[redacted]		[redacted]		[redacted]
Fluoranthene	ug/kg	423	2230	<400		<560		[redacted]		[redacted]		900		[redacted]		480		[redacted]		<330		[redacted]		[redacted]		[redacted]
Pyrene	ug/kg	195	1520	<400		<560		[redacted]		[redacted]		690		[redacted]		370		[redacted]		<330		[redacted]		[redacted]		[redacted]
Benzo(a)anthracene	ug/kg	108	1050	<400		<560		[redacted]		[redacted]		<480		[redacted]		<350		420		<330		[redacted]		[redacted]		[redacted]
Chrysene	ug/kg	166	1290	<400		<560		<5300		[redacted]		<480		[redacted]		<350		520		<330		[redacted]		[redacted]		[redacted]
Benzo(b)fluoranthene	ug/kg			<400		<560		<5300		<5300		<480		2,900		<350		530		<330		36,000		120,000		87,000
Benzo(k)fluoranthene	ug/kg			<400		<560		<5300		<5300		<480		3,000		<350		500		<330		39,000		120,000		100,000
Benzo(a)pyrene	ug/kg	150	1450	<400		<560		<5300		[redacted]		<480		[redacted]		<350		450		<330		[redacted]		[redacted]		[redacted]
Indeno(1,2,3-cd)pyrene	ug/kg			<400		<560		<5300		<5300		<480		870		<350		<380		<330		42,000		130,000		92,000
Dibenz(a,h)anthracene	ug/kg	33		<400		<560		<5300		<5300		<480		<330		<350		<380		<330		<35000		<44000		<41000
Benzo(g,h,i)perylene	ug/kg			<400		<560		<5300		5,800		<480		790		<350		<380		<330		48,000		130,000		93,000
Total PAHs	ug/kg	1610	22800	1700	0.075	360	0.016	[redacted]	4.127	[redacted]	5.880	4,380	0.192	[redacted]	2.877	850	0.037	8,220	0.361	-	0.000	[redacted]	88.553	[redacted]	172.105	[redacted]
SUM PEC-Q					1.277		1.757		5.803		7.782		2.110		5.022		2.693		2.449		0.288		70.041		174.380	
PEC-Q					0.142		0.195		0.645		0.778		0.211		0.558		0.269		0.245		0.032		7.004		17.438	
MAX PEC-Q					0.473		0.617		4.127		5.880		0.556		2.877		0.633		0.461		0.119		88.553		172.105	

[redacted] = Exceeds Threshold Effects Concentration (TEC) of MacDonald, et al. (2000)
[redacted] = Exceeds Probable Effects Concentration (PEC) of MacDonald, et al. (2000)

Sample ID		TEC	PEC	PEC-Q 14P
Lab ID				C/PEC
latitude				
longitude				
total solids	%			
total organic carbon	mg/kg			
total cyanide	mg/kg			
ammonia nitrogen	mg/kg			
oil & grease	mg/kg			
METALS				
arsenic	mg/kg	9.8	33.0	0.079
barium	mg/kg			
cadmium	mg/kg	0.99	4.98	0.092
chromium	mg/kg	43.4	111	0.207
copper	mg/kg	31.6	149	0.154
iron	mg/kg			
lead	mg/kg	35.8	128	1.172
manganese	mg/kg			
mercury	mg/kg	0.18	1.06	0.113
nickel	mg/kg	22.70	48.60	0.370
selenium	mg/kg			
silver	mg/kg			
zinc	mg/kg	121	459	0.163
PESTICIDE				
alpha-BHC	ug/kg			
gamma-BHC	ug/kg	2.37	4.99	
Heptachlor Epoxide	ug/kg	2.47	15	
Endosulfan I	ug/kg			
4,4'-DDE	ug/kg	3.16	31.3	
Dieldrin	ug/kg	1.9	61.8	
Endrin	ug/kg	2.22	62.4	
4,4'-DDD	ug/kg	4.88	28	
Endosulfan II	ug/kg			
4,4'-DDT	ug/kg	5.28	62.9	
Chlordane	ug/kg	3.24	17.6	
Toxaphene	ug/kg			
PCBs				
PCB-1016	ug/kg			
PCB-1221	ug/kg			
PCB-1232	ug/kg			
PCB-1242	ug/kg			
PCB-1248	ug/kg			
PCB-1254	ug/kg			
PCB-1260	ug/kg			
Total PCBs	ug/kg	59.8	676	0.000
PAHs				
Naphthalene	ug/kg	176	561	
2-Methylnaphthalene	ug/kg			
Acenaphthylene	ug/kg			
Acenaphthene	ug/kg			
Fluorene	ug/kg	77.4	536	
Phenanthrene	ug/kg	204	1170	
Anthracene	ug/kg	57.2	845	
Fluoranthene	ug/kg	423	2230	
Pyrene	ug/kg	195	1520	
Benzo(a)anthracene	ug/kg	108	1050	
Chrysene	ug/kg	166	1290	
Benzo(b)fluoranthene	ug/kg			
Benzo(k)fluoranthene	ug/kg			
Benzo(a)pyrene	ug/kg	150	1450	
Indeno(1,2,3-cd)pyrene	ug/kg			
Dibenz(a,h)anthracene	ug/kg	33		
Benzo(g,h,i)perylene	ug/kg			
Total PAHs	ug/kg	1610	22800	147.368
SUM PEC-Q				149.740
PEC-Q				14.974
MAX PEC-Q				147.368

= Exceeds Threshold Effects Concent

= Exceeds Probable Effects Concentr

JUNE 2000 SURVEY OF SEDIMENT CONTAMINATION ON THE MANITOWOC RIVER, MANITOWOC, WISCONSIN

Prepared by:

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September 2002

Table 1 - Field Observations
1530 Former Manitowoc MGP Site, WPSC
Manitowoc River Pole and Ponar Grab data, May 22 & 23,2003

Sampling Point	Pole data			Field Notes
	DTS	DTB	Sed. Thick	
T1-1	18'	19' 10"	1' 10"	Soft organic material, trace clay
T1-2	19' 10"	23' 5"	3' 7"	Silt
T1-3	15' 6"	17' 5"	1' 11"	Organic material, silty sand, zebra mussels
T2-1	10' 3"	11' 3"	1'	Silty sand, gravel, trace coal, odor
T2-2	18' 5 "	23' 5"	4'	Sandy Silt, small coal fragments, odor
T2-3	21'	26' 2"	5' 2"	Silty sand, small coal fragments
T2-4	21' 8"	26' 4"	4' 8"	Sandy silt w/organics
T2-5	23' 10"	26'	2' 2"	Silty sand
T2-6	17' 4"	19' 10"	2' 6"	Sandy silt
T3-1	10' 5"	13' 11"	3' 6"	Sand and gravel, trace tar, odor, sheen
T3-2	18' 7"	19' 6"	11"	Sandy silt, possible coal fragments, odor, trace tar
T3-3	20'	26' 3"	6' 3"	Organic material, sandy silt, odor
T3-4	22' 11"	26' 7"	3' 8"	Sandy Silt w/clay, coal fragments, odor, organic material
T3-5	22' 1"	25' 11"	3' 10"	Sandy silt w/organics
T3-6	16' 3"	18' 8"	2' 5"	Sandy silt w/organics, zebra mussel shells, coal fragments
T4-1	7' 4"	10' 1"	2' 9"	Sand with gravel
T4-2	16' 6"	18' 5"	1' 11"	Organic material w/silt, odor, some clay
T4-3	21' 8"	25'	3' 3"	Sandy silt w/clay, hard layer under sediment
T4-4	17' 4"	17' 7"	3"	Sandy silt
T5-1	12' 6"	13' 11"	1' 5"	Sandy silt, abundant zebra mussels
T5-2	22' 5"	27' 6"	5' 1"	Sandy silt, coal or organic material, hard layer under sediment
T5-3	17' 2"	17' 4"	2"	Sand
T6-1	9'	9' 6"	6"	Sand and gravel, zebra mussels
T6-2	23' 4"	25' 2"	1' 10"	Silty sand w/coal fragment, zebra mussel shells, strong current
T6-3	21' 9"	27' 11"	6' 2"	Sandy silt, coal fragments, organic material
T7-1	22' 1"	22' 8"	7"	Sand
T7-2	22' 9"	23' 2"	5"	Sand
T7-3	10' 1"	10' 9"	8"	Sandy silt, organic material, tar, odor, sheen
T7-4	11' 1"	12' 1"	1'	Sandy silt w/clay, organic material, odor, tar specks, sheen
T7-5	12' 7"	15' 10"	3' 3"	Tar specks, odor
T7-6	9' 2"	11' 11"	2' 9"	Tar smear on pole, odor, and sheen, sandy silt w/organics
T7-7	10' 8"	14' 9"	4' 1"	Silty Sand w/organics, tar specks, odor, sheen
T7-8	10' 3"	13' 10"	3' 7"	Silty Sand, tar specks, odor, sheen
T7-9	9' 11"	13' 11"	4'	Sandy Silt, trace tar, odor, sheen, zebra mussels
T7-10	10' 1"	13'	2' 11"	Sandy silt, organic material, odor
T7-11	13' 2"	15' 8"	2' 6"	Sandy silt w/organic material, zebra mussels
T8-1	17' 11"	21'	3' 1"	Sandy silt w/organic material
T8-2	12' 8"	15' 6"	2' 10"	Sandy silt, odor, coal fragments
T8-3	18' 6"	26' 4"	7' 10"	Sandy silt, organic material, coal fragments
T8-4	19' 11"	24' 10"	4' 11"	Sandy silt w/organic material and coal fragments
T8-5	22' 5"	27'	4' 7"	Sandy silt w/clay, odor
T8-6	14' 6"	18' 9"	4' 3"	Sandy silt w/clay, organic material
T8-7	22' 1"	27' 7"	5' 6"	Sandy silt w/clay and organic material

Notes:

[O-MJR, 6/12/03, C-JTB, 6/14/03, R-RGF 10/14/03)

DTS = depth to soft sediment
DTB = depth to hard bottom

Table 2 - Sediment analytical summary of BTEX compounds, Total Cyanide, Metals, PCBs, and Inorganic compounds
Former Wisconsin Fuel & Light Manufactured Gas Plant
Wisconsin Public Service Corporation, Manitowoc, Wisconsin

		BTEX Compounds (µg/Kg)							Metals (mg/Kg)								PCBs (µg/Kg)	additional Inorganics	
Sample Location	Sample Date	Benzene	Toluene	Ethylbenzene	Xylene, o	Xylenes, m + p	Total BTEX	Total Cyanide (mg/Kg)	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Silver	Zinc	Aroclor 1254	Ammonia (mg/Kg)	TOC (mg/Kg)
T1-1	6/3/2003	na	na	na	na	na	na	< 0.25	2.7	0.63	27	22	19	0.060	0.084	86	83	300	47,000
T1-2	6/3/2003	< 25	< 25	< 25	< 25	< 50	< 25	na	na	na	na	na	na	na	na	na	na	na	na
T2-2	6/3/2003	250	300	740	440	1,100	2,830	na	na	na	na	na	na	na	na	na	na	na	na
T3-1	6/3/2003	900	110	2700	1400	3,700	8,810	0.44	4.7	0.39	20	21	14	0.049	0.055	55	53	210	42,000
T3-3	6/3/2003	< 25	< 25	< 25	< 25	< 50	< 25	<0.33 N	3.1	0.65	32	28	30	0.089	0.095	93	150	400	10,000
T4-4	6/3/2003	< 25	< 25	< 25	< 25	< 50	< 25	na	na	na	na	na	na	na	na	na	na	na	na
T6-1	6/3/2003	< 25	2,100	< 25	< 25	< 50	2,100	na	na	na	na	na	na	na	na	na	na	na	na
QC-1	6/3/2003	< 25	990	< 25	< 25	< 50	990	na	na	na	na	na	na	na	na	na	na	na	na
T6-3	6/3/2003	< 25	< 25	< 25	< 25	< 50	< 25	na	na	na	na	na	na	na	na	na	na	na	na
T7-9	6/3/2003	< 25	< 25	340	180	270	790	na	na	na	na	na	na	na	na	na	na	na	na
T8-1	6/3/2003	< 25	< 25	< 25	< 25	< 50	< 25	na	na	na	na	na	na	na	na	na	na	na	na
T8-3	6/3/2003	< 25	< 25	180	94	160	434	na	na	na	na	na	na	na	na	na	na	na	na

(o-JTB/MJR 7/8/03)

Notes:

1) Only detected compounds shown in bold, reference analytical report for full list of compounds.
2) All samples taken from top 4-6 inches of sediment surface.

na: Parameter not analyzed for.
< 25: Analyte was not detected above the limit of detection (LOD) indicated.
N: Spiked sample recovery not within control limits.
µg/Kg: Microgram per kilogram
mg/Kg: Milligram per kilogram
QC-1: Field duplicate

Table 3 - Sediment analytical summary of Polyaromatic Hydrocabons (PAHs).
Former Wisconsin Fuel & Light Manufactured Gas Plant
Wisconsin Public Service Corporation, Manitowoc, Wisconsin

Sample Location	Sample Date	PAH Compounds (µg/Kg)																		
		1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthalene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benz(a) pyrene	Benzo(b) fluoranthene	Benzo(ghi) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a, h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAHs
T1-2	6/3/2003	38	65	120	< 85	190	240	280	280	120	220	240	< 35	710	100	110	83	520	520	3,836
T2-2	6/3/2003	23,000	42,000	56,000	11,000	60,000	50,000	48,000	32,000	19,000	33,000	40,000	5,200	130,000	41,000	19,000	120,000	160,000	100,000	989,200
T3-1	6/3/2003	4,900	7,500	10,000	< 1,100	6,000	5,200	5,400	3,700	1,500	4,700	4,300	490	14,000	6,000	1,700	32,000	21,000	10,000	138,390
T3-3	6/3/2003	2,800	4,300	6,500	1,300	6,300	6,000	6,700	4,300	3,400	5,200	5,400	780	16,000	4,100	3,200	14,000	17,000	12,000	119,280
T4-4	6/3/2003	280	360	1,200	490	1,900	2,700	3,100	2,000	1,600	2,400	2,300	360	6,600	810	1,400	1,100	5,300	4,900	38,800
T6-1	6/3/2003	< 54	65	< 85	< 140	< 85	66	72	62	< 93	<70	79	< 57	160	< 47	< 85	290	130	130	1,054
QC-1	6/3/2003	170	240	730	350 Q	1,300	1,900	2,000	1,400	1,000	1,400	1,500	300	5,000	670	950	490	4,900	3,600	27,900
T6-3	6/3/2003	140	260	740	440	1,400	2,200	2,500	2,200	980	1,700	1,700	300	5,400	620	980	670	3,800	4,000	30,030
T7-9	6/3/2003	6,500	9,500	14000	2100	12,000	12,000	14,000	9,800	3,900	11,000	10,000	1,300	31,000	8,600	4,100	34,000	38,000	23,000	244,800
T8-1	6/3/2003	17,000	28,000	49,000	12,000	51,000	67,000	70,000	47,000	22,000	52,000	47,000	6,100	170,000	32,000	23,000	52,000	160,000	140,000	1,045,100
T8-3	6/3/2003	1,700	2,300	3,500	670	3,700	4,000	4,600	3,200	3,100	3,000	3,500	880	9,700	2,200	2,700	8,000	10,000	6,800	73,550

(o-JTB/MJR 7/8/03)

Notes:

1) *Detected compounds shown in bold.*
2) All samples taken from top 4-6 inches of sediment surface.

na: Parameter not analyzed for.
BDL: Below detection Limits
< 25: Analyte was not detected above the limit of detection (LOD) indicated.
N: Spiked sample recovery not within control limits.
µg/Kg: Microgram per kiliogram
QC-1: Field duplicate

Natural Resource Technology, Inc.
N R T

WI DNR RECEIVED OCT 15 2003 NER WASTE/RR

October 14, 2003
(1530)

Ms. Connie Lawniczak
Wisconsin Public Service Corp.
700 N. Adams Street
Green Bay, WI 54307-9002

RE: Phase 1 Sediment Sampling Results for the Former Wisconsin Fuel & Light Manufactured Gas Plant, Manitowoc, Wisconsin
BRRTS ID: 02-36-000219

During the week of May 18, 2003 Natural Resource Technology, Inc. (NRT) conducted the first phase (Phase 1) of sediment investigative field work at the former Wisconsin Fuel & Light (WF&L) manufactured gas plant (MGP) site. The investigation focused on defining the horizontal extent of impacted surficial sediments in the Manitowoc River, sediment thickness and surface sediment types.

The former MGP site is located at 402 North Tenth Street in Section 19, Township 19 North, Range 24 East, City of Manitowoc, Manitowoc County, Wisconsin (Figure 1).

PREVIOUS SEDIMENT INVESTIGATIONS

WW Engineering and Sciences (WWE) performed sediment sampling in 1991 using an offshore drill rig (for stations SB-21 through SB-35, SB-41, and SB-42) and Wildco® Sediment Corer (for stations SD-01 through SD-06). Results are reported in "Environmental Site Investigation Former Coal Gas Manufacturing Plant – Manitowoc, Wisconsin, Project No. 22159," WW Engineering & Sciences, January 1992. Sampling locations are shown on Figure 2. Core samples collected from the drill rig ranged from 4-14 feet while the Wildco® Sediment Corer penetrated 30 inches or less. All sediment samples were collected from within approximately 200 feet of shore. In addition, results were reported for a "heavily coal tar impacted sediment" sample with 14,000 mg/kg total PAHs in "Pilot Test Report, In-Situ Stabilization/Solidification Coal Tar Impacted Soil/Sediments, Wisconsin Fuel & Light Company, Manitowoc, Wisconsin, Project No. 22446," WW Engineering & Sciences, February 1993. No details on sample locations or collection methods were presented.

The following observations were noted during review of WWE reports:

- Total polynuclear aromatic hydrocarbons (PAHs) ranged from below the detection limit to 11,000 mg/kg (mg/kg) in core samples. The highest total PAHs were measured in SB-28 (Figure 2);

23713 W. Paul Road, Unit D • Pewaukee, WI 53072 • (262) 523-9000 • Fax (262) 523-9001
www.naturalrt.com

TABLE 4

Manitowoc Site
Comparison of Detected Soil Quality to Typical Soil Background Concentrations

Substance	Sample No./Depth	Detected Soil Concentration (mg/kg)	Typical Background Concentration (mg/kg)
Arsenic	SB-1 (7-7.5 ft)	3.0	10.0
	SB-3 (16-17 ft)	2.0	10.0
	SB-4 (7.5-9 ft)	1.9	10.0
	SB-6 (15-16.5 ft)	2.9	10.0
	SS-1 (Surface)	2.3	10.0
	SS-2 (Surface)	2.2	10.0
Beryllium	SB-1 (7-7.5 ft)	0.26	6.0
	SB-6 (15-16.5 ft)	0.57	6.0
Cadmium	SB-1 (7-7.5 ft)	1.0	0.7
	SS-1 (Surface)	0.25	0.7
Chromium	SB-1 (7-7.5 ft)	18.0	42.0
	SB-2 (20-21.5 ft)	3.9	42.0
	SB-3 (16-17 ft)	3.4	42.0
	SB-4 (7.5-9 ft)	9.2	42.0
	SB-5 (15-16.5 ft)	4.3	42.0
	SB-6 (15-16.5 ft)	28.0	42.0
	SS-1 (Surface)	11.0	42.0
	SS-2 (Surface)	14.0	42.0
Copper	SB-1 (7-7.5 ft)	21.0	10.0
	SB-2 (20-21.5 ft)	5.2	10.0
	SB-3 (16-17 ft)	20.0	10.0
	SB-4 (7.5-9 ft)	14.0	10.0
	SB-5 (15-16.5 ft)	2.8	10.0
	SB-6 (15-16.5 ft)	23.0	10.0
	SS-1 (Surface)	13.0	10.0
	SS-2 (Surface)	20.0	10.0

TABLE 4 (cont)

Manitowoc Site
Comparison of Detected Soil Quality to Typical Soil Background Concentrations

Substance	Sample No./Depth	Detected Soil Concentration (mg/kg)	Typical Background Concentration (mg/kg)
Lead	SB-1 (7-7.5 ft)	490.0	14.0
	SB-3 (16-17 ft)	41.0	14.0
	SB-4 (7.5-9 ft)	10.0	14.0
	SB-6 (15-16.5 ft)	4.0	14.0
	SS-1 (Surface	23.0	14.0
	SS-2 (Surface)	7.7	14.0
Mercury	SB-1 (7-7.5 ft)	0.570	0.300
Nickel	SB-1 (7-7.5 ft)	9.1	18.0
	SB-2 (20-21.5 ft)	2.8	18.0
	SB-3 (16-17 ft)	6.8	18.0
	SB-4 (7.5-9 ft)	7.3	18.0
	SB-5 (15-16.5 ft)	7.9	18.0
	SB-6 (15-16.5 ft)	25.0	18.0
	SS-1 (Surface)	6.5	18.0
	SS-2 (Surface)	9.9	18.0
Silver	SS-1 (Surface)	0.26	1.2
Thallium	SB-3 (16-17 ft)	2.3	2.0
	SB-4 (7.5-9 ft)	2.1	2.0
	SS-2 (Surface)	2.7	2.0
Zinc	SB-1 (7-7.5 ft)	110.0	49.0
	SB-2 (20-21.5 ft)	12.0	49.0
	SB-3 (16-17 ft)	59.0	49.0
	SB-4 (7.5-9 ft)	26.0	49.0
	SB-5 (15-16.5 ft)	10.0	49.0
	SB-6 (15-16.5 ft)	35.0	49.0
	SS-1 (Surface)	40.0	49.0
	SS-2 (Surface)	90.0	49.0
Cyanide	SB-1 (7-7.5 ft)	<40.0 (?)	
	SB-6 (15-16.5 ft)	15.0	

TABLE 4 (cont)

Manitowoc Site
Comparison of Detected Soil Quality to Typical Soil Background Concentrations

Substance	Sample No./Depth	Detected Soil Concentration (mg/kg)	Typical Background Concentration (mg/kg)
Benzene	SB-1 (7-7.5 ft)	9.0	
	SB-3 (16-17 ft)	32.0	
Ethylbenzene	SB-1 (7-7.5 ft)	8.6	
	SB-3 (16-17 ft)	22.0	
	SB-4 (7.5-9 ft)	0.026	
Toluene	SB-1 (7-7.5 ft)	7.9	
	SB-3 (16-17 ft)	65.0	
Acenaphthene	SB-3 (16-17 ft)	52.0	0.050-1.0 (urban soils)
Acenaphthylene	SB-3 (16-17 ft)	280.0	0.050-1.0 (urban soils)
Anthracene	SB-3 (16-17 ft)	220.0	0.050-1.0 (urban soils)
Benzo (a) Anthracene	SB-3 (16-17 ft)	82.0	0.050-1.0 (urban soils)
Benzo (k) Fluoranthene	SB-3 (16-17 ft)	150.0	0.050-1.0 (urban soils)
Benzo (a) Pyrene	SB-3 (16-17 ft)	110.0	0.050-1.0 (urban soils)
Benzo (g,h,i) Perylene	SB-3 (16-17 ft)	90.0	0.050-1.0 (urban soils)
Bis-(2 Ethyl Hexyl) Phthalate	SB-2 (20-21.5 ft)	1.8	0.050-1.0 (urban soils)
	SB-4 (7.5-9 ft)	1.3	0.050-1.0 (urban soils)
	SB-6 (15-16 ft)	1.0	0.050-1.0 (urban soils)
	SS-1 (Surface)	1.0	0.050-1.0 (urban soils)
Butyl Benzyl Phthalate	SB-2 (20-21.5 ft)	1.3	0.050-1.0 (urban soils)
	SB-4 (7.5-9 ft)	2.0	0.050-1.0 (urban soils)
	SB-5 (15-16 ft)	0.41	0.050-1.0 (urban soils)
	SB-6 (15-16 ft)	0.96	0.050-1.0 (urban soils)
	SS-1 (Surface)	0.91	0.050-1.0 (urban soils)

TABLE 4 (cont)

Manitowoc Site
Comparison of Detected Soil Quality to Typical Soil Background Concentrations

Substance	Sample No./Depth	Detected Soil Concentration (mg/kg)	Typical Background Concentration (mg/kg)
Chrysene	SB-3 (16-17 ft)	120.0	0.050-1.0 (urban soils)
Dibutyl Phthalate	SB-2 (20-21.5 ft)	1.7	0.050-1.0 (urban soils)
	SB-4 (7.5-9 ft)	3.5	0.050-1.0 (urban soils)
	SB-5 (15-16 ft)	3.1	0.050-1.0 (urban soils)
	SB-6 (15-16 ft)	2.5	0.050-1.0 (urban soils)
	SS-1 (Surface)	5.1	0.050-1.0 (urban soils)
	SS-2 (Surface)	4.3	0.050-1.0 (urban soils)
Fluoranthene	SB-1 (7-7.5 ft)	11.0	0.050-1.0 (urban soils)
	SB-3 (16-17 ft)	370.0	0.050-1.0 (urban soils)
	SB-4 (7.5-9 ft)	1.1	0.050-1.0 (urban soils)
Fluorene	SB-3 (16-17 ft)	250.0	0.050-1.0 (urban soils)
Indeno (1,2,3-cd) Pyrene	SB-3 (16-17 ft)	65.0	0.050-1.0 (urban soils)
Naphthalene	SB-1 (7.-7.5 ft)	1700.0	0.050-1.0 (urban soils)
	SB-3 (16-17 ft)	730.0	0.050-1.0 (urban soils)
	SB-4 (7.5-9 ft)	0.50	0.050-1.0 (urban soils)
Phenanthrene	SB-1 (7-7.5 ft)	12.0	0.050-1.0 (urban soils)
	SB-2 (20-21.5 ft)	0.17	0.050-1.0 (urban soils)
	SB-3 (16-17 ft)	630.0	0.050-1.0 (urban soils)
	SB-4 (7.5-9 ft)	0.30	0.050-1.0 (urban soils)
Pyrene	SB-1 (7-7.5 ft)	9.4	0.050-1.0 (urban soils)
	SB-3 (16-17 ft)	440.0	0.050-1.0 (urban soils)
	SB-4 (7.5-9 ft)	1.1	0.050-1.0 (urban soils)

Site Investigation
Former Coal Gas Manufacturing Plant
Manitowoc, Wisconsin

prepared for

WISCONSIN FUEL & LIGHT COMPANY

Wisconsin Fuel and Light Company

November, 1988

20969

EDI Engineering & Science
Environmental Engineering, Geology, Biology and Chemistry
a subsidiary of **WW Engineering & Science**

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Summary of Laboratory Analytical Results of Soil Samples

Wisconsin Fuel & Light Company

Manitowoc, Wisconsin

(Units as given)

Site id:		Typical Background Concentration *	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13	SB-14	SB-16	SB-16	SB-18
Sample id:			E02621	E02622	E02623	E02624	E02625	E02626	E02627	E02628	E05061	E05062	E05063
Sample date:			10/01/91	10/02/91	10/02/91	10/02/91	10/02/91	10/02/91	10/03/91	10/03/91	11/06/91	11/06/91	11/06/91
Depth (feet):			4-6	4-6	4-6	4-6	6-8	6-8	6-8	6-8	5.5 - 7.5	22 - 24	5.5 - 7.5
Volatile Fraction	*Units*												
Bromodichloromethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Bromoform	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Bromomethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Carbon tetrachloride	mg/kg		<.01	<.01	<.01	<.01	<.01	.015	<.01	<.01	<.01	<.01	<.01
Chlorobenzene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Chloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
2-Chloroethylvinyl ether	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Chloroform	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Chloromethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Dibromochloromethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,2-Dichlorobenzene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,3-Dichlorobenzene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,4-Dichlorobenzene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Dichlorodifluoromethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,1-Dichloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,2-Dichloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,1-Dichloroethylene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
trans-1,2-Dichloroethylene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,2-Dichloropropane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
cis-1,3-Dichloropropene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
trans-1,3-Dichloropropene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Methylene chloride	mg/kg		<.01	<.02	<.01	<.01	<.02	<.025	<.01	<.01	<.01	<.01	<.01
1,1,2,2-Tetrachloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Tetrachloroethylene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,1,1-Trichloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,1,2-Trichloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Trichloroethylene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Trichlorofluoromethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Vinyl chloride	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Benzene	mg/kg		<.01	<.01	<.01	<.01	.22	.013	<.01	<.01	<.01	<.01	<.01
Ethylbenzene	mg/kg		<.01	.023	<.01	<.01	.055	<.01	<.01	<.01	<.01	<.01	<.01
Toluene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Xylene	mg/kg		<.01	.033	<.01	<.01	.046	<.01	<.01	<.01	<.01	<.01	<.01

< = Parameter not detected. The value presented indicates the detection limit.

** = Typical background concentration for soil constituents found in urban settings in the upper Midwest.*

Table 3

Summary of Laboratory Analytical Results of Soil Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id:		Typical Background Concentration *	SB-18	SB-19	SB-19	SB-20	SB-36	SB-36	TB-1
Sample Id:			E05064	E05065	E05066	E04499	E05055	E05056	E05067
Sample date:			11/07/91	11/07/91	11/07/91	10/28/91	11/08/91	11/08/91	11/07/91
Depth (feet):			22 - 24	5.5 - 7.5	22 - 24	4 - 6	5.5 - 7.5	22 - 24	13 - 15
Volatile Fraction	*Units*								
Bromodichloromethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Bromoform	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Bromomethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Carbon tetrachloride	mg/kg		<.01	<.01	<.01	.012	<.01	<.01	<.01
Chlorobenzene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Chloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
2-Chloroethylvinyl ether	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Chloroform	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Chloromethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Dibromochloromethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,2-Dichlorobenzene	mg/kg	[illegible]	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,3-Dichlorobenzene	mg/kg	[illegible]	<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,4-Dichlorobenzene	mg/kg	[illegible]	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Dichlorodifluoromethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,1-Dichloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,2-Dichloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,1-Dichloroethylene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
trans-1,2-Dichloroethylene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,2-Dichloropropane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
cis-1,3-Dichloropropene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
trans-1,3-Dichloropropene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Methylene chloride	mg/kg		<.01	<.01	<.01	<.02	<.01	<.01	<.01
1,1,2,2-Tetrachloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Tetrachloroethylene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,1,1-Trichloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
1,1,2-Trichloroethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Trichloroethylene	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Trichlorofluoromethane	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Vinyl chloride	mg/kg		<.01	<.01	<.01	<.01	<.01	<.01	<.01
Benzene	mg/kg	[illegible]	<.01	<5	<.01	<.01	<.01	.034	.048
Ethylbenzene	mg/kg	[illegible]	<.01	24	.019	.057	<.01	.13	<.025
Toluene	mg/kg	[illegible]	<.01	13	<.01	.058	<.01	.051	<.025
Xylene	mg/kg	[illegible]	<.01	130	.33	<.01	<.01	.32	.14

< = Parameter not detected. The value presented indicates the detection limit.
** = Typical background concentration for soil constituents found in urban settings in the upper Midwest.*

Table 3

Summary of Laboratory Analytical Results of Soil Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id:		Typical Background Concentration *	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13	SB-14	SB-16	SB-16	SB-18
Sample id:			E02621	E02622	E02623	E02624	E02625	E02626	E02627	E02628	E05061	E05062	E05063
Sample date:			10/01/91	10/02/91	10/02/91	10/02/91	10/02/91	10/02/91	10/03/91	10/03/91	11/06/91	11/06/91	11/06/91
Depth (feet):			4-6	4-6	4-6	4-6	6-8	6-8	6-8	6-8	5.5 - 7.5	22 - 24	5.5 - 7.5
PNA Fraction	*Units*												
Acenaphthene	mg/kg	0.050 - 1.0	<.15	<10	<.15	<.15	<.15	<10	<1	.31	<.5	<.5	<.5
Acenaphthylene	mg/kg	0.050 - 1.0	<.15	<10	<.15	<.15	<.15	<10	<1	<.15	<.5	<.5	<.5
Anthracene	mg/kg	0.050 - 1.0	<.15	13	<.15	<.15	.35	<10	<1	1.5	<.5	<.5	<.5
Benzo(a)anthracene	mg/kg	0.050 - 1.0	.22	<10	<.15	<.15	.31	<10	<1	3.1	<.5	<.5	<.5
Benzo(b and/or k)fluoranthene	mg/kg	0.050 - 1.0	.37	<10	<.15	.22	.52	16	1.4	.55	<.5	<.5	<.5
Benzo(a)pyrene	mg/kg	0.050 - 1.0	.23	<10	<.15	<.15	.29	<10	<1	1.4	<.5	<.5	<.5
Benzo(ghi)perylene	mg/kg	0.050 - 1.0	.15	<10	<.15	<.15	.17	<10	<1	<.15	<.5	<.5	<.5
Chrysene	mg/kg	0.050 - 1.0	.23	<10	<.15	.17	.37	10	<1	1.7	<.5	<.5	<.5
Dibenz(a,h)anthracene	mg/kg	0.050 - 1.0	<.15	<10	<.15	<.15	<.15	<10	<1	<.15	<.5	<.5	<.5
Fluoranthene	mg/kg	0.050 - 1.0	.54	28	<.15	.28	1.3	36	1.4	4.8	<.5	<.5	<.5
Fluorene	mg/kg	0.050 - 1.0	<.3	<20	<.3	<.3	<.3	<20	<2	.54	<1	<1	<1
Indeno(1,2,3-cd)pyrene	mg/kg	0.050 - 1.0	<.15	<10	<.15	<.15	<.15	<10	<1	<.15	<.5	<.5	<.5
Naphthalene	mg/kg	0.050 - 1.0	<.15	66	<.15	<.15	.22	<10	<1	<.15	<.5	<.5	<.5
Phenanthrene	mg/kg	0.050 - 1.0	<.15	43	<.15	<.15	1.5	11	1.4	2.8	<.5	<.5	<.5
Pyrene	mg/kg	0.050 - 1.0	.54	24	<.15	.32	1.1	31	1.4	3.6	<.5	<.5	<.5

** = Typical background concentration for soil constituents found in urban settings in the upper Midwest.*
< = Parameter not detected. Value presented indicates the detection limit.

Table 3

Summary of Laboratory Analytical Results of Soil Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id:		Typical Background Concentration *	SB-18	SB-19	SB-19	SB-20	SB-36	SB-36	TB-1
Sample id:			E05064	E05065	E05066	E04499	E05055	E05056	E05067
Sample date:			11/07/91	11/07/91	11/07/91	10/28/91	11/08/91	11/08/91	11/07/91
Depth (feet):			22 - 24	5.5 - 7.5	22 - 24	4 - 6	5.5 - 7.5	22 - 24	13 - 15
PNA Fraction	*Units*								
Acenaphthene	mg/kg	0.050 - 1.0	<.5	<.5	<.5	<.5	<.5	<.5	1.3
Acenaphthylene	mg/kg	0.050 - 1.0	<.5	2.2	<.5	<.5	<.5	<.5	1.1
Anthracene	mg/kg	0.050 - 1.0	<.5	1.7	<.5	<.5	<.5	<.5	1.1
Benzo(a)anthracene	mg/kg	0.050 - 1.0	<.5	2.5	<.5	<.5	<.5	<.5	.98
Benzo(b and/or k)fluoranthene	mg/kg	0.050 - 1.0	<.5	3	<.5	<.5	<.5	.5	2
Benzo(a)pyrene	mg/kg	0.050 - 1.0	<.5	1.4	<.5	<.5	<.5	<.5	1.8
Benzo(ghi)perylene	mg/kg	0.050 - 1.0	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Chrysene	mg/kg	0.050 - 1.0	<.5	2.2	<.5	<.5	<.5	<.5	<.5
Dibenz(a,h)anthracene	mg/kg	0.050 - 1.0	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Fluoranthene	mg/kg	0.050 - 1.0	<.5	6.2	<.5	<.5	<.5	1.4	3.3
Fluorene	mg/kg	0.050 - 1.0	<1	1.5	<1	<1	<1	<1	1.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.050 - 1.0	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Naphthalene	mg/kg	0.050 - 1.0	<.5	4.3	1.4	<.5	<.5	3.3	5.3
Phenanthrene	mg/kg	0.050 - 1.0	<.5	8.4	<.5	<.5	<.5	1.7	4.5
Pyrene	mg/kg	0.050 - 1.0	<.5	4.8	<.5	<.5	<.5	1.5	2.5

** = Typical background concentration for soil constituents found in urban settings in the upper Midwest.*
< = Parameter not detected. Value presented indicates the detection limit.

Table 3

Summary of Laboratory Analytical Results of Soil Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id:		Typical Background Concentration *	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13	SB-14	SB-16	SB-16	SB-18
Sample id:			E02621	E02622	E02623	E02624	E02625	E02626	E02627	E02628	E05061	E05062	E05063
Sample date:			10/01/91	10/02/91	10/02/91	10/02/91	10/02/91	10/02/91	10/03/91	10/03/91	11/06/91	11/06/91	11/06/91
Depth (feet):			4-6	4-6	4-6	4-6	6-8	6-8	6-8	6-8	5.5-7.5	22-24	5.5-7.5
Metals	*Units*												
Lead, total	mg/kg	47.5	--	--	--	--	--	--	--	--	<2	<2	<2
Selenium, total	mg/kg	0.32	--	--	--	--	--	--	--	--	<4	<4	<4
Zinc, total	mg/kg	46.2	--	--	--	--	--	--	--	--	8.5	6.1	8.1
Cyanide, amenable	mg/kg	N/A	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	.6
Cyanide, total	mg/kg	1.35	<.5	<.5	<.5	1.2	<.5	1.4	<.5	1.6	<.5	<.5	.6
Sulfate	mg/kg	N/A	--	--	--	--	--	--	--	--	<50	<50	<50
Grease & oil	mg/kg	N/A	152	5340	79	128	73	1310	3500	135	71	64	57

** = Michigan regional background concentration for selected metals in the area of the Michigan glacial lobe, assuming sandy soil type. The value presented was calculated as mean + 3 standard deviations. (Source: Michigan Background Soil Survey, MDNR, Waste Management Division, April 1991).*

-- = Analysis not performed.

< = Parameter not detected. Value presented indicates the detection limit.

N/A = Not Available

Table 3

Summary of Laboratory Analytical Results of Soil Samples

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin
(Units as given)

Site id:		Typical Background Concentration *	SB-18	SB-19	SB-19	SB-20	SB-36	SB-36	TB-1
Sample id:			E05064	E05065	E05066	E04499	E05055	E05056	E05067
Sample date:			11/07/91	11/07/91	11/07/91	10/28/91	11/08/91	11/08/91	11/07/91
Depth (feet):			22-24	5.5-7.5	22-24	4-6	5.5-7.5	22-24	13-15
Metals	*Units*								
Lead, total	mg/kg	47.5	<2	8.6	2.2	1.1	3.4	3	175
Selenium, total	mg/kg	0.32	<4	<4	<4	<4	<4	<4	<4
Zinc, total	mg/kg	46.2	7	13	7.9	12	9.1	8.8	76
Cyanide, amenable	mg/kg	N/A	<.5	<.5	<.5	<.5	<.5	.64	<.5
Cyanide, total	mg/kg	1.35	<.5	4.3	<.5	<.5	<.5	.64	<.5
Sulfate	mg/kg	N/A	<50	111	<50	<50	140	61	89
Grease & oil	mg/kg	N/A	62	253	76	<50	144	138	3930

** = Michigan regional background concentration for selected metals in the area of the Michigan glacial lobe, assuming sandy soil type. The value presented was calculated as mean + 3 standard deviations. (Source: Michigan Background Soil Survey, MDNR, Waste Management Division, April 1991).*

-- = Analysis not performed.

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N/A = Not Available

ENVIRONMENTAL SITE INVESTIGATION
FORMER COAL GAS MANUFACTURING PLANT
MANITOWOC, WISCONSIN

Prepared for

WISCONSIN FUEL & LIGHT COMPANY
MANITOWOC, WISCONSIN

Prepared by

WW ENGINEERING & SCIENCE
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GRAND RAPIDS, MICHIGAN 49588-0874

JANUARY 1992

PROJECT 22159

Reviewed by:

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Table 3
Soil Data Summary
Wisconsin Fuel Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		SB-95-1	SB-95-2	SB-95-3	SB-95-4	SB-95-5
Sample Identification:		52821-1752	52821-1753	52852-1906	52852-1905	52821-1754
Date Sampled:		5/15/95	5/16/95	5/18/95	5/18/95	5/16/95
Sampled By:		HORIZON	HORIZON	HORIZON	HORIZON	HORIZON
Analyzed By:		ANATECH	ANATECH	ANATECH	ANATECH	ANATECH
Sample Collection Depth:		4-6'	3-4.8'	3-5'	5.5-6'	7-8.5'
Parameters	***Units***					
Cyanide, amenable	mg/kg	<0.3	<0.3	<0.3	<0.3	<0.3
Cyanide, total	mg/kg	**1.4**	<0.3	<0.3	<0.3	<0.3
WI PVOC Scan (USEPA-8020)	***Units***					
Benzene	ug/kg	<5	<5	<5	<5	<5
Ethylbenzene	ug/kg	<5	<5	<5	<5	<5
Methyl tertiary butyl ether	ug/kg	<5	<5	<5	<5	<5
Toluene	ug/kg	<5	<5	<5	<5	<5
1,2,4-trimethylbenzene	ug/kg	<5	<5	<5	<5	<5
1,3,5-trimethylbenzene	ug/kg	<5	<5	<5	<5	<5
Xylene, total	ug/kg	<15	<15	<15	<15	<15
USEPA-8270 Scan	***Units***					
2-Chloronaphthalene	ug/kg	<330	<330	<2000	<330	<330
Bis(2-chloroethyl)ether	ug/kg	<330	<330	<2000	<330	<330
Hexachlorobenzene	ug/kg	<330	<330	<2000	<330	<330
2-Chlorophenol	ug/kg	<330	<330	<2000	<330	<330
Hexachlorocyclopentadiene	ug/kg	<330	<330	<2000	<330	<330
Bis(2-chloroisopropyl)ether	ug/kg	<330	<330	<2000	<330	<330
n-Nitrosodi-n-propylamine	ug/kg	<330	<330	<2000	<330	<330
Hexachloroethane	ug/kg	<330	<330	<2000	<330	<330
Nitrobenzene	ug/kg	<330	<330	<2000	<330	<330
2-Methylphenol	ug/kg	<330	<330	<2000	<330	<330
Isophorone	ug/kg	<330	<330	<2000	<330	<330
Bis(2-chloroethoxy)methane	ug/kg	<330	<330	<2000	<330	<330
3 & 4-Methylphenol	ug/kg	<330	<330	<2000	<330	<330
Dimethyl phthalate	ug/kg	<330	<330	<2000	<330	<330
2-Nitrophenol	ug/kg	<330	<330	<2000	<330	<330
Diethyl phthalate	ug/kg	<330	<330	<2000	<330	<330
2,4-Dimethylphenol	ug/kg	<330	<330	<2000	<330	<330
n-Nitrosodiphenylamine	ug/kg	<330	<330	<2000	<330	<330
2,4-Dichlorophenol	ug/kg	<330	<330	<2000	<330	<330
Di-n-butyl phthalate	ug/kg	<330	<330	<2000	<330	<330
4-Chloroaniline	ug/kg	<1300	<1300	<7800	<1300	<1300
Butyl benzyl phthalate	ug/kg	<330	<330	<2000	<330	<330
4-Chloro-3-methylphenol	ug/kg	<330	<330	<2000	<330	<330
Bis(2ethylhexyl) phthalate	ug/kg	<330	<330	<2000	<330	<330
Di-n-octyl phthalate	ug/kg	<330	<330	<2000	<330	<330
2-Methyl naphthalene	ug/kg	<330	<330	**12,000**	<330	<330
Phenol	ug/kg	<330	<330	<2000	<330	<330

Note: Bold values indicate concentrations above the method detection limit.

Table 3
Soil Data Summary
Wisconsin Fuel Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		SB-95-1	SB-95-2	SB-95-3	SB-95-4	SB-95-5
Sample Identification:		52821-1752	52821-1753	52852-1906	52852-1905	52821-1754
Date Sampled:		5/15/95	5/16/95	5/18/95	5/18/95	5/16/95
Sampled By:		HORIZON	HORIZON	HORIZON	HORIZON	HORIZON
Analyzed By:		ANATECH	ANATECH	ANATECH	ANATECH	ANATECH
Sample Collection Depth:		4-6'	3-4.8'	3-5'	5.5-6'	7-8.5'
2,4,6-Trichlorophenol	ug/kg	<330	<330	<2000	<330	<330
2,4,5-Trichlorophenol	ug/kg	<1700	<1700	<2000	<1700	<1700
Acenaphthene	ug/kg	<330	<330	**5,700**	<330	<330
Acenaphthylene	ug/kg	<330	<330	**29,000**	<330	<330
2-Nitroaniline	ug/kg	<1700	<1700	<7800	<1700	<1700
Fluorene	ug/kg	<330	<330	**35,000**	<330	<330
Phenanthrene	ug/kg	<330	<330	**193,000**	<330	<330
2,6-Dinitrotoluene	ug/kg	<330	<330	<2000	<330	<330
Anthracene	ug/kg	<330	<330	**58,000**	<330	<330
3-Nitroaniline	ug/kg	<1700	<1700	<2000	<1700	<1700
Fluoranthene	ug/kg	<330	<330	**152,000**	<330	<330
2,4-Dinitrophenol	ug/kg	<1700	<1700	<7800	<1700	<1700
Pyrene	ug/kg	<330	<330	**156,000**	<330	<330
4-Nitrophenol	ug/kg	<1700	<1700	<7800	<1700	<1700
Benzo(a)anthracene	ug/kg	<330	<330	**52,000**	<330	<330
Chrysene	ug/kg	<330	<330	**47,000**	<330	<330
Carbazole	ug/kg	<330	<330	**27,000**	<330	<330
Benzo(b)fluoranthene	ug/kg	<330	<330	**36,000**	<330	<330
2,4-Dinitrotoluene	ug/kg	<330	<330	<2000	<330	<330
Benzo(k)fluoranthene	ug/kg	<330	<330	**40,000**	<330	<330
Benzo(a)pyrene	ug/kg	<330	<330	**43,000**	<330	<330
Indeno(123-cd)pyrene	ug/kg	<330	<330	**15,000**	<330	<330
4-Chlorophenylphenyl ether	ug/kg	<330	<330	<2000	<330	<330
Dibenzo(a,h)anthracene	ug/kg	<330	<330	<2000	<330	<330
4-Nitroaniline	ug/kg	<1700	<1700	<7800	<1700	<1700
Benzo(g,h,i)perylene	ug/kg	<330	<330	**14,000**	<330	<330
2-Methyl-4,6-dinitrophenol	ug/kg	<1700	<1700	<7800	<1700	<1700
1,3-Dichlorobenzene	ug/kg	<330	<330	<2000	<330	<330
4-Bromophenylphenyl ether	ug/kg	<330	<330	<2000	<330	<330
1,4-Dichlorobenzene	ug/kg	<330	<330	<2000	<330	<330
1,2-Dichlorobenzene	ug/kg	<330	<330	<2000	<330	<330
1,2,4-Trichlorobenzene	ug/kg	<330	<330	<2000	<330	<330
Hexachlorobutadiene	ug/kg	<330	<330	<2000	<330	<330
Naphthalene	ug/kg	<330	<330	**19,000**	<330	<330
Dibenzofuran	ug/kg	<330	<330	**26,000**	<330	<330
Pentachlorophenol	ug/kg	<1700	<1700	<2000	<1700	<1700
3,3-Dichlorobenzidine	ug/kg	<2000	<2000	<7800	<2000	<2000

Note: Bold values indicate concentrations above the method detection limit.

Table 3
Soil Data Summary
Wisconsin Fuel Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		SB-95-6	MW-15T	MW-16T	MW-17T	MW-18T
Sample Identification:		52852-1907	52821-1751	52821-1750	52821-1755	52821-1756
Date Sampled:		5/18/95	5/15/95	5/16/95	5/17/95	5/17/95
Sampled By:		HORIZON	HORIZON	HORIZON	HORIZON	HORIZON
Analyzed By:		ANATECH	ANATECH	ANATECH	ANATECH	ANATECH
Sample Collection Depth:		25-27	5-6'	3-4'	10-11'	13-14.5'
Parameters	***Units***					
Cyanide, amenable	mg/kg	<0.3	<0.3	<0.3	<0.3	<0.3
Cyanide, total	mg/kg	<0.3	**3.2**	<0.3	<0.3	<0.3
WI PVOC Scan (USEPA-8020)	***Units***					
Benzene	ug/kg	<5	<5	<5	<5	<5
Ethylbenzene	ug/kg	<5	<5	<5	<5	<5
Methyl tertiary butyl ether	ug/kg	<5	<5	<5	<5	<5
Toluene	ug/kg	<5	<5	<5	<5	<5
1,2,4-trimethylbenzene	ug/kg	<5	<5	<5	<5	<5
1,3,5-trimethylbenzene	ug/kg	<5	<5	<5	<5	<5
Xylene, total	ug/kg	<15	<15	<15	<15	<15
USEPA-8270 Scan	***Units***					
2-Chloronaphthalene	ug/kg	<330	<330	<330	<330	<330
Bis(2-chloroethyl)ether	ug/kg	<330	<330	<330	<330	<330
Hexachlorobenzene	ug/kg	<330	<330	<330	<330	<330
2-Chlorophenol	ug/kg	<330	<330	<330	<330	<330
Hexachlorocyclopentadiene	ug/kg	<330	<330	<330	<330	<330
Bis(2-chloroisopropyl)ether	ug/kg	<330	<330	<330	<330	<330
n-Nitrosodi-n-propylamine	ug/kg	<330	<330	<330	<330	<330
Hexachloroethane	ug/kg	<330	<330	<330	<330	<330
Nitrobenzene	ug/kg	<330	<330	<330	<330	<330
2-Methylphenol	ug/kg	<330	<330	<330	<330	<330
Isophorone	ug/kg	<330	<330	<330	<330	<330
Bis(2-chloroethoxy)methane	ug/kg	<330	<330	<330	<330	<330
3 & 4-Methylphenol	ug/kg	<330	<330	<330	<330	<330
Dimethyl phthalate	ug/kg	<330	<330	<330	<330	<330
2-Nitrophenol	ug/kg	<330	<330	<330	<330	<330
Diethyl phthalate	ug/kg	<330	<330	<330	<330	<330
2,4-Dimethylphenol	ug/kg	<330	<330	<330	<330	<330
n-Nitrosodiphenylamine	ug/kg	<330	<330	<330	<330	<330
2,4-Dichlorophenol	ug/kg	<330	<330	<330	<330	<330
Di-n-butyl phthalate	ug/kg	<330	<330	<330	<330	<330
4-Chloroaniline	ug/kg	<1300	<1300	<1300	<1300	<1300
Butyl benzyl phthalate	ug/kg	<330	<330	<330	<330	<330
4-Chloro-3-methylphenol	ug/kg	<330	<330	<330	<330	<330
Bis(2ethylhexyl) phthalate	ug/kg	<330	<330	<330	<330	<330
Di-n-octyl phthalate	ug/kg	<330	<330	<330	<330	<330
2-Methyl naphthalene	ug/kg	<330	<330	<330	<330	<330
Phenol	ug/kg	<330	<330	<330	<330	<330

Note: Bold values indicate concentrations above the method detection limit.

Table 3
Soil Data Summary
Wisconsin Fuel Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		SB-95-6	MW-15T	MW-16T	MW-17T	MW-18T
Sample Identification:		52852-1907	52821-1751	52821-1750	52821-1755	52821-1756
Date Sampled:		5/18/95	5/15/95	5/16/95	5/17/95	5/17/95
Sampled By:		HORIZON	HORIZON	HORIZON	HORIZON	HORIZON
Analyzed By:		ANATECH	ANATECH	ANATECH	ANATECH	ANATECH
Sample Collection Depth:		25-27	5-6'	3-4'	10-11'	13-14.5'
2,4,6-Trichlorophenol	ug/kg	<330	<330	<330	<330	<330
2,4,5-Trichlorophenol	ug/kg	<1700	<1700	<1700	<1700	<1700
Acenaphthene	ug/kg	<330	<330	<330	<330	<330
Acenaphthylene	ug/kg	<330	<330	<330	<330	<330
2-Nitroaniline	ug/kg	<1700	<1700	<1700	<1700	<1700
Fluorene	ug/kg	<330	<330	<330	<330	<330
Phenanthrene	ug/kg	<330	<330	<330	<330	<330
2,6-Dinitrotoluene	ug/kg	<330	<330	<330	<330	<330
Anthracene	ug/kg	<330	<330	<330	<330	<330
3-Nitroaniline	ug/kg	<1700	<1700	<1700	<1700	<1700
Fluoranthene	ug/kg	<330	<330	<330	<330	<330
2,4-Dinitrophenol	ug/kg	<1700	<1700	<1700	<1700	<1700
Pyrene	ug/kg	<330	<330	<330	<330	<330
4-Nitrophenol	ug/kg	<1700	<1700	<1700	<1700	<1700
Benzo(a)anthracene	ug/kg	<330	<330	<330	<330	<330
Chrysene	ug/kg	<330	<330	<330	<330	<330
Carbazole	ug/kg	<330	<330	<330	<330	<330
Benzo(b)fluoranthene	ug/kg	<330	<330	<330	<330	<330
2,4-Dinitrotoluene	ug/kg	<330	<330	<330	<330	<330
Benzo(k)fluoranthene	ug/kg	<330	<330	<330	<330	<330
Benzo(a)pyrene	ug/kg	<330	<330	<330	<330	<330
Indeno(123-cd)pyrene	ug/kg	<330	<330	<330	<330	<330
4-Chlorophenylphenyl ether	ug/kg	<330	<330	<330	<330	<330
Dibenzo(a,h)anthracene	ug/kg	<330	<330	<330	<330	<330
4-Nitroaniline	ug/kg	<1700	<1700	<1700	<1700	<1700
Benzo(g,h,i)perylene	ug/kg	<330	<330	<330	<330	<330
2-Methyl-4,6-dinitrophenol	ug/kg	<1700	<1700	<1700	<1700	<1700
1,3-Dichlorobenzene	ug/kg	<330	<330	<330	<330	<330
4-Bromophenylphenyl ether	ug/kg	<330	<330	<330	<330	<330
1,4-Dichlorobenzene	ug/kg	<330	<330	<330	<330	<330
1,2-Dichlorobenzene	ug/kg	<330	<330	<330	<330	<330
1,2,4-Trichlorobenzene	ug/kg	<330	<330	<330	<330	<330
Hexachlorobutadiene	ug/kg	<330	<330	<330	<330	<330
Naphthalene	ug/kg	<330	<330	<330	<330	<330
Dibenzofuran	ug/kg	<330	<330	<330	<330	<330
Pentachlorophenol	ug/kg	<1700	<1700	<1700	<1700	<1700
3,3-Dichlorobenzidine	ug/kg	<2000	<2000	<2000	<2000	<2000

Note: Bold values indicate concentrations above the method detection limit.

SUBSURFACE INVESTIGATION OF PROPERTIES ADJACENT TO FORMER WISCONSIN FUEL & LIGHT CO. COAL GAS MANUFACTURING PLANT MANITOWOC, WISCONSIN

Prepared for:

Wisconsin Fuel & Light Co.
402 North Tenth Street
P.O. Box 970
Manitowoc, Wisconsin 54221-0970
(414) 683-2538

Prepared by:

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WFL-0101

September, 1995

HORIZON ENVIRONMENTAL

Table 3
Soil Data Summary
Wisconsin Fuel & Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		SB-96-1	SB-96-2	SB-96-3	SB-96-4	SB-96-5
Sample Identification:		62982-0491	62982-0492	62982-0493	62982-0494	62982-0495
Date Sampled:		6/3/96	6/3/96	6/4/96	6/4/96	6/5/96
Sampled By:		MP	MP	MP	MP	MP
Analyzed By:		Anatech	Anatech	Anatech	Anatech	Anatech
Sample Collection Depth:		18'-20'	18'-20'	25'-27'	28'-30'	25'-27'
Parameters	***Units***					
Cyanide, amenable	mg/kg	ND0.2	ND0.2	ND0.2	ND0.2	ND0.2
Cyanide, total	mg/kg	ND0.2	ND0.2	ND0.2	ND0.2	ND0.2
Physical Properties	***Units***					
Solids	%	79.0	80.0	81.4	82.0	80.5
WI PVOC Scan (USEPA-8020)	***Units***					
Benzene	ug/kg	**370**	**65**	**460**	**14,000**	**240**
Ethylbenzene	ug/kg	**540**	**150**	**1800**	**560,000**	**160**
Methyl tertiary butyl ether	ug/kg	ND25	ND25	ND25	ND500	ND25
Toluene	ug/kg	**2700**	**170**	**770**	**250,000**	**640**
1,2,4-trimethylbenzene	ug/kg	**750**	**110**	**380**	**250,000**	**120**
1,3,5-trimethylbenzene	ug/kg	**290**	ND25	**150**	**74,000**	**64**
Xylene, total	ug/kg	**5300**	**310**	**1200**	**510,000**	**720**
USEPA-8270 Scan	***Units***					
2-Chloronaphthalene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Bis(2-chloroethyl)ether	ug/kg	ND330	ND330	ND330	ND83000	ND330
Hexachlorobenzene	ug/kg	ND330	ND330	ND330	ND83000	ND330
2-Chlorophenol	ug/kg	ND330	ND330	ND330	ND83000	ND330
Hexachlorocyclopentadiene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Bis(2-chloroisopropyl)ether	ug/kg	ND330	ND330	ND330	ND83000	ND330
n-Nitrosodi-n-propylamine	ug/kg	ND330	ND330	ND330	ND83000	ND330
Hexachloroethane	ug/kg	ND330	ND330	ND330	ND83000	ND330
Nitrobenzene	ug/kg	ND330	ND330	ND330	ND83000	ND330
2-Methylphenol	ug/kg	ND330	ND330	ND330	ND83000	ND330
Isophorone	ug/kg	ND330	ND330	ND330	ND83000	ND330
Bis(2-chloroethoxy)methane	ug/kg	ND330	ND330	ND330	ND83000	ND330
3 & 4-Methylphenol	ug/kg	ND660	ND660	ND660	ND160000	ND660
Dimethyl phthalate	ug/kg	ND330	ND330	ND330	ND83000	ND330
2-Nitrophenol	ug/kg	ND330	ND330	ND330	ND83000	ND330
Diethyl phthalate	ug/kg	ND330	ND330	ND330	ND83000	ND330
2,4-Dimethylphenol	ug/kg	ND330	ND330	ND330	ND83000	ND330
n-Nitrosodiphenylamine	ug/kg	ND330	ND330	ND330	ND83000	ND330
2,4-Dichlorophenol	ug/kg	ND330	ND330	ND330	ND83000	ND330
Di-n-butyl phthalate	ug/kg	ND330	ND330	ND330	ND83000	ND330
4-Chloroaniline	ug/kg	ND1300	ND1300	ND1300	ND320000	ND1300
Butyl benzyl phthalate	ug/kg	ND330	ND330	ND330	ND83000	ND330
4-Chloro-3-methylphenol	ug/kg	ND330	ND330	ND330	ND83000	ND330
Bis(2ethylhexyl) phthalate	ug/kg	ND330	ND330	ND330	ND83000	ND330
Di-n-octyl phthalate	ug/kg	ND330	ND330	ND330	ND83000	ND330

Note: Bold values indicate concentrations above the method detection limit.

Table 3
Soil Data Summary
Wisconsin Fuel & Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		SB-96-1	SB-96-2	SB-96-3	SB-96-4	SB-96-5
Sample Identification:		62982-0491	62982-0492	62982-0493	62982-0494	62982-0495
Date Sampled:		6/3/96	6/3/96	6/4/96	6/4/96	6/5/96
Sampled By:		MP	MP	MP	MP	MP
Analyzed By:		Anatech	Anatech	Anatech	Anatech	Anatech
Sample Collection Depth:		18'-20'	18'-20'	25'-27'	28'-30'	25'-27'
2-Methyl naphthalene	ug/kg	ND330	ND330	ND330	**330,000**	ND330
Phenol	ug/kg	ND330	ND330	ND330	ND83000	ND330
2,4,6-Trichlorophenol	ug/kg	ND330	ND330	ND330	ND83000	ND330
2,4,5-Trichlorophenol	ug/kg	ND330	ND330	ND330	ND83000	ND330
Acenaphthene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Acenaphthylene	ug/kg	ND330	ND330	ND330	**180,000**	ND330
2-Nitroaniline	ug/kg	ND1300	ND1300	ND1300	ND320000	ND1300
Fluorene	ug/kg	ND330	ND330	ND330	**120,000**	ND330
Phenanthrene	ug/kg	ND330	ND330	ND330	**300,000**	**470**
2,6-Dinitrotoluene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Anthracene	ug/kg	ND330	ND330	ND330	ND83000	ND330
3-Nitroaniline	ug/kg	ND1300	ND1300	ND1300	ND320000	ND1300
Fluoranthene	ug/kg	ND330	ND330	ND330	**130,000**	ND330
2,4-Dinitrophenol	ug/kg	ND1300	ND1300	ND1300	ND320000	ND1300
Pyrene	ug/kg	ND330	ND330	ND330	**140,000**	ND330
4-Nitrophenol	ug/kg	ND1300	ND1300	ND1300	ND320000	ND1300
Benzo(a)anthracene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Chrysene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Carbazole	ug/kg	ND330	**400**	ND330	ND83000	ND330
Benzo(b)fluoranthene	ug/kg	ND330	ND330	ND330	ND83000	ND330
2,4-Dinitrotoluene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Benzo(k)fluoranthene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Benzo(a)pyrene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Indeno(123-cd)pyrene	ug/kg	ND330	ND330	ND330	ND83000	ND330
4-Chlorophenylphenyl ether	ug/kg	ND330	ND330	ND330	ND83000	ND330
Dibenzo(a,h)anthracene	ug/kg	ND330	ND330	ND330	ND83000	ND330
4-Nitroaniline	ug/kg	ND1300	ND1300	ND1300	ND320000	ND1300
Benzo(g,h,i)perylene	ug/kg	ND330	ND330	ND330	ND83000	ND330
2-Methyl-4,6-dinitrophenol	ug/kg	ND1300	ND1300	ND1300	ND320000	ND1300
1,3-Dichlorobenzene	ug/kg	ND330	ND330	ND330	ND83000	ND330
4-Bromophenylphenyl ether	ug/kg	ND330	ND330	ND330	ND83000	ND330
1,4-Dichlorobenzene	ug/kg	ND330	ND330	ND330	ND83000	ND330
1,2-Dichlorobenzene	ug/kg	ND330	ND330	ND330	ND83000	ND330
1,2,4-Trichlorobenzene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Hexachlorobutadiene	ug/kg	ND330	ND330	ND330	ND83000	ND330
Naphthalene	ug/kg	**1700**	**1200**	**1800**	**1,000,000**	**1000**
Dibenzofuran	ug/kg	ND330	ND330	ND330	ND83000	ND330
Pentachlorophenol	ug/kg	ND330	ND330	ND330	ND83000	ND330
3,3-Dichlorobenzidine	ug/kg	ND1300	ND1300	ND1300	ND320000	ND1300

Note: Bold values indicate concentrations above the method detection limit.

Table 3
Soil Data Summary
Wisconsin Fuel & Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		SB-96-6	SB-96-6	SB-96-7	SB-96-7	SB-96-8
Sample Identification:		62982-0496	62982-0497	62982-0498	62982-0499	62982-0500
Date Sampled:		6/5/96	6/5/96	6/6/96	6/6/96	6/6/96
Sampled By:		MP	MP	MP	MP	MP
Analyzed By:		Anatech	Anatech	Anatech	Anatech	Anatech
Sample Collection Depth:		17'19'	31'-33'	15'-17'	39'-41'	33'-35'
Parameters	***Units***					
Cyanide, amenable	mg/kg	ND0.2	**0.2**	ND0.2	ND0.2	ND0.2
Cyanide, total	mg/kg	ND0.2	**0.2**	ND0.2	ND0.2	ND0.2
Physical Properties	***Units***					
Solids	%	79.4	83.0	80.5	81.1	80.0
WI PVOC Scan (USEPA-8020)	***Units***					
Benzene	ug/kg	**100**	**1900**	**1800**	**1100**	**10,000**
Ethylbenzene	ug/kg	**11,000**	**180,000**	**38,000**	**8600**	**73,000**
Methyl tertiary butyl ether	ug/kg	ND25	ND500	ND1300	ND130	**700**
Toluene	ug/kg	**1100**	**67,000**	**80,000**	**12,000**	**57,000**
1,2,4-trimethylbenzene	ug/kg	**210,000**	**170,000**	**320,000**	**25,000**	**100,000**
1,3,5-trimethylbenzene	ug/kg	**73,000**	**54,000**	**150,000**	**7700**	**29,000**
Xylene, total	ug/kg	**530,000**	**250,000**	**800,000**	**81,000**	**250,000**
USEPA-8270 Scan	***Units***					
2-Chloronaphthalene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Bis(2-chloroethyl)ether	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Hexachlorobenzene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2-Chlorophenol	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Hexachlorocyclopentadiene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Bis(2-chloroisopropyl)ether	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
n-Nitrosodi-n-propylamine	ug/kg	*ND83000*	*ND170000*	*ND170000*	*ND17000*	*ND170000*
Hexachloroethane	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Nitrobenzene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2-Methylphenol	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Isophorone	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Bis(2-chloroethoxy)methane	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
3 & 4-Methylphenol	ug/kg	ND160000	ND340000	ND340000	ND34000	ND340000
Dimethyl phthalate	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2-Nitrophenol	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Diethyl phthalate	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2,4-Dimethylphenol	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
n-Nitrosodiphenylamine	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2,4-Dichlorophenol	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Di-n-butyl phthalate	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
4-Chloroaniline	ug/kg	ND320000	ND650000	ND650000	ND65000	ND650000
Butyl benzyl phthalate	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
4-Chloro-3-methylphenol	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Bis(2ethylhexyl) phthalate	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Di-n-octyl phthalate	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000

Note: Bold values indicate concentrations above the method detection limit.

Table 3
Soil Data Summary
Wisconsin Fuel & Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		SB-96-6	SB-96-6	SB-96-7	SB-96-7	SB-96-8
Sample Identification:		62982-0496	62982-0497	62982-0498	62982-0499	62982-0500
Date Sampled:		6/5/96	6/5/96	6/6/96	6/6/96	6/6/96
Sampled By:		MP	MP	MP	MP	MP
Analyzed By:		Anatech	Anatech	Anatech	Anatech	Anatech
Sample Collection Depth:		17'19'	31'-33'	15'-17'	39'-41'	33'-35'
2-Methyl naphthalene	ug/kg	ND83000	**170,000**	ND170000	**41,000**	**370,000**
Phenol	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2,4,6-Trichlorophenol	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2,4,5-Trichlorophenol	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Acenaphthene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Acenaphthylene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2-Nitroaniline	ug/kg	ND320000	ND650000	ND650000	ND65000	ND650000
Fluorene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Phenanthrene	ug/kg	ND83000	ND170000	ND170000	**24,000**	ND170000
2,6-Dinitrotoluene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Anthracene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
3-Nitroaniline	ug/kg	ND320000	ND650000	ND650000	ND65000	ND650000
Fluoranthene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2,4-Dinitrophenol	ug/kg	ND320000	ND650000	ND650000	ND65000	ND650000
Pyrene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
4-Nitrophenol	ug/kg	ND320000	ND650000	ND650000	ND65000	ND650000
Benzo(a)anthracene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Chrysene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Carbazole	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Benzo(b)fluoranthene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2,4-Dinitrotoluene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Benzo(k)fluoranthene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Benzo(a)pyrene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Indeno(123-cd)pyrene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
4-Chlorophenylphenyl ether	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Dibenzo(a,h)anthracene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
4-Nitroaniline	ug/kg	ND320000	ND650000	ND650000	ND65000	ND650000
Benzo(g,h,i)perylene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
2-Methyl-4,6-dinitrophenol	ug/kg	ND320000	ND650000	ND650000	ND65000	ND650000
1,3-Dichlorobenzene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
4-Bromophenylphenyl ether	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
1,4-Dichlorobenzene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
1,2-Dichlorobenzene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
1,2,4-Trichlorobenzene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Hexachlorobutadiene	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Naphthalene	ug/kg	**360,000**	**570,000**	**1,100,000**	**130,000**	**1,300,000**
Dibenzofuran	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
Pentachlorophenol	ug/kg	ND83000	ND170000	ND170000	ND17000	ND170000
3,3-Dichlorobenzidine	ug/kg	ND320000	ND650000	ND650000	ND65000	ND650000

Note: Bold values indicate concentrations above the method detection limit.

Table 3
Soil Data Summary
Wisconsin Fuel & Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		SB-96-9	SB-96-10	SB-96-11	SB-96-12
Sample Identification:		63126-1043	63126-1044	63126-1045	63126-1046
Date Sampled:		6/8/96	6/8/96	6/9/96	6/9/96
Sampled By:		MP	MP	MP	MP
Analyzed By:		Anatech	Anatech	Anatech	Anatech
Sample Collection Depth:		39'-41'	33'-35'	13'-15'	25'-27'
Parameters	***Units***				
Cyanide, amenable	mg/kg	ND0.2	**0.3**	**0.6**	**0.6**
Cyanide, total	mg/kg	ND0.2	**0.3**	**0.6**	**0.6**
Physical Properties	***Units***				
Solids	%	80.5	81.1	83.0	83.0
WI PVOC Scan (USEPA-8020)	***Units***				
Benzene	ug/kg	ND25	**69**	ND25	**470**
Ethylbenzene	ug/kg	ND25	**140**	**370**	**580**
Methyl tertiary butyl ether	ug/kg	ND25	ND25	ND25	ND25
Toluene	ug/kg	**49**	**110**	**60**	**2600**
1,2,4-trimethylbenzene	ug/kg	ND25	ND25	**1700**	**2400**
1,3,5-trimethylbenzene	ug/kg	ND25	ND25	**2600**	**390**
Xylene, total	ug/kg	ND75	**150**	**1100**	**8100**
USEPA-8270 Scan	***Units***				
2-Chloronaphthalene	ug/kg	ND330	ND330	ND1600	ND330
Bis(2-chloroethyl)ether	ug/kg	ND330	ND330	ND1600	ND330
Hexachlorobenzene	ug/kg	ND330	ND330	ND1600	ND330
2-Chlorophenol	ug/kg	ND330	ND330	ND1600	ND330
Hexachlorocyclopentadiene	ug/kg	ND330	ND330	ND1600	ND330
Bis(2-chloroisopropyl)ether	ug/kg	ND330	ND330	ND1600	ND330
n-Nitrosodi-n-propylamine	ug/kg	ND330	ND330	ND1600	ND330
Hexachloroethane	ug/kg	ND330	ND330	ND1600	ND330
Nitrobenzene	ug/kg	ND330	ND330	ND1600	ND330
2-Methylphenol	ug/kg	ND330	ND330	ND1600	ND330
Isophorone	ug/kg	ND330	ND330	ND1600	ND330
Bis(2-chloroethoxy)methane	ug/kg	ND330	ND330	ND1600	ND330
3 & 4-Methylphenol	ug/kg	ND660	ND660	NF3300	ND660
Dimethyl phthalate	ug/kg	ND330	ND330	ND1600	ND330
2-Nitrophenol	ug/kg	ND330	ND330	ND1600	ND330
Diethyl phthalate	ug/kg	ND330	ND330	ND1600	ND330
2,4-Dimethylphenol	ug/kg	ND330	ND330	ND1600	ND330
n-Nitrosodiphenylamine	ug/kg	ND330	ND330	ND1600	ND330
2,4-Dichlorophenol	ug/kg	ND330	ND330	ND1600	ND330
Di-n-butyl phthalate	ug/kg	ND330	ND330	ND1600	ND330
4-Chloroaniline	ug/kg	ND1300	ND1300	ND6500	ND1300
Butyl benzyl phthalate	ug/kg	ND330	ND330	ND1600	ND330
4-Chloro-3-methylphenol	ug/kg	ND330	ND330	ND1600	ND330
Bis(2ethylhexyl) phthalate	ug/kg	ND330	ND330	ND1600	ND330
Di-n-octyl phthalate	ug/kg	ND330	ND330	ND1600	ND330

Note: Bold values indicate concentrations above the method detection limit.

Table 3
Soil Data Summary
Wisconsin Fuel & Light Co.
Manitowoc, Wisconsin
(Units as given)

Site Identification:		SB-96-9	SB-96-10	SB-96-11	SB-96-12
Sample Identification:		63126-1043	63126-1044	63126-1045	63126-1046
Date Sampled:		6/8/96	6/8/96	6/9/96	6/9/96
Sampled By:		MP	MP	MP	MP
Analyzed By:		Anatech	Anatech	Anatech	Anatech
Sample Collection Depth:		39'-41'	33'-35'	13'-15'	25'-27'
2-Methyl naphthalene	ug/kg	ND330	ND330	ND1600	**1000**
Phenol	ug/kg	ND330	ND330	ND1600	ND330
2,4,6-Trichlorophenol	ug/kg	ND330	ND330	ND1600	ND330
2,4,5-Trichlorophenol	ug/kg	ND330	ND330	ND1600	ND330
Acenaphthene	ug/kg	ND330	ND330	ND1600	ND330
Acenaphthylene	ug/kg	ND330	ND330	ND1600	**430**
2-Nitroaniline	ug/kg	ND1300	ND1300	ND6500	ND1300
Fluorene	ug/kg	ND330	ND330	ND1600	ND330
Phenanthrene	ug/kg	ND330	ND330	ND1600	ND330
2,6-Dinitrotoluene	ug/kg	ND330	ND330	ND1600	ND330
Anthracene	ug/kg	ND330	ND330	ND1600	ND330
3-Nitroaniline	ug/kg	ND1300	ND1300	ND6500	ND1300
Fluoranthene	ug/kg	ND330	ND330	ND1600	ND330
2,4-Dinitrophenol	ug/kg	ND1300	ND1300	ND6500	ND1300
Pyrene	ug/kg	ND330	ND330	ND1600	ND330
4-Nitrophenol	ug/kg	ND1300	ND1300	ND6500	ND1300
Benzo(a)anthracene	ug/kg	ND330	ND330	ND1600	ND330
Chrysene	ug/kg	ND330	ND330	ND1600	ND330
Carbazole	ug/kg	ND330	ND330	ND1600	ND330
Benzo(b)fluoranthene	ug/kg	ND330	ND330	ND1600	ND330
2,4-Dinitrotoluene	ug/kg	ND330	ND330	ND1600	ND330
Benzo(k)fluoranthene	ug/kg	ND330	ND330	ND1600	ND330
Benzo(a)pyrene	ug/kg	ND330	ND330	ND1600	ND330
Indeno(123-cd)pyrene	ug/kg	ND330	ND330	ND1600	ND330
4-Chlorophenylphenyl ether	ug/kg	ND330	ND330	ND1600	ND330
Dibenzo(a,h)anthracene	ug/kg	ND330	ND330	ND1600	ND330
4-Nitroaniline	ug/kg	ND1300	ND1300	ND6500	ND1300
Benzo(g,h,i)perylene	ug/kg	ND330	ND330	ND1600	ND330
2-Methyl-4,6-dinitrophenol	ug/kg	ND1300	ND1300	ND6500	ND1300
1,3-Dichlorobenzene	ug/kg	ND330	ND330	ND1600	ND330
4-Bromophenylphenyl ether	ug/kg	ND330	ND330	ND1600	ND330
1,4-Dichlorobenzene	ug/kg	ND330	ND330	ND1600	ND330
1,2-Dichlorobenzene	ug/kg	ND330	ND330	ND1600	ND330
1,2,4-Trichlorobenzene	ug/kg	ND330	ND330	ND1600	ND330
Hexachlorobutadiene	ug/kg	ND330	ND330	ND1600	ND330
Naphthalene	ug/kg	ND330	ND330	**8700**	**4600**
Dibenzofuran	ug/kg	ND330	ND330	ND1600	ND330
Pentachlorophenol	ug/kg	ND330	ND330	ND1600	ND330
3,3-Dichlorobenzidine	ug/kg	ND1300	ND1300	ND6500	ND1300

Note: Bold values indicate concentrations above the method detection limit.

SUBSURFACE INVESTIGATION
FORMER WISCONSIN FUEL & LIGHT CO.
COAL GAS MANUFACTURING PLANT
MANITOWOC, WISCONSIN

RECEIVED
FEB 20 1997
LMD SOLID WASTE

Prepared for:

Wisconsin Fuel & Light Co.
402 North Tenth Street
P.O. Box 970
Manitowoc, Wisconsin 54221-0970
(414) 683-2538

Prepared by:

Horizon Environmental Corporation
4595 Broadmoor SE
Suite 200
Grand Rapids, Michigan 49512
(616) 554-3210

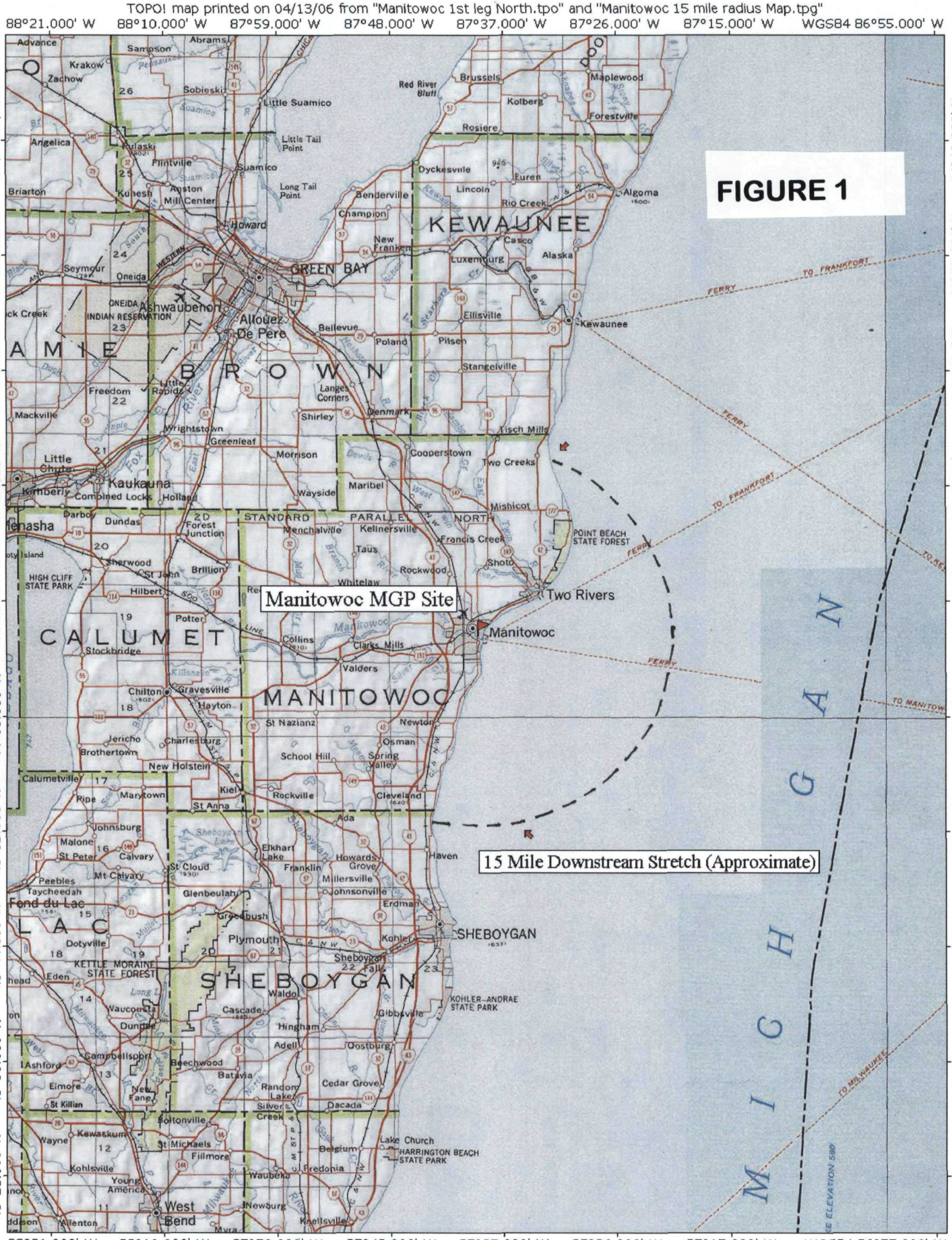
WFL-0105

February 1997

HORIZON ENVIRONMENT

FIGURES

TOPO! map printed on 04/13/06 from "Manitowoc 1st leg North.tpo" and "Manitowoc 15 mile radius Map.tpg"



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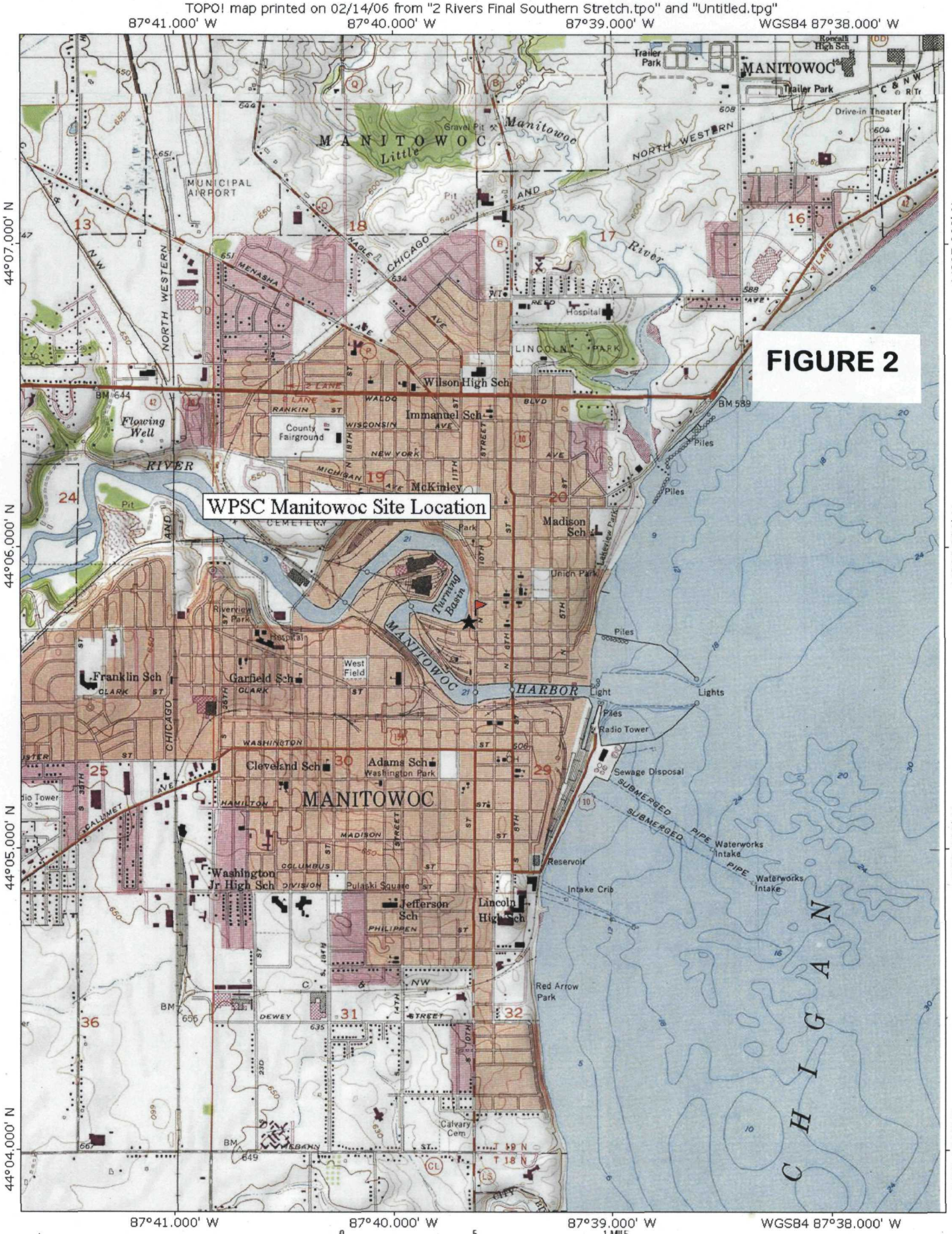
TOPO! map printed on 02/14/06 from "2 Rivers Final Southern Stretch.tpo" and "Untitled.tpg"



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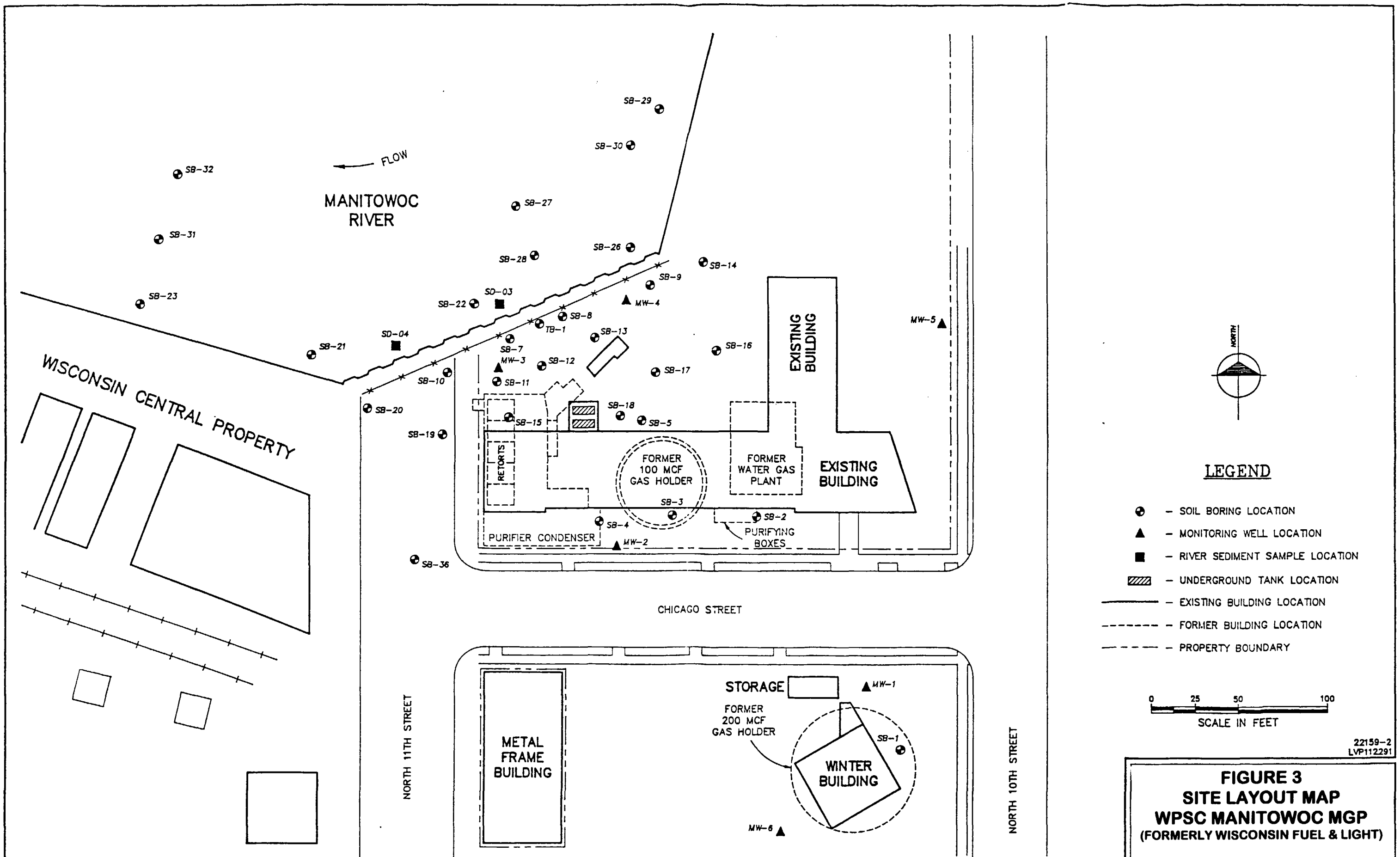


FIGURE 3
SITE LAYOUT MAP
WPSC MANITOWOC MGP
(FORMERLY WISCONSIN FUEL & LIGHT)

DECEMBER, 1991 22159

WW Engineering & Science, Inc.

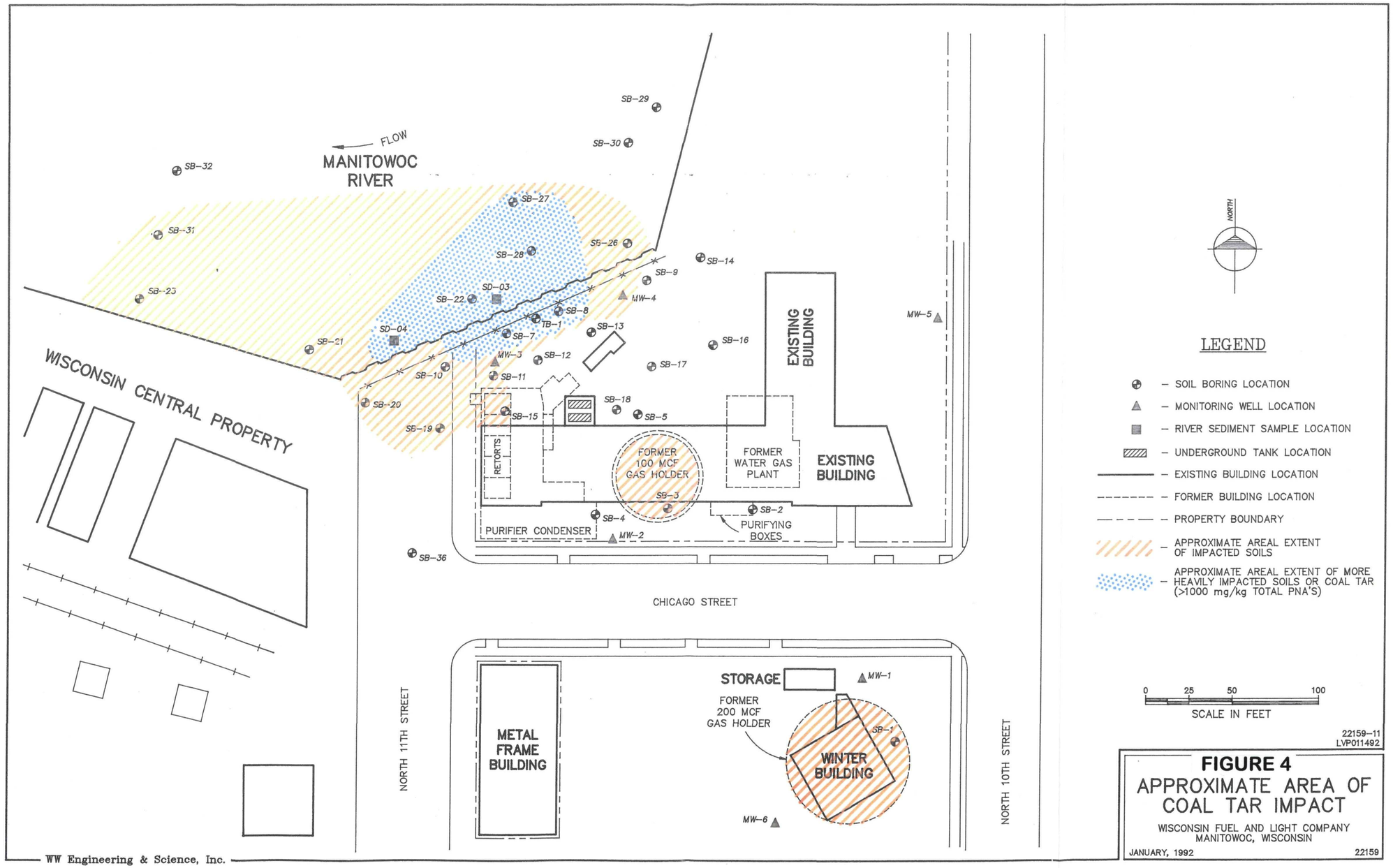


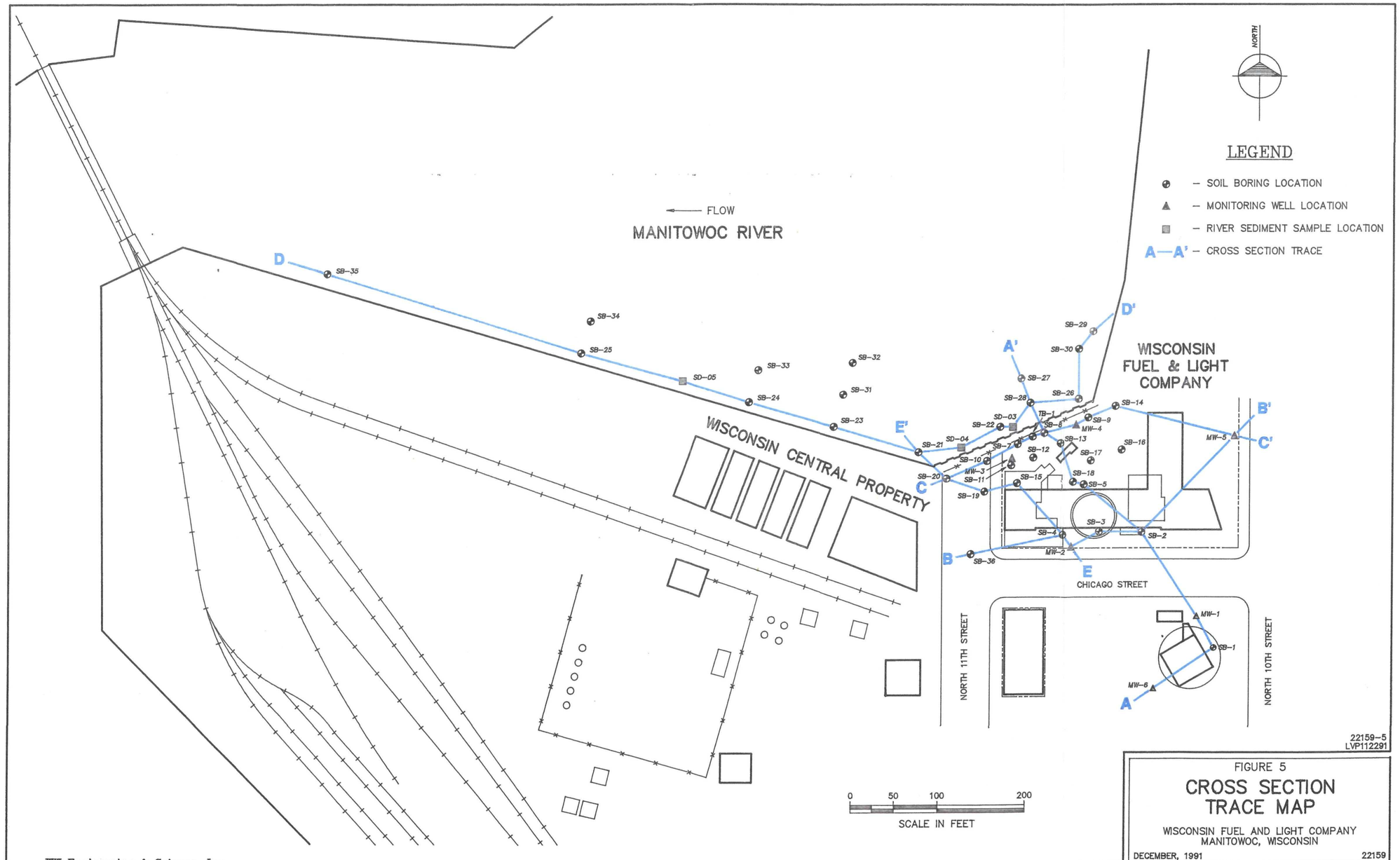
FIGURE 4

APPROXIMATE AREA OF COAL TAR IMPACT

WISCONSIN FUEL AND LIGHT COMPANY
MANITOWOC, WISCONSIN

JANUARY, 1992 22159

WW Engineering & Science, Inc.



22159-5
LVP112291

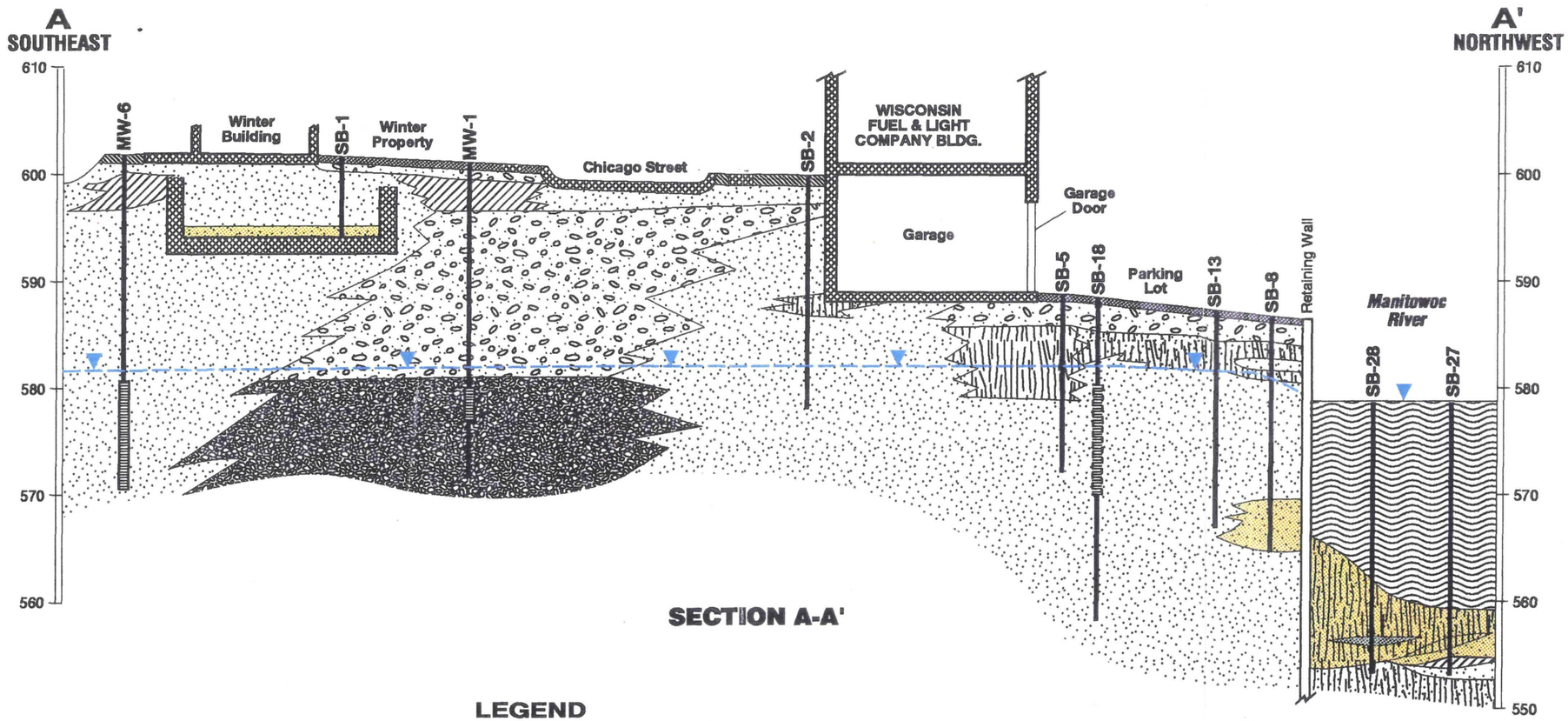
FIGURE 5

CROSS SECTION TRACE MAP

WISCONSIN FUEL AND LIGHT COMPANY
MANITOWOC, WISCONSIN

DECEMBER, 1991 22159

WW Engineering & Science, Inc.



SECTION A-A'

LEGEND

- Asphalt
- Concrete
- Topsoil
- Water
- Sand
- Clay
- Silt
- Gravel
- Silty Sand
- Sand & Gravel
- Coal Tar
- Coal Tar Impacted Soils
- Approximate Location of the Water Table
- Well Screen
- Temporary Well Screen

0 25 50 100

Horizontal Scale in Feet
Vertical Scale: 1" = 10'
Vertical Exaggeration: 4x

Figure 6

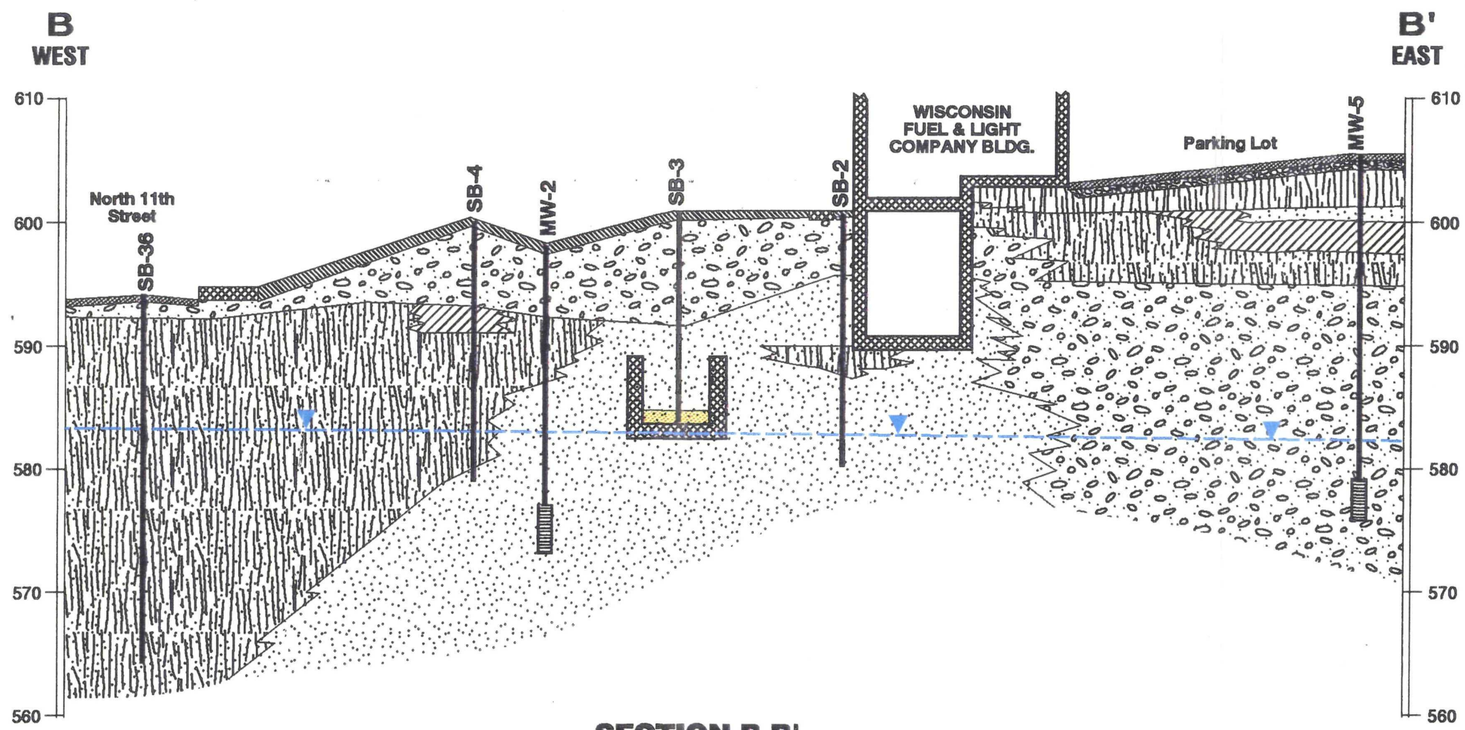
Cross Section A-A'

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin

December 1991 22159

WW Engineering & Science

22159/1261/03



SECTION B-B'

LEGEND

- Asphalt
- Concrete
- Topsoil
- Sand
- Clay
- Gravel
- Silty Sand
- Sand & Gravel
- Coal Tar Impacted Soils
- Approximate Location of the Water Table
- Well Screen

0 25 50 100

Horizontal Scale in Feet
Vertical Scale: 1" = 10'
Vertical Exaggeration: 4x

Figure 7

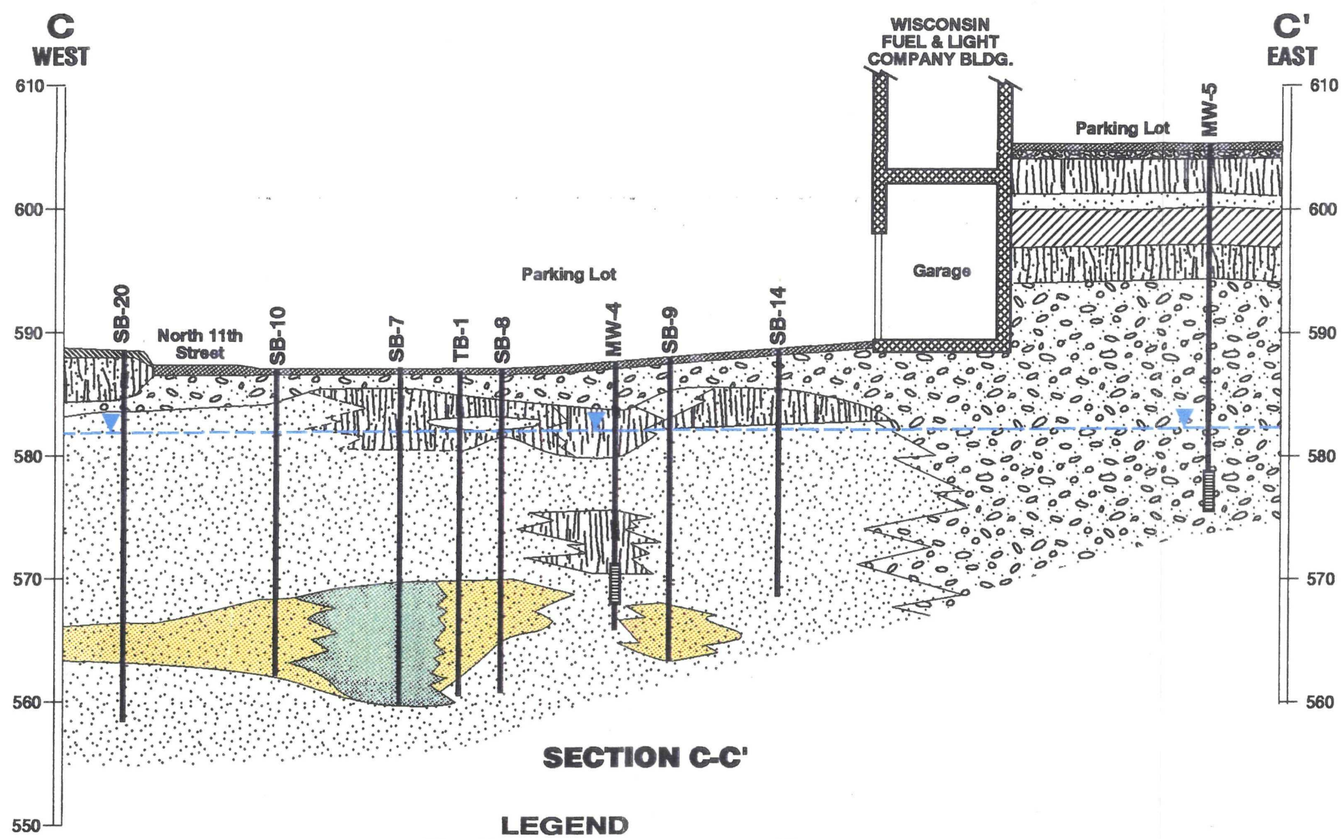
Cross Section B-B'

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin

December 1991 22159

WW Engineering & Science

22159/1291/03



SECTION C-C'

LEGEND

- Asphalt
- Concrete
- Topsoil
- Sand
- Clay
- Silt
- Gravel
- Silty Sand
- Sand & Gravel
- Coal Tar
- Coal Tar Impacted Soils
- Approximate Location of the Water Table
- Well Screen

0 25 50 100

Horizontal Scale in Feet
Vertical Scale: 1" = 10'
Vertical Exaggeration: 4x

Figure 8

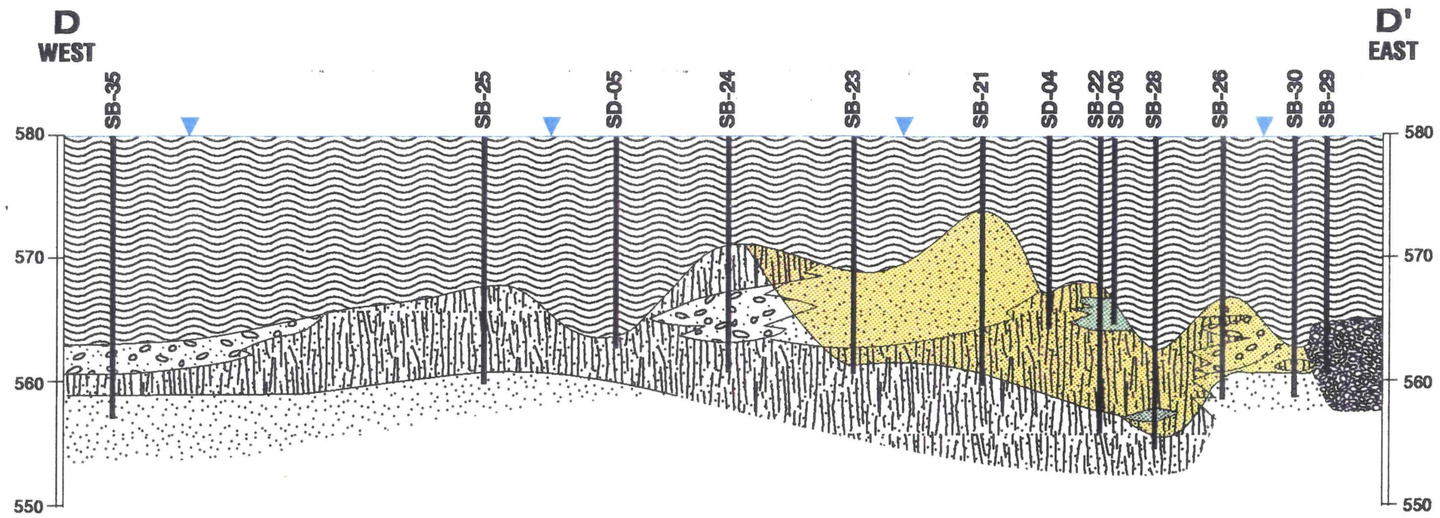
Cross Section C-C'

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin

December 1991 22159

WW Engineering & Science

22159/1291/C3



SECTION D-D'

LEGEND

- Sand
- Silt
- Water
- Gravel
- Silty Sand
- Sand & Gravel
- Coal Tar
- Coal Tar Impacted Soils
- Water Level of Manitowoc River

0 50 100 200

Horizontal Scale in Feet
Vertical Scale: 1" = 10'
Vertical Exaggeration: 10x

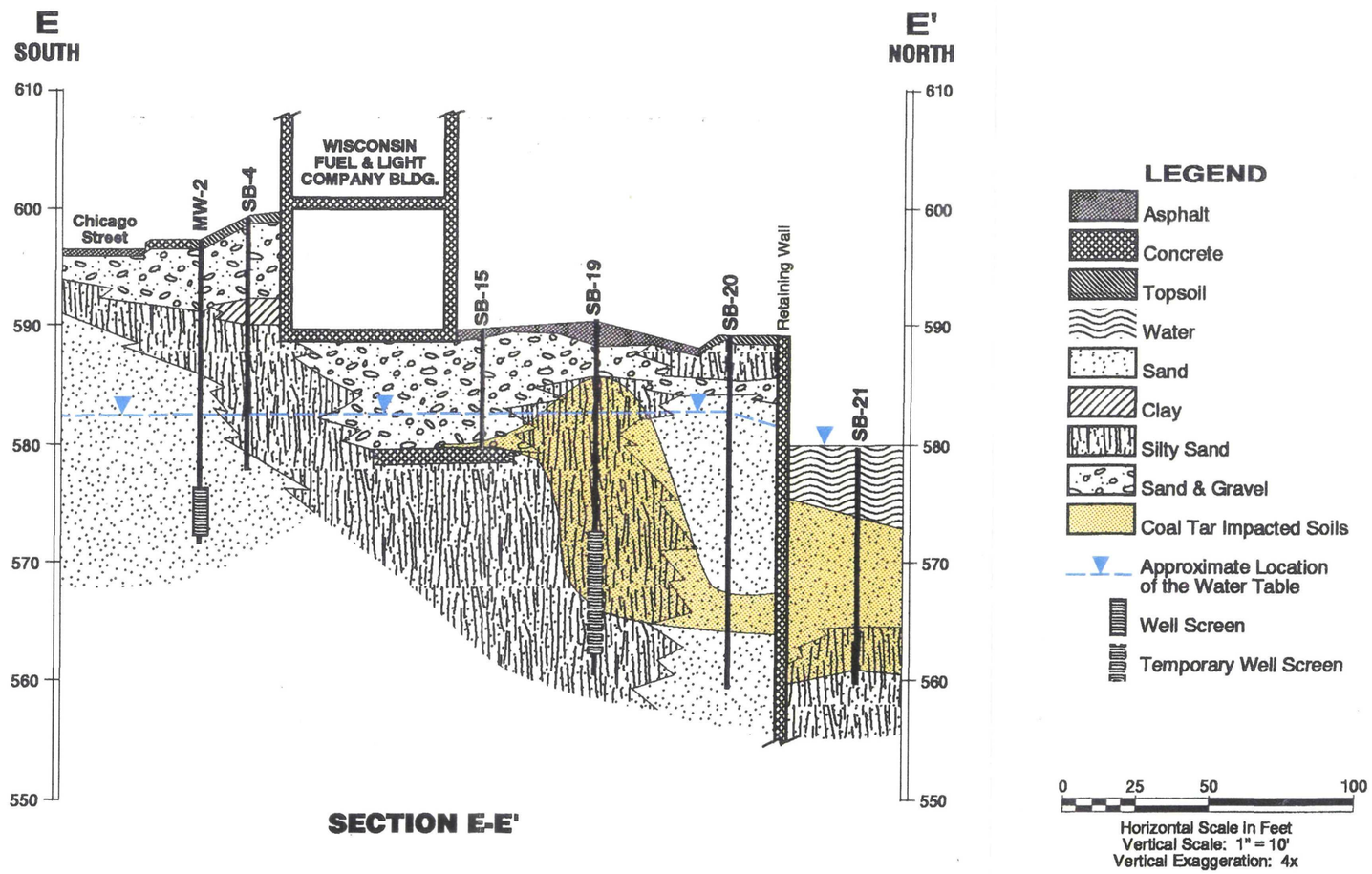
Figure 9

Cross Section D-D'

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin

December 1991 22159

WW Engineering & Science



SECTION E-E'

Figure 10

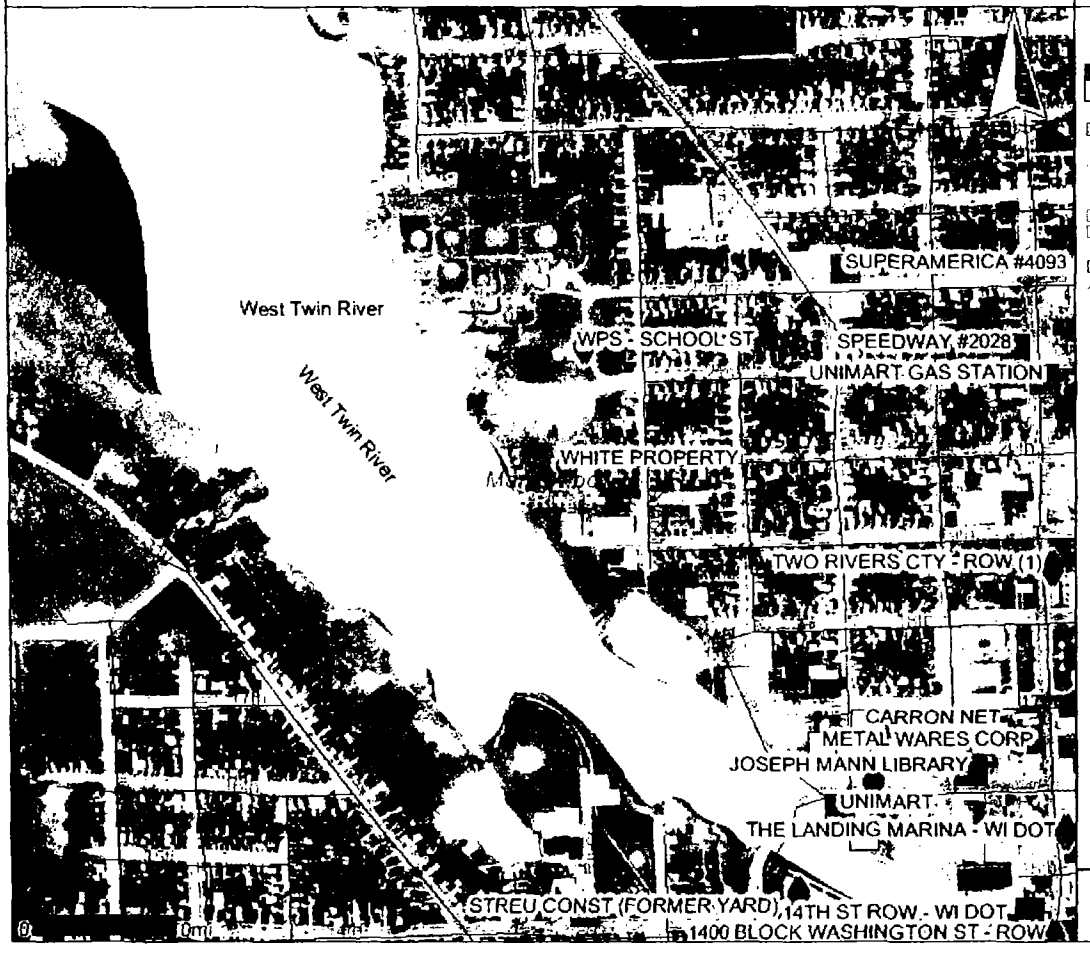
Cross Section E-E'

Wisconsin Fuel & Light Company
Manitowoc, Wisconsin

December 1991 22159

WW Engineering & Science

Two Rivers, WPS MGP vicinity



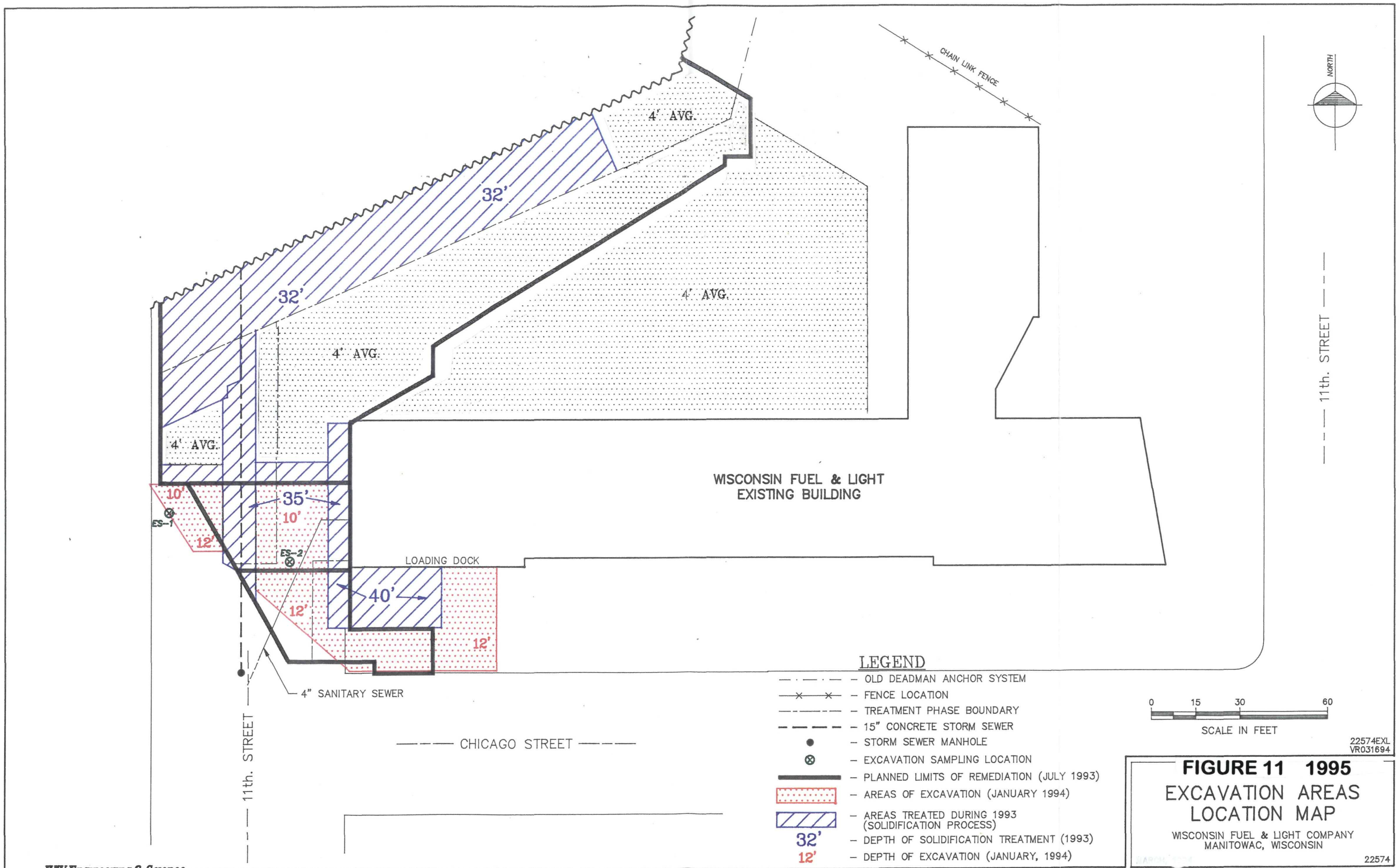
Legend

All activities
LUST open
ERP open
LUST closed
ERP closed
Target Activities
LUST open
ERP open
LUST closed
ERP closed
Great Lakes Region
LAKE MICHIGAN
LAKE SUPERIOR
MICHIGAN UPPER
County Boundary
Local Roads
Rivers and Streams
24K Open Water
Municipalities
Digital Air Photo

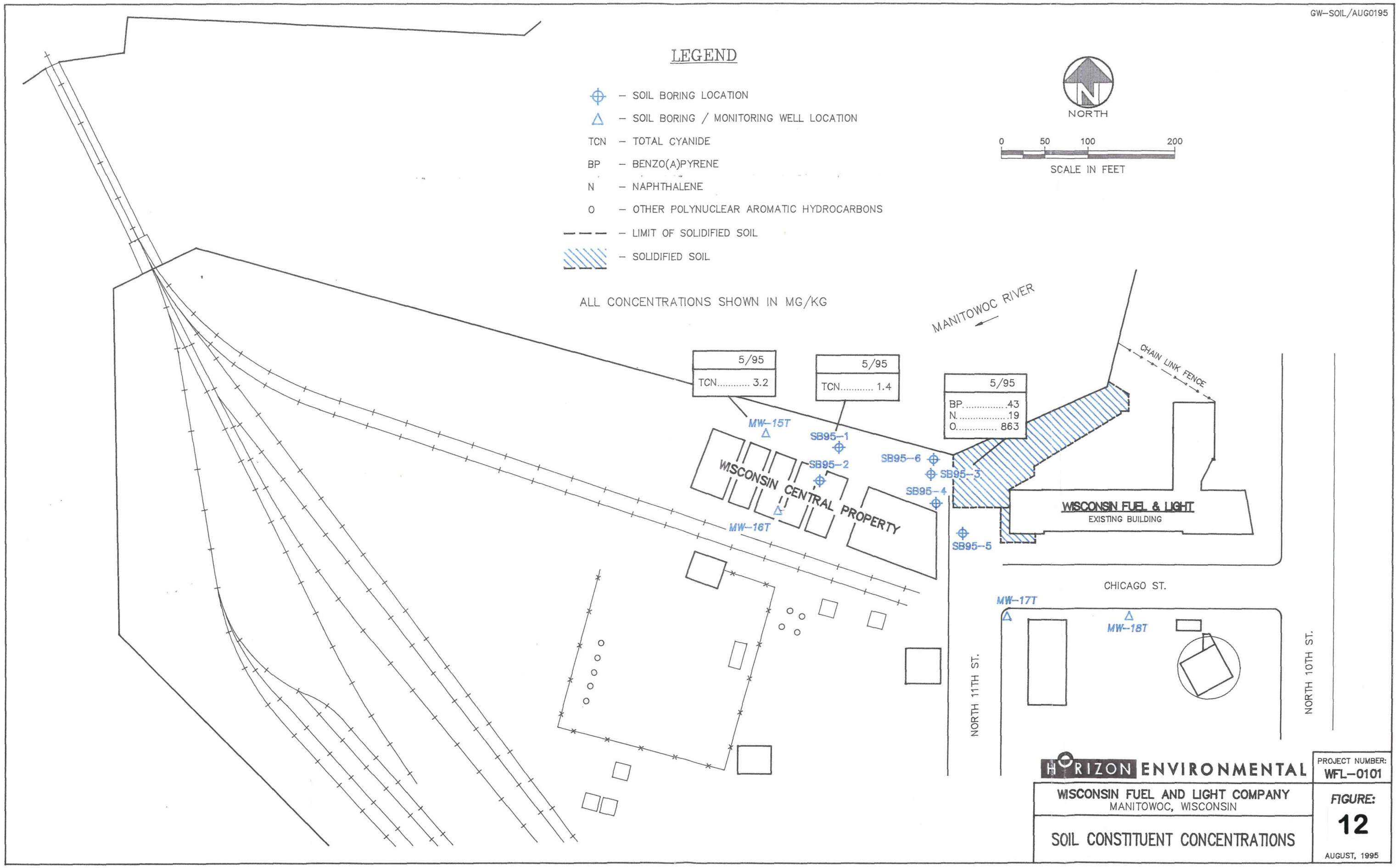
FIGURE 11

Scale: 1:7,463

DO NOT USE FOR NAVIGATION


CHAIN LINK FENCE
NORTH
4' AVG.
32'
32'
4' AVG.
4' AVG.
4' AVG.
4' AVG.
WISCONSIN FUEL & LIGHT
EXISTING BUILDING
11th. STREET
10'
35'
10'
ES-1
12'
ES-2
LOADING DOCK
40'
12'
12'
4" SANITARY SEWER
11th. STREET
CHICAGO STREET
LEGEND
OLD DEADMAN ANCHOR SYSTEM
FENCE LOCATION
TREATMENT PHASE BOUNDARY
15" CONCRETE STORM SEWER
STORM SEWER MANHOLE
EXCAVATION SAMPLING LOCATION
PLANNED LIMITS OF REMEDIATION (JULY 1993)
AREAS OF EXCAVATION (JANUARY 1994)
AREAS TREATED DURING 1993 (SOLIDIFICATION PROCESS)
32' DEPTH OF SOLIDIFICATION TREATMENT (1993)
12' DEPTH OF EXCAVATION (JANUARY, 1994)
0 15 30 60
SCALE IN FEET
22574EXL
VR031694
FIGURE 11 1995
EXCAVATION AREAS
LOCATION MAP
WISCONSIN FUEL & LIGHT COMPANY
MANITOWAC, WISCONSIN
22574
WW Engineering & Science

GW-SOIL/AUG0195



HORIZON ENVIRONMENTAL

PROJECT NUMBER: WFL-0101

WISCONSIN FUEL AND LIGHT COMPANY
MANITOWOC, WISCONSIN

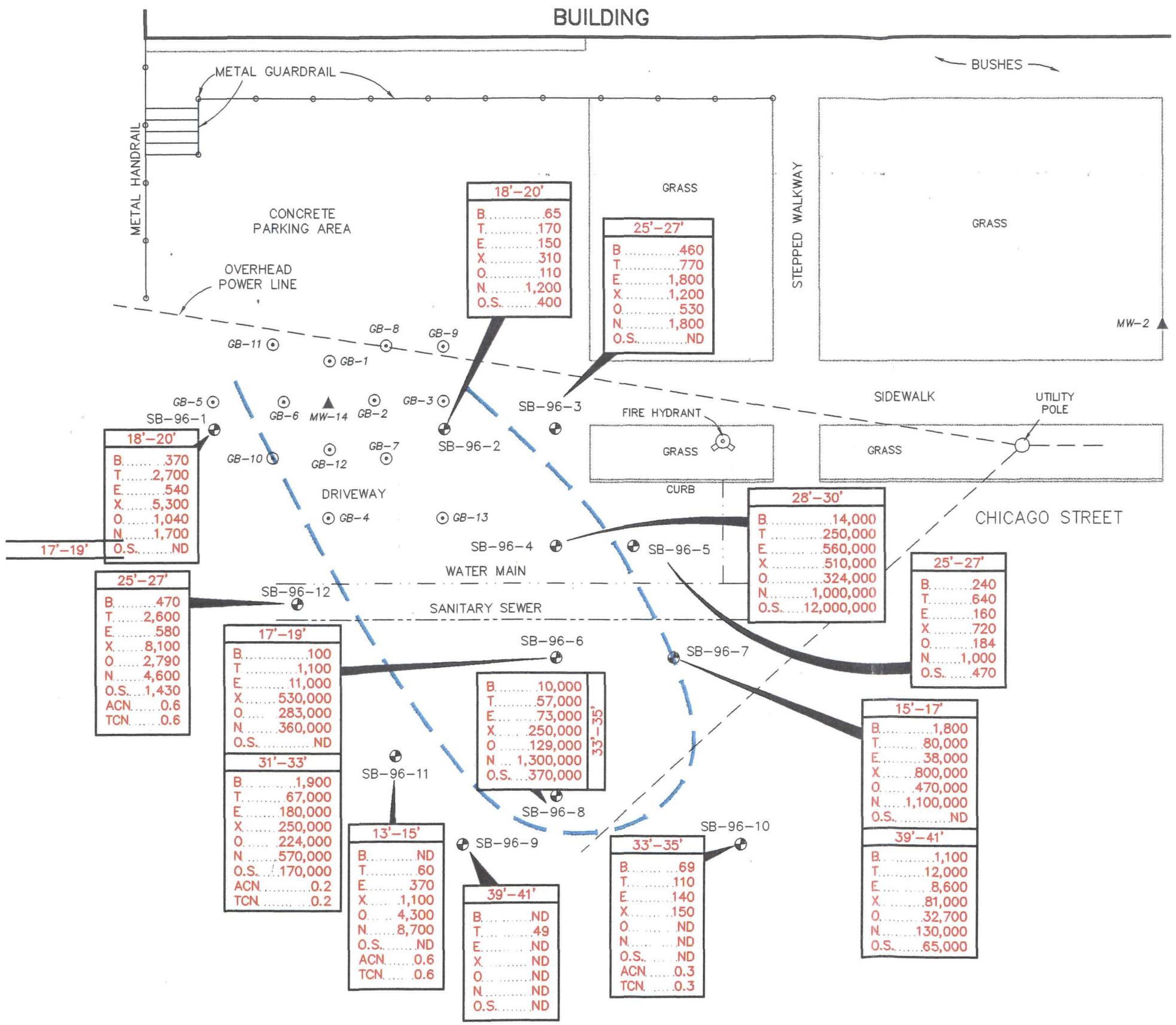
SOIL CONSTITUENT CONCENTRATIONS

FIGURE: 12

AUGUST, 1995

11-134
12-1

AN-SOIL/NOV0796



NORTH

LEGEND

▲ – MONITORING WELL LOCATION

⊙ – GEOPROBE BORING LOCATION

◐ – SOIL BORING LOCATION

– – – – HORIZONTAL EXTENT OF PRODUCT

B – BENZENE
T – TOLUENE
E – ETHYLBENZENE
X – XYLENE
O – 1,2,4-TRIMETHYLBENZENE & 1,3,5-TRIMETHYLBENZENE
N – NAPHTHALENE
O.S. – OTHER SOIL CONSTITUENTS
ACN – AMENABLE CYANIDE
TCN – TOTAL CYANIDE

ALL CONCENTRATIONS IN ug/kg

0 5 10 20

SCALE IN FEET

HORIZON ENVIRONMENTAL

PROJECT NUMBER: WFL-0105

WISCONSIN FUEL & LIGHT COMPANY
MANITOWOC, WISCONSIN

FIGURE: 13

SOIL CONSTITUENT CONCENTRATIONS

NOVEMBER, 1996

0109GW1/APR2498
11-5
12-4

NORTH

MANITOWOC RIVER
(581.18)

CHAIN LINK FENCE

582.0
582.5
583.0
583.1
583.2
583.3

MW-8
(583.11)

MW-5
(583.32)

MW-9
(583.07)

MW-7
(583.20)

MW-10
(583.11)

MW-11
(582.84)

MW-15T
(NM)

WISCONSIN CENTRAL PROPERTY

(NM)
MW-16T

(580.28)
MW-12D
(580.89) MW-12
(575.35) PW-1

MW-13
(581.81)

580
581

WISCONSIN FUEL & LIGHT
EXISTING BUILDING

NORTH 10TH ST.

NORTH 11TH ST.

(582.20)
MW-14

MW-2
(583.16)

MW-21T
(583.10)

CHICAGO ST.

MW-19T
(581.91)

MW-17T
(582.11)

MW-20T
(582.93)

MW-18T
(583.12)

STORAGE

MW-1
(583.11)

MW-6
(583.26)

LEGEND

- PURGE WELL LOCATION
- MONITORING WELL LOCATION
- LIMIT OF SOLIDIFIED SOIL
- SOLIDIFIED SOIL
- 583.1 — GROUND WATER CONTOUR IN FEET
- (583.11) — GROUND WATER ELEVATION IN FEET
- (NM) — NOT MEASURED
- GROUND WATER FLOW DIRECTION

ALL ELEVATIONS IN FEET
RELATIVE TO NGVD.

0 25 50 100
SCALE IN FEET

HORIZON ENVIRONMENTAL

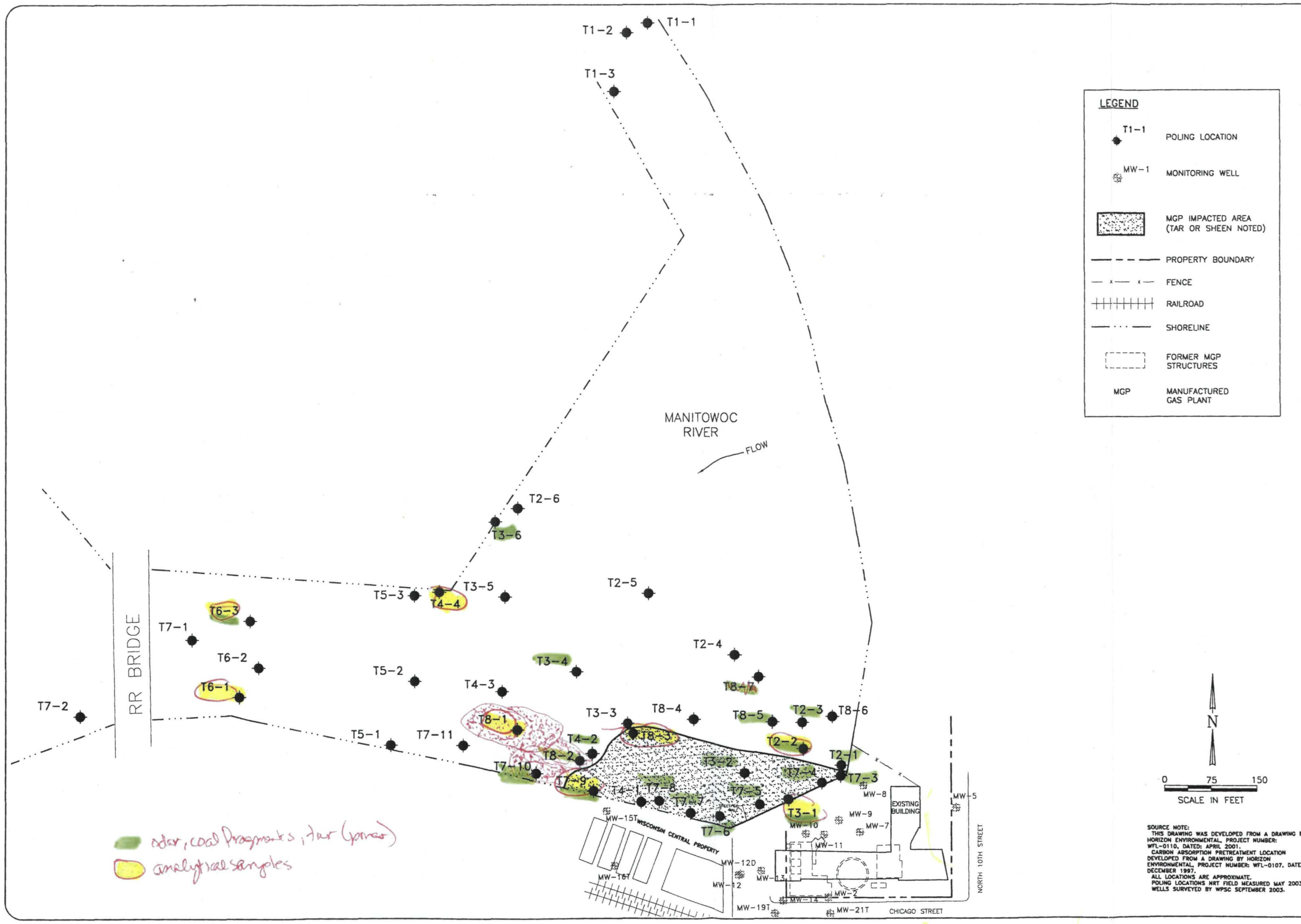
WISCONSIN FUEL & LIGHT COMPANY
MANITOWOC, WISCONSIN

GROUND WATER ELEVATIONS
(MEASURED 4/13/98)

PROJECT NUMBER:
WFL-0109

FIGURE:
14

APRIL, 1998



SOURCE NOTE:
THIS DRAWING WAS DEVELOPED FROM A DRAWING BY HORIZON ENVIRONMENTAL, PROJECT NUMBER: WFL-0110, DATED: APRIL 2001;
CARBON ABSORPTION PRETREATMENT LOCATION DEVELOPED FROM A DRAWING BY HORIZON ENVIRONMENTAL, PROJECT NUMBER: WFL-0107, DATED DECEMBER 1997.
ALL LOCATIONS ARE APPROXIMATE.
POLING LOCATIONS WRT FIELD MEASURED MAY 2003.
WELLS SURVEYED BY WPSC SEPTEMBER 2003.

DRAWN BY: TAS/RLH	DATE: 09/29/03	
CHECKED BY: JTB	DATE: 10/07/03	
APPROVED BY: RGF	DATE: 10/14/03	
XREF FILE: NONE		

SEDIMENT SAMPLE LOCATIONS MAY 2003

FORMER WISCONSIN FUEL AND LIGHT COMPANY MGP SITE
WISCONSIN PUBLIC SERVICE CORPORATION
MANITOWOC, WISCONSIN

Natural Resource Technology

PROJECT NO. 1530/3.1SED

DRAWING NO. 1530-31-B01

FIGURE 15

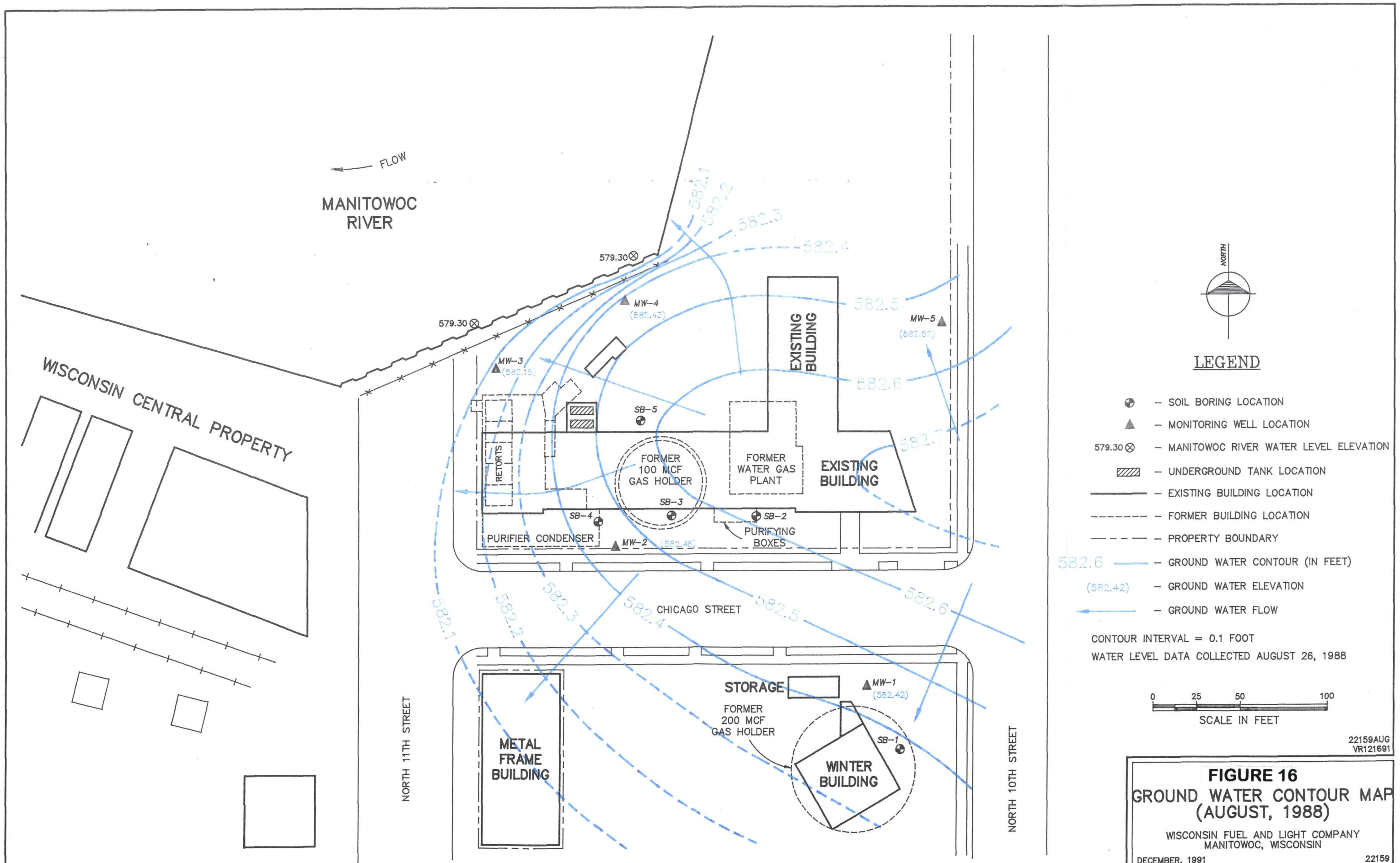


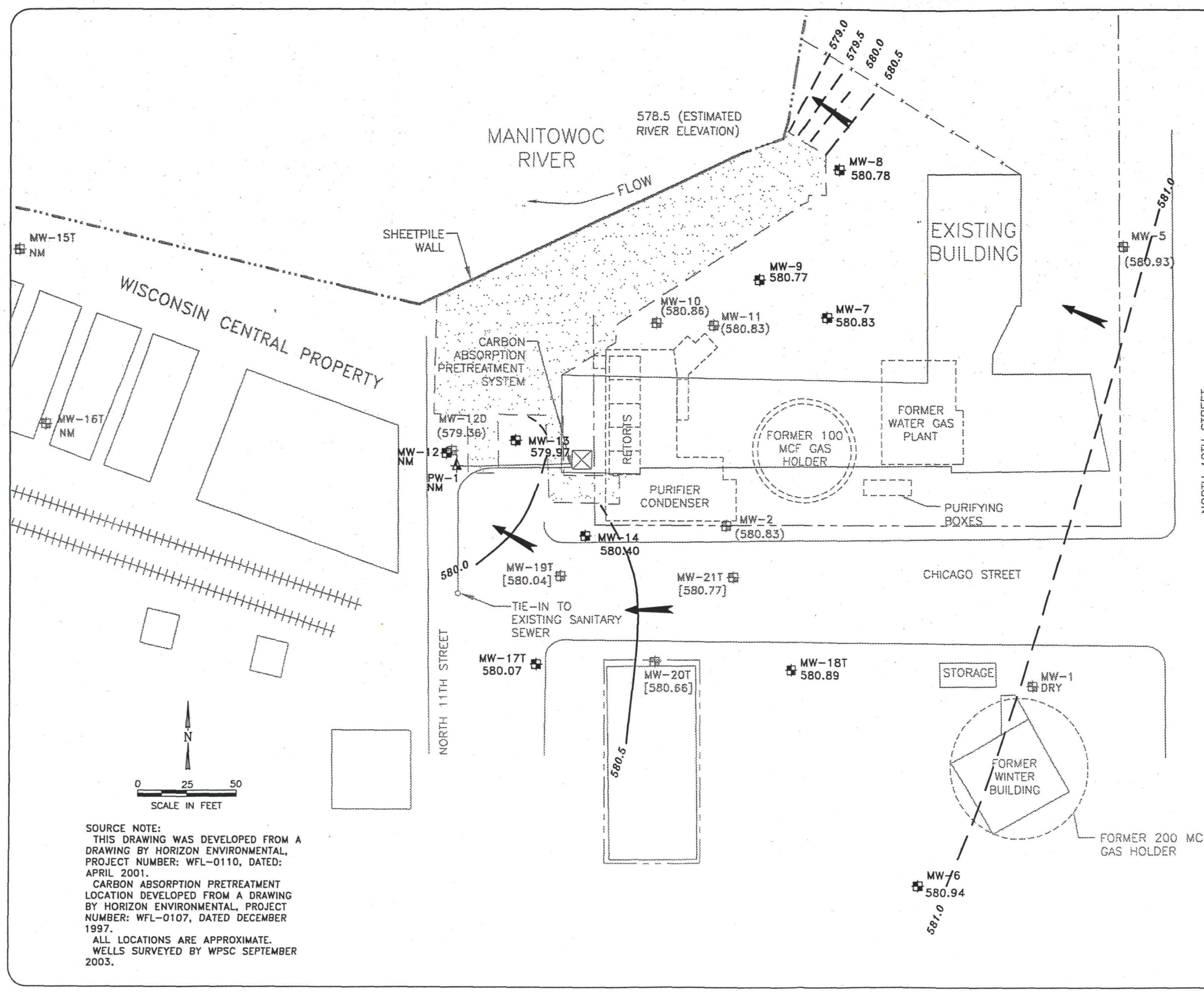
FIGURE 16

GROUND WATER CONTOUR MAP (AUGUST, 1988)

WISCONSIN FUEL AND LIGHT COMPANY
MANITOWOC, WISCONSIN

DECEMBER, 1991 22159

WW Engineering & Science, Inc.



SOURCE NOTE:
THIS DRAWING WAS DEVELOPED FROM A DRAWING BY HORIZON ENVIRONMENTAL, PROJECT NUMBER: WFL-0110, DATED: APRIL 2001.
CARBON ABSORPTION PRETREATMENT LOCATION DEVELOPED FROM A DRAWING BY HORIZON ENVIRONMENTAL, PROJECT NUMBER: WFL-0107, DATED DECEMBER 1997.
ALL LOCATIONS ARE APPROXIMATE.
WELLS SURVEYED BY WPSC SEPTEMBER 2003.

LEGEND

579.0	GROUNDWATER CONTOUR (0.5 FT INTERNAL)
	GROUNDWATER FLOW DIRECTION
MW-7 580.83	MONITORING WELL AND WATER LEVEL ELEVATION (FT.)
PW-1 NM	PUMPING WELL AND WATER LEVEL ELEVATION (FEET)
[580.77]	PIEZOMETRIC SURFACE ELEVATION
(580.86)	WATER TABLE MONITORING WELL WITH GROUNDWATER ELEVATION ABOVE SCREEN. ELEVATION WAS NOT USED TO DEVELOP SHALLOW GROUNDWATER ELEVATION CONTOURS
NM	NOT MEASURED
	PROPERTY BOUNDARY
	FENCE
	SHORELINE
	FORMER MGP STRUCTURES
	STABILIZED AREA (1994 REMEDIATION)
MGP	MANUFACTURED GAS PLANT
MCF	MILLION CUBIC FEET

NOTE:
1. WATER ELEVATIONS FROM PIEZOMETERS AND WATER TABLE ELEVATIONS ABOVE THE TOP OF THE WELL SCREEN WERE NOT USED TO DEVELOP WATER TABLE CONTOURS. WATER ELEVATIONS NOT UTILIZED ARE DESIGNATED AS SHOWN IN THE LEGEND.
2. GROUNDWATER ELEVATION AT PW-1 AND MW-12 COULD NOT BE MEASURED ON MAY 15, 2003 AS THE WELLS WERE ASPHALTED OVER.

DRAWN BY: TAS	DATE: 09/26/03	
CHECKED BY: RJC	DATE: 09/26/03	
APPROVED BY: JAZ	DATE: 10/07/03	
CAD FILE: 1530-21-B09.DWG		
REF FILE: NONE		

WATER TABLE ELEVATION CONTOURS MAY 15, 2003

FORMER WISCONSIN FUEL AND LIGHT COMPANY MGP SITE
WISCONSIN PUBLIC SERVICE CORPORATION
MANITOWOC, WISCONSIN

Natural Resource Technology

PROJECT NO. 1530/2.1GW

FIGURE NO. 17

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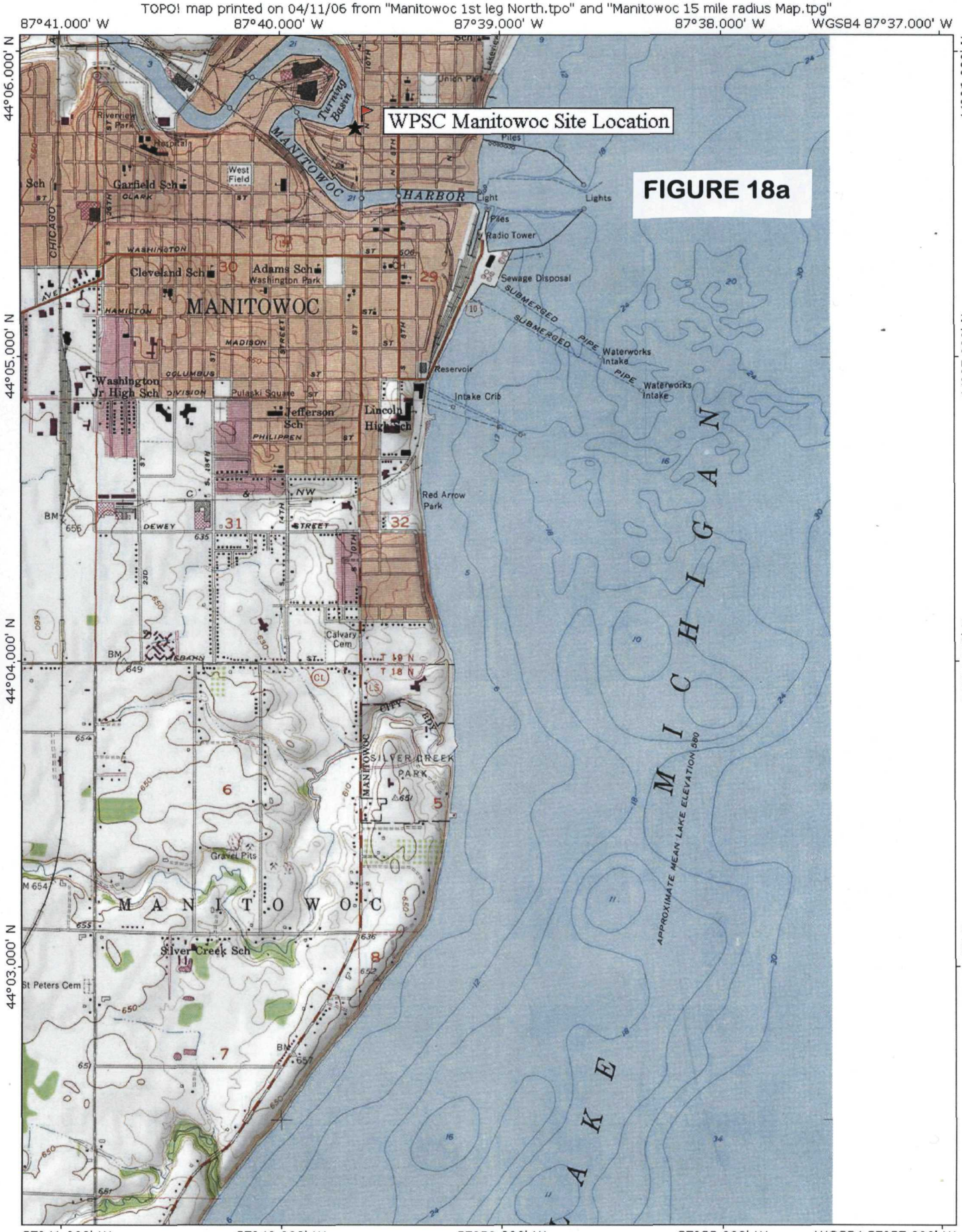

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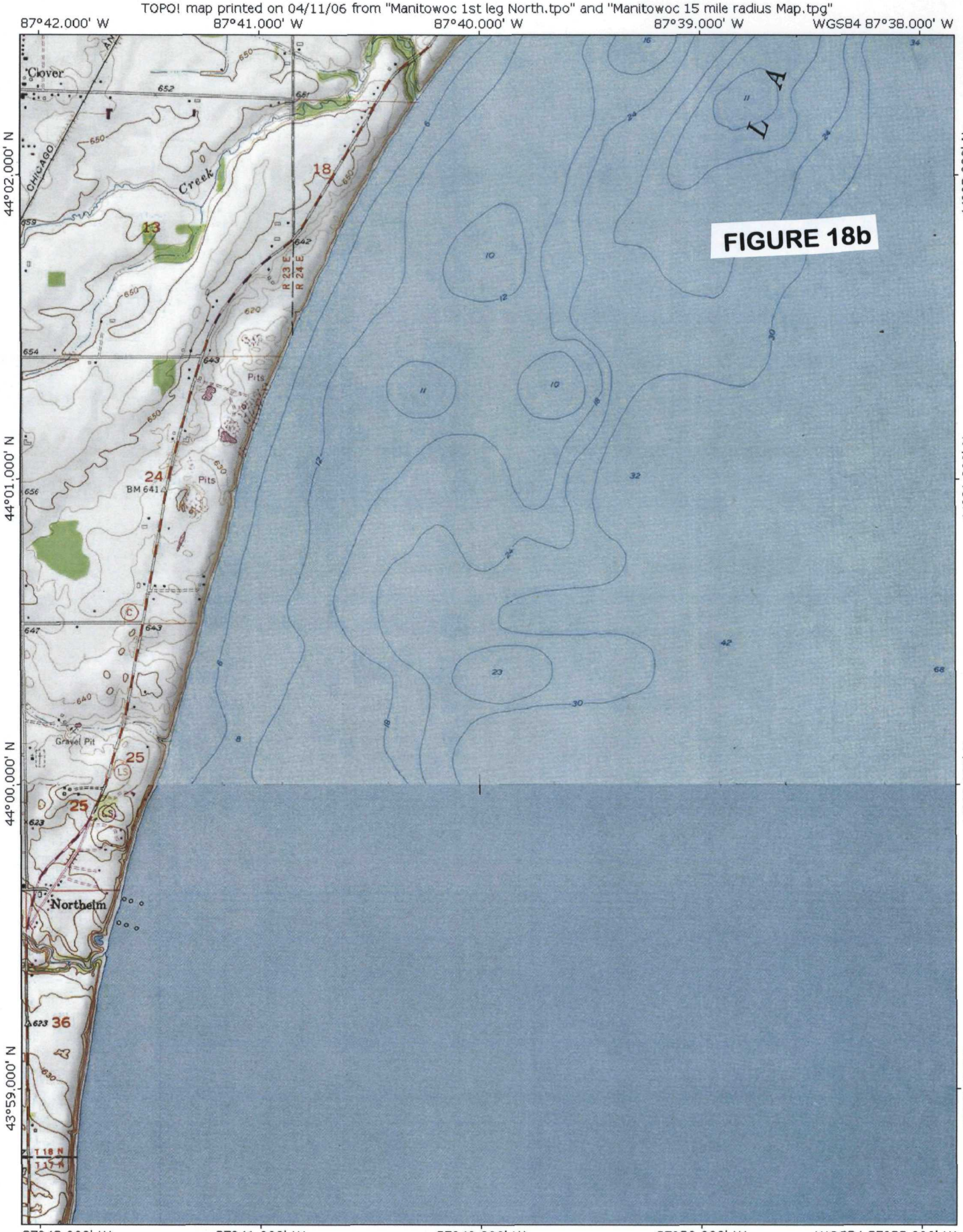

MN TN
3½°

0 .5 1 MILE
0 1000 FEET 0 500 1000 METERS

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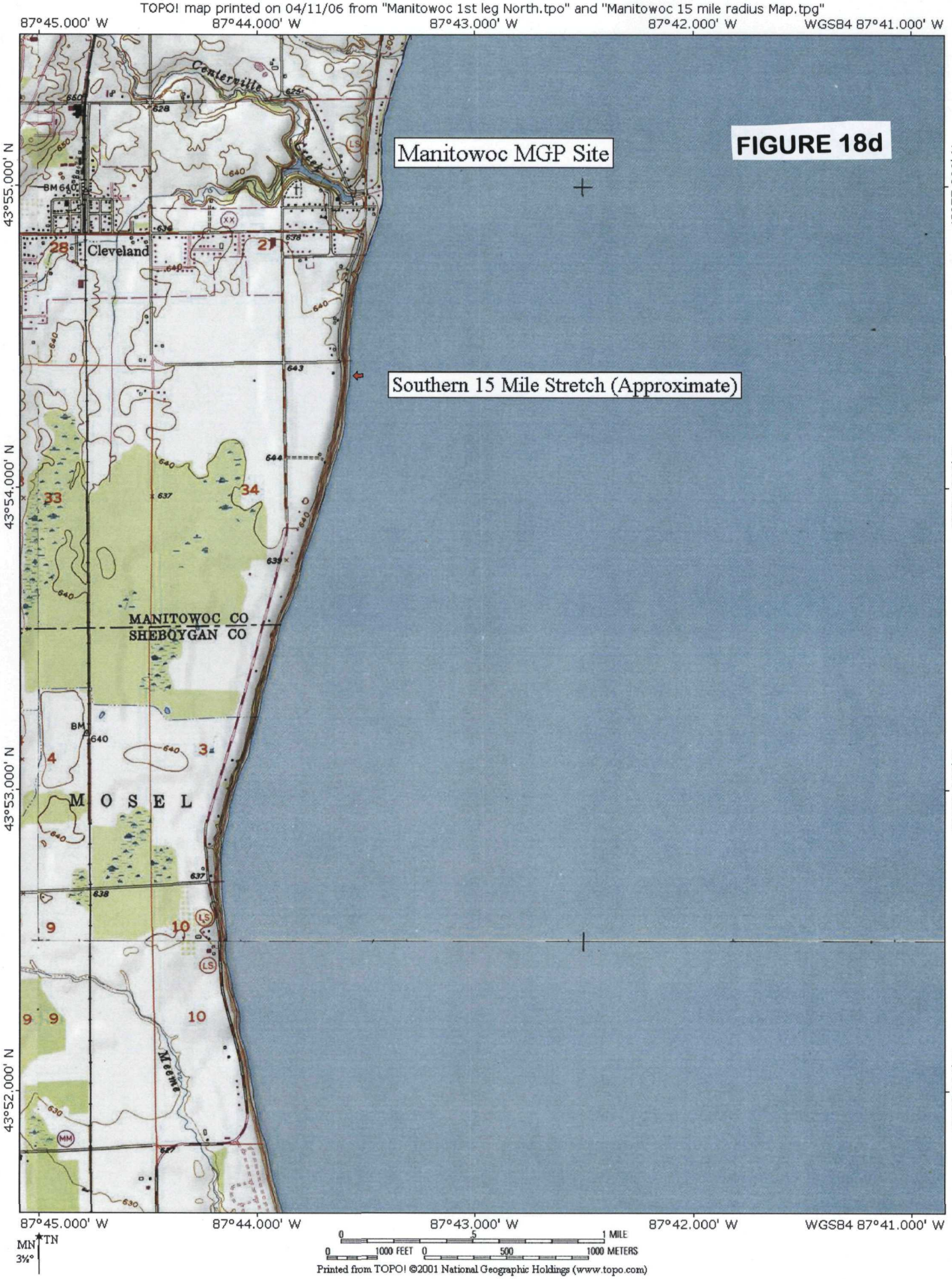
TOPO! map printed on 04/11/06 from "Manitowoc 1st leg North.tpo" and "Manitowoc 15 mile radius Map.tpg"



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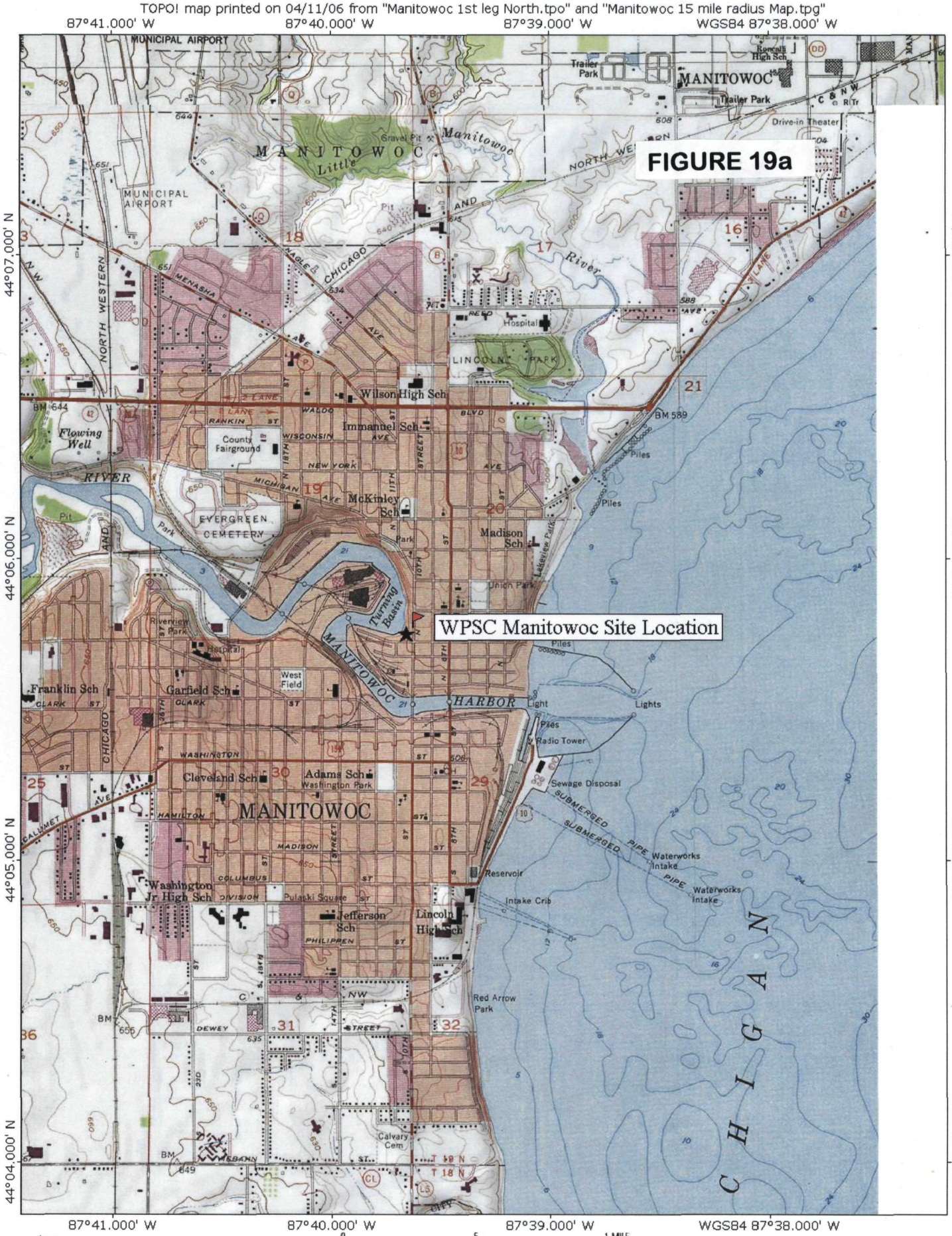
TOPO! map printed on 04/11/06 from "Manitowoc 1st leg North.tpo" and "Manitowoc 15 mile radius Map.tpg"



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TOPO! map printed on 04/11/06 from "Manitowoc 1st leg North.tpo" and "Manitowoc 15 mile radius Map.tpg"

87°37.000' W 87°36.000' W 87°35.000' W WGS84 87°34.000' W

87°37.000' W 87°36.000' W 87°35.000' W WGS84 87°34.000' W

MN TN 4°

0 5 1 MILE

0 1000 FEET 0 500 1000 METERS

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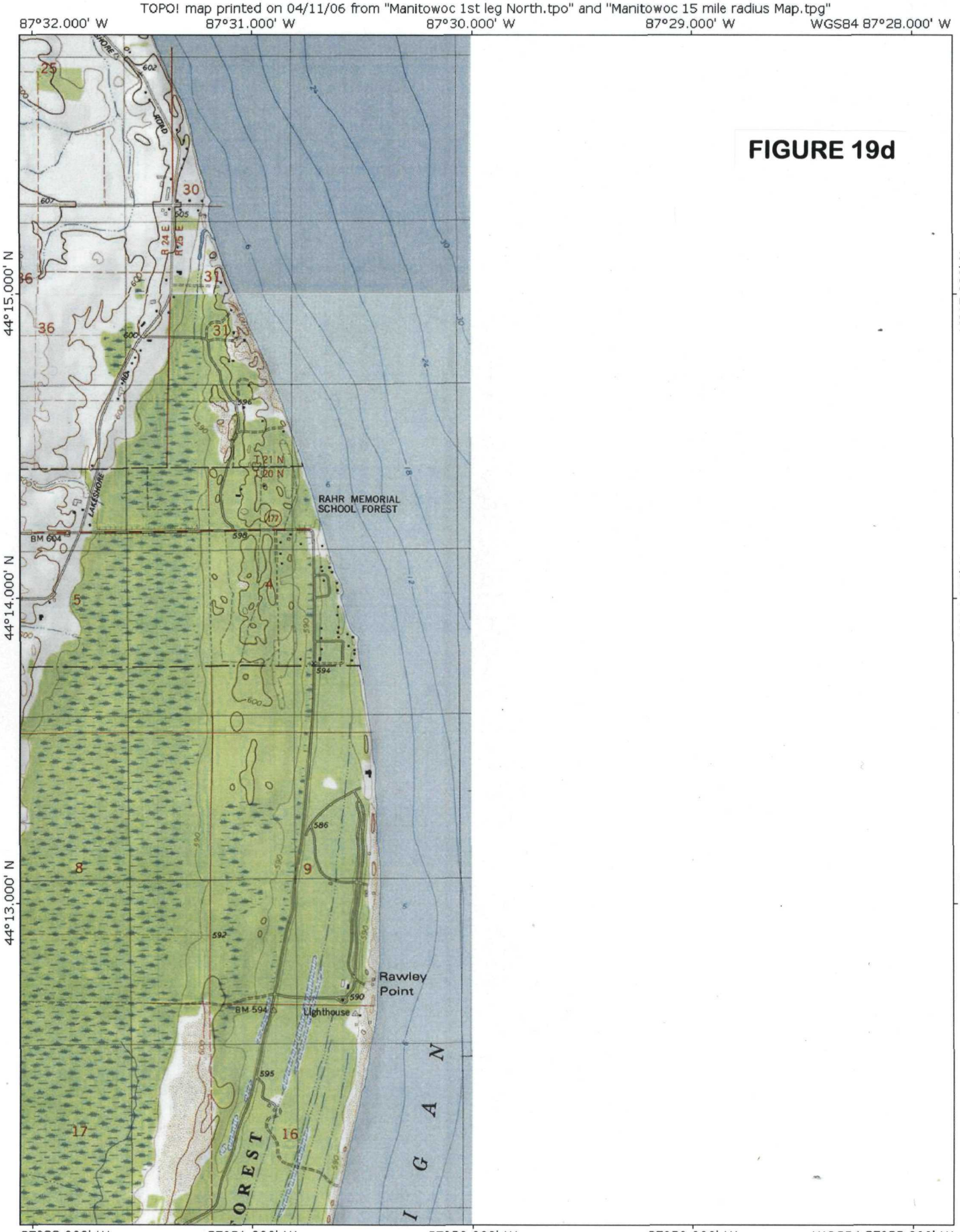
TOPO! map printed on 04/11/06 from "Manitowoc 1st leg North.tpo" and "Manitowoc 15 mile radius Map.tpg"



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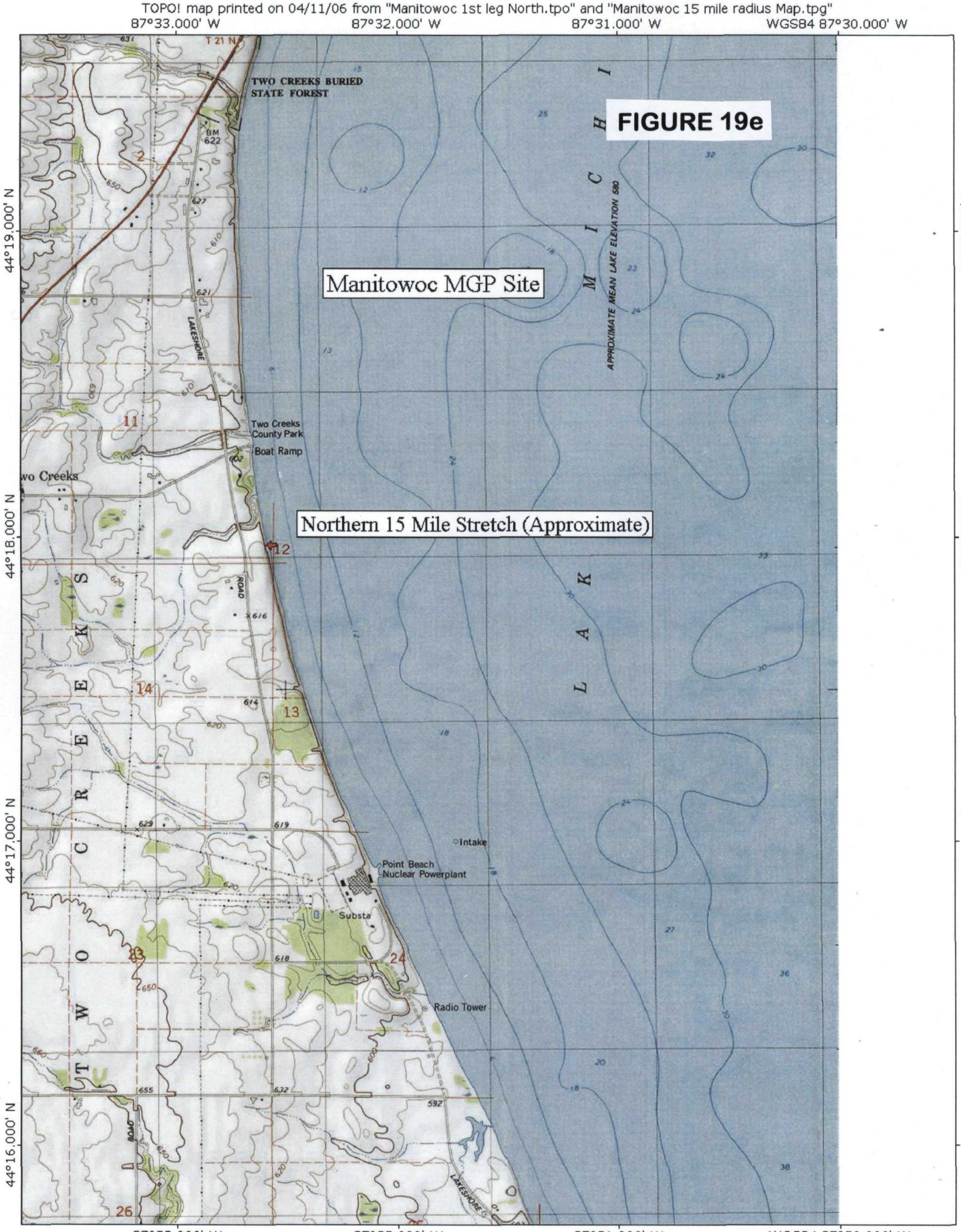

MN TN
4°

0 1000 FEET 0 500 1000 METERS

0 .5 1 MILE

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WDNR RR Sites Map - WPSC Manitowoc MGP site

Legend

All activities
LUST open
ERP open
LUST closed
ERP closed
Larger Activities
LUST open
ERP open
LUST closed
ERP closed
Great Lakes Region
LAKE MICHIGAN
LAKE SUPERIOR
MICHIGAN-UPPER
County Boundary
Local Roads
Rivers and Streams
24K Open Water
Municipalities
Digital Air Photo

Figure 20

Scale: 1:6,213

DO NOT USE FOR NAVIGATION

PHOTOGRAPHS

2006	WPSC building and north residential properties "Winter Building" Properties to the south and east of the WPSC building Sign on River retaining wall warning of presence of oil or tar substances Lower parking lot ((MecTool ™ – remediated area) East side of WPSC building and lower parking lot "Experimental" booms along retaining wall
2003	Oil "sheens" observed on Manitowoc River
1993	MecTool ™ in-situ solidification Demonstration

Wisconsin Public Service Corporation
402 North 10th Street, Manitowoc WI
May 25, 2006
Photos by A. Weissbach

↑View west/northwest of the existing WPS building on North 10th Street. Residential properties begin north of the upper parking lot to the north of the building

View of "Winter Building" on the southwest corner of Chicago and N 10th Street. The building was built on top of a former 200 MCF (thousand cubic feet) gas holder with a one-foot layer of coal tar impacted soil on its concrete foundation at a depth of ~7 feet.

Wisconsin Public Service Corporation
402 North 10th Street, Manitowoc WI
May 25, 2006
Photos by A. Weissbach

View south: property on southeast corner of North 10th and Chicago Street.

View north: property on northeast corner of North 10th and Chicago Street.

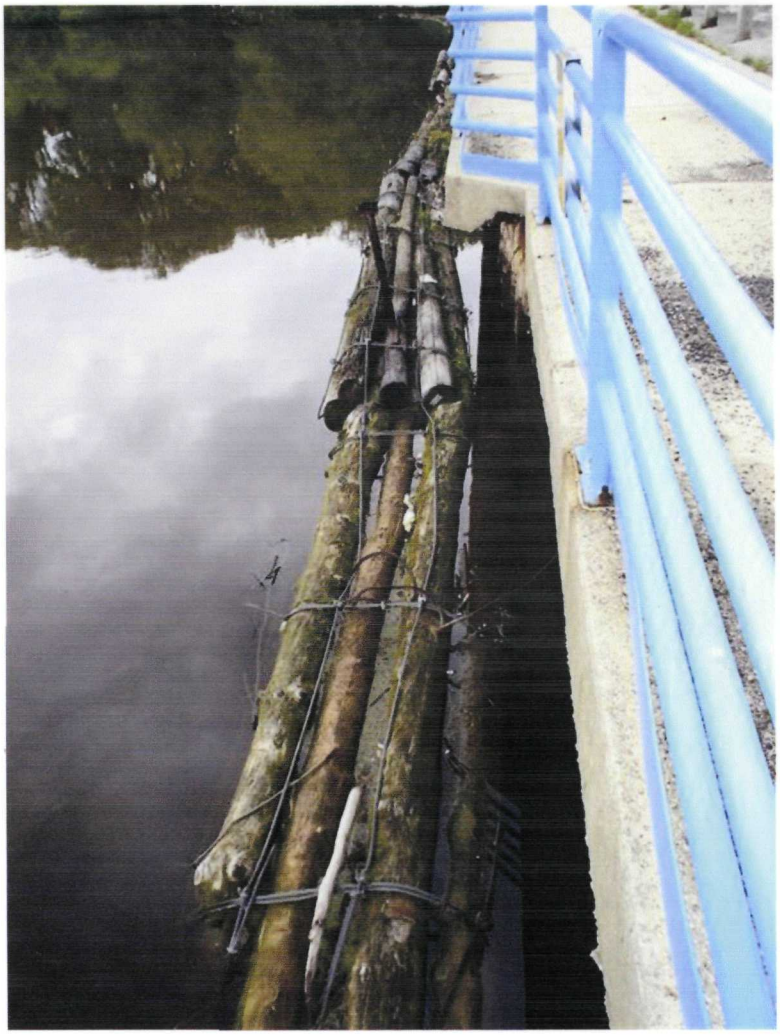
Wisconsin Public Service Corporation
402 North 10th Street, Manitowoc WI
May 25, 2006, Photos by A. Weissbach

View northwest – Manitowoc River/ Turning Basin
Sign posted at retaining wall: "Sediments contain Residuals from the operation of a Manufactured gas plant formerly located at this site.
Should oil or tar substance observed as a sheen on the water surface come into contact with skin, immediately wash off with soap and water."

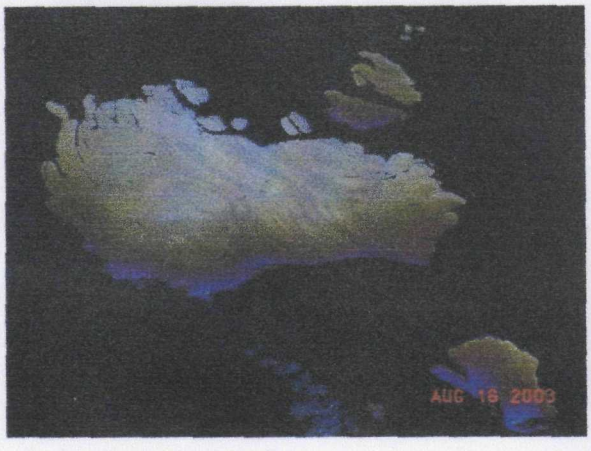
View east – rear of WPSC Building.
Lower parking lot and remediated area.
Refer to Figure 11 for description of types of remediation conducted in this are in 1993-1994.

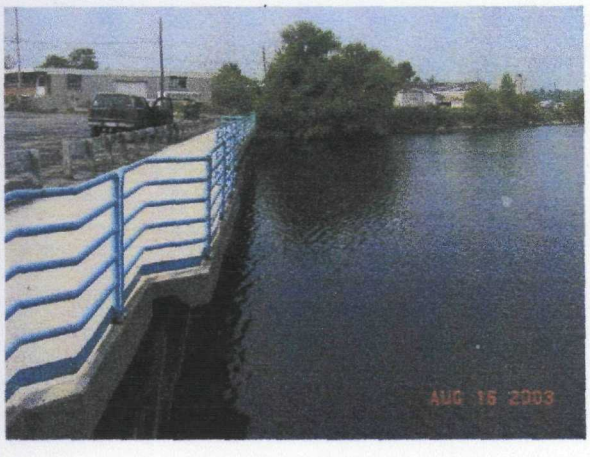
Wisconsin Public Service Corporation
402 North 10th Street, Manitowoc WI
May 25, 2006
Photos by A. Weissbach

View Southeast – east side of WPSC building



"Experimental" booms placed along retaining wall at WPSC Manitowoc site.

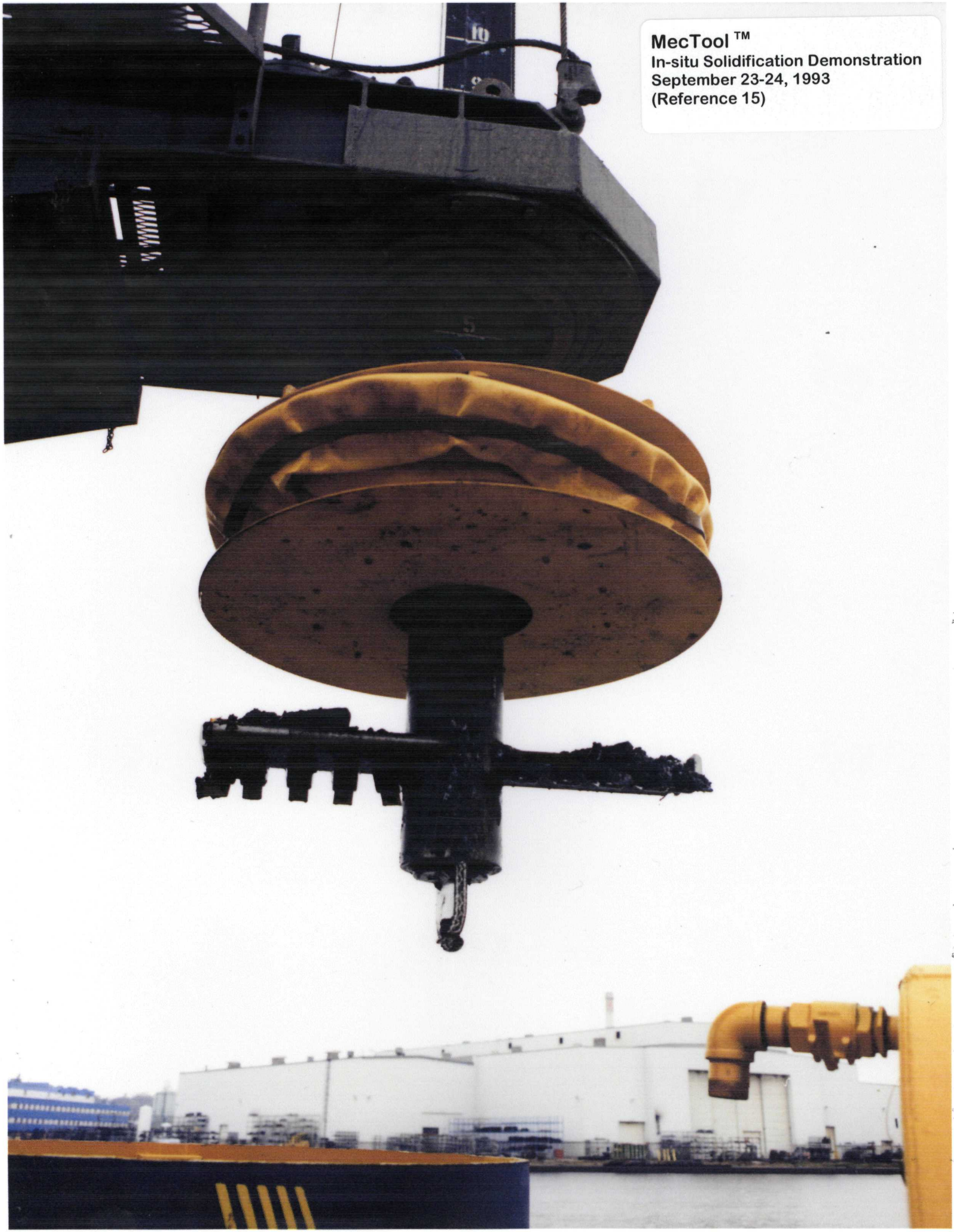




08-16-2003 Manitowoc River – Turning Basin near WPS Coal Tar Site
Photos by Ryan Volenberg

Oil Sheen (Reference 37)

MecTool ™
In-situ Solidification Demonstration
September 23-24, 1993
(Reference 15)
Manitowoc
MecTool



MecTool ™
In-situ Solidification Demonstration
September 23-24, 1993
(Reference 15)

MecTool ™
In-situ Solidification Demonstration
September 23-24, 1993
(Reference 15)
Manitowoc
Manitowoc