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PB96-964101
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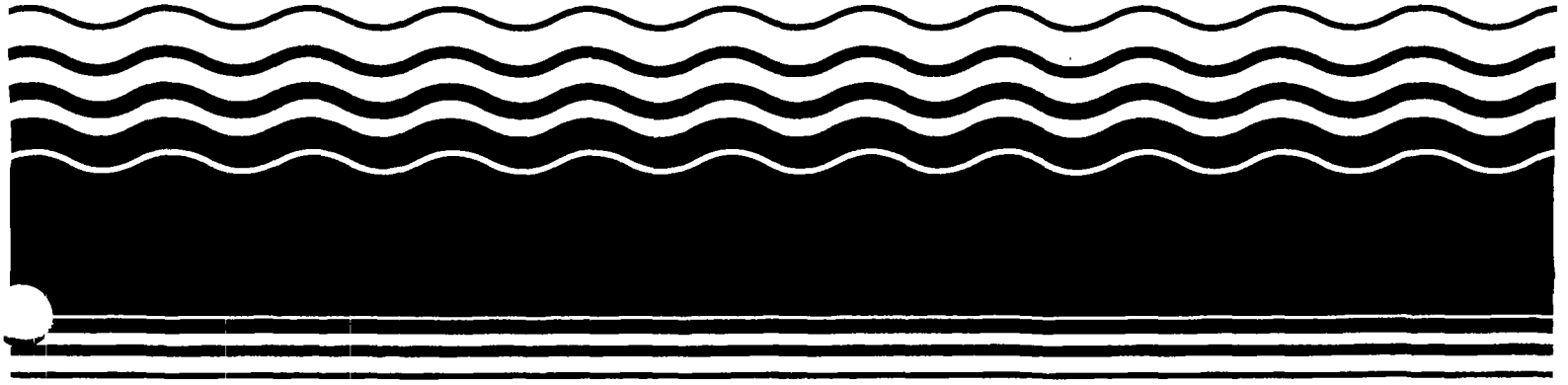
June 1996

EPA Superfund Record of Decision:

Lauer 1 Sanitary Landfill, (Boundary Road), Menomonee Falls, WI 3/11/1996



RECORD OF DECISION DECLARATION
FINAL REMEDIAL ACTION

Boundary Road Landfill (f/k/a Lauer 1 Landfill)
Menomonee Falls, WI

Site Name and Location

The Boundary Road Landfill (formerly known as the Lauer 1 Landfill) is located in the northeastern portion of the Village of Menomonee Falls. The site address is W124 N8925 Boundary Road and the section location is the SE¼ of Section 1, Tn8N, R20E. The site occupies approximately 58 acres of a 75 acre tract of land. The site is situated in an urbanizing area, with mixed surrounding land uses, including some residential, industrial and agricultural uses.

Statement of Basis and Purpose

This decision document represents the selected final remedial action for the Boundary Road site. This action was developed pursuant to section 144.442, Wis. Stats., the Environmental Repair Contract #SF-90-01 entered into by Waste Management of Wisconsin, Inc. (WMWI) and the Department of Natural Resources (the Department) and is consistent with and in substantial compliance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Contingency Plan (NCP). This decision is based on the administrative record for the site.

The U.S. EPA concurs with the selected final action. U.S. EPA's letter of concurrence is attached to this Record of Decision (ROD).

Assessment of the Site

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the remedial action selected in this Record of Decision, may present an imminent and substantial danger to public health, welfare, or the environment.

Description of the Remedy

The selected remedy, Alternative 3, includes:

- Construction of a new multi-layer soil cover system over the landfill
- Installation of leachate extraction measures in the northeastern portion of the site
- Installation of an active landfill gas extraction system
- Construction of a new leachate conveyance, likely a forcemain (pressure pipe), to transmit all extracted leachate from the site to the

local sanitary sewer system

- Continued operation and maintenance of an existing slurry cut-off wall and leachate collection system, including conveyance of leachate from the collection system to the new forcemain

- Implementation of proper institutional controls

- Installation of new fencing and improvement of existing fencing to restrict site access

- Long-term monitoring of groundwater, surface water and landfill gas

- Supplementary studies of groundwater quality and internal landfill leachate elevations

- Implementation of additional remedial actions found to be necessary under the additional studies of groundwater quality and internal leachate elevations

Statutory Determinations

This final remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy satisfies the statutory preference for remedies which reduce the toxicity, mobility or volume of hazardous substances.

Because this remedy will result in hazardous substances remaining on-site, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within 5 years after the commencement of this source control remedial action.

George E. Meyer

George Meyer, Secretary
Wisconsin Department of Natural Resources

3/21/96
Date

RECORD OF DECISION SUMMARY
FINAL REMEDIAL ACTION
Boundary Road Landfill (f/k/a Lauer 1 Landfill)
Menomonee Falls, WI

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RECORD OF DECISION SUMMARY

Boundary Road Landfill (f/k/a Lauer 1 Landfill)
Menomonee Falls, wi

I. SITE DESCRIPTION, HISTORY AND ENFORCEMENT ACTIVITIES

The 58-acre Boundary Road Landfill (formerly known as the Lauer 1 Landfill), owned since 1971 by Waste Management of Wisconsin, Inc. (WMWI), opened in 1954 and accepted waste until at least 1971. The site was not properly closed, through the placement of adequate amounts of cover material and the establishment of a proper vegetative cover, until the late 1970's. The site is located in the northeast corner of the Village of Menomonee Falls, and is just south of the Waste Management Parkview landfill and the Waste Management Controlled Waste Solidification/Storage facility. The site is situated in an urbanizing area, with mixed surrounding land uses, including some residential, industrial and agricultural uses. Figure 1 (Drawing 1537101-A2) shows the site location and surrounding land uses.

Wastes disposed at the site included both municipal and industrial materials. WMWI submitted a Superfund notification form to U.S. EPA in 1981 indicating that the site accepted 10 million gallons of hazardous waste, and general waste types and sources were listed, but no specific waste codes were provided on the form. No further specific information on the waste types accepted are available at this time.

Because leachate was seeping to surface water next to the site, a slurry cutoff wall and leachate collection system was installed by WMWI in the early 1980s along the southern perimeter of the site to reduce leachate movement to surface water. The leachate from this system is collected and hauled to the Omega Hills leachate pretreatment facility, which discharges to the Milwaukee Metropolitan Sewerage District (MMSD) system.

Enforcement action by the Department was necessary to achieve final site closure (proper cover placement and vegetation) and the installation of the slurry cutoff wall and leachate collection system.

The site was used as a soccer field for the Milwaukee Kickers until the Superfund investigation began in 1991.

The site was nominated by the Department to be placed on the Superfund National Priorities List in 1983 and was placed on the list in 1985. WMWI entered into Environmental Repair Contract #SF-90-01 for the Boundary Corporation Landfill (the name it was known by at the time) with the Department in 1990 to investigate and remediate the site pursuant to s. 144.442, Wisconsin Statutes. WMWI has been monitoring and maintaining the site since its closure in 1972.

The Remedial Investigation (RI) was completed in August, 1993 and the Feasibility Study (FS) was completed in November, 1994. The Department issued a proposed plan in February, 1995. The proposed plan recommended the

selection of Alternative 4A, an alternative utilizing a composite cover system, as the final remedy. Information submitted during the public comment period caused the Department to change the recommendation outlined in the proposed plan. Factors considered by the Department in making its decision are listed in Section II, Community Participation.

II. COMMUNITY PARTICIPATION

A Community Relations Plan for the site was finalized in February, 1991. This document lists contacts and interested parties throughout the local and government community. It also establishes communication pathways to ensure timely dissemination of pertinent information. An information repository has been established at the Maude Shunk Library in Menomonee Falls. The administrative record is available to the public at the Department's Madison and Southeast Regional offices.

In July, 1991, the Department issued a Superfund Fact Sheet which provided a summary of the site history, explained the Superfund process and delineated the approved RI work plan. On August 8, 1991 the Department and the Wisconsin Department of Health and Social Services (WDHSS) held a public informational meeting at the Menomonee Falls Municipal Building. The meeting was held to present information about the site and to explain the RI field work which was about to start.

In August, 1993, the Department issued a Superfund Fact Sheet which provided a summary of the RI results. On September 9, 1993 the Department and WDHSS held a second public informational meeting at the Menomonee Falls Municipal Building to discuss the RI results.

The Proposed Plan for the site was made available for public comment in early February, 1995. A public meeting to explain the Proposed Plan, and to receive public comments was held on February 16, 1995. The public comment period was originally between February 16 and March 16, 1995, and was extended twice at the request of WMWI for a total extension of 60 days (2 30-day extensions). All comments which were received by the Department prior to the end of the public comment period, including those expressed verbally at the public meeting, were considered in making the final decision and are addressed in the Responsiveness Summary, which is part of this ROD.

The proposed plan recommended the selection of Alternative 4A, an alternative utilizing a composite cover system, as the final remedy. Information submitted during the public comment period caused the Department to change the recommendation outlined in the proposed plan. The main reasons for this are:

1. Alternatives 3, 4 (which also includes a composite cover system design) and 4A meet the threshold criteria for remedy selection (protective and meets state and federal laws) under the federal Superfund program. Therefore, the Department could select any of these alternatives in this decision, after considering the balancing and modifying criteria (these criteria are described in section VII, below).

2. There was public support expressed for alternative 3 and no public support expressed for alternative 4A. All comments received by the Department, were in opposition to the selection of alternative 4A and favored the selection of alternative 3. One of the modifying criteria is community acceptance, e.g., the public's response to the proposed plan.

3. Alternative 4A would have additional construction and maintenance difficulties (implementability problems) as compared to alternatives 3 and 4. The Department received improved information on these difficulties during the public comment period. This difficulties are discussed in the Responsiveness Summary, attached to this Decision Summary, and section VII.B., below. Based on the improved information, the Department has determined that implementability problems preclude the selection of alternative 4A. Based on criteria outlined in section VIII, below, the Department could subsequently revise this decision to select alternative 4. Any subsequent revisions to this decision would require a public notice of the proposed change and an opportunity for public comment.

4. Alternatives 4 and 4A would allow less infiltration into the site as compared to alternative 3. However, despite the increased infiltration, it is expected that alternative 3 will reduce the movement of leachate to groundwater and surface water at a similar rate to the other alternatives, provided alternative 3 is implemented and maintained with aggressive leachate extraction.

The public participation requirements of s. 144.442(6)(f), Wisconsin Statutes, and the community relations requirements in the National Contingency Plan under 40 CFR s. 300.430(f)(3) have been met in this remedy selection process. All the documents listed above are available in the Administrative Record maintained at the Department's Madison and Southeast Regional offices.

III. SCOPE AND ROLE OF THE RESPONSE ACTION

The landfilled waste, landfill gas and leachate within the waste are sources of contamination to the affected media around the site. The landfilled waste and leachate are considered low level threat waste, because it is expected that they can be contained reliably and likely would present only a low level risk if they were directly released. Contaminated groundwater, soil and surface water at the site are the affected media that pose a threat to human health and the environment because of the current and future risks identified. Contaminated groundwater at the site poses a possible future threat to human health and the environment because of the risks from possible ingestion of or dermal contact with the groundwater should wells intercepting the contaminated groundwater be installed in the contaminated zone. Contaminated soil at the site poses a possible future threat because of the risks of possible ingestion of the soils should the land use at the site change. Contaminated surface water poses a threat to the environment because sensitive water organisms could be affected by contaminants in the surface water.

The selected remedial action, described as alternative 3, addresses the threats posed by the site conditions by eliminating the potential for direct

contact with contaminants of concern in the soil and reducing the levels of contamination in the ground and surface waters. The selected action is expected to reliably contain the landfilled waste and leachate, as well as remove and treat the landfill leachate and gas.

IV. SUMMARY OF SITE CHARACTERISTICS

A. Topography

The landscape surrounding the site is gently sloping to nearly level, with little relief, except for the Omega Hills Landfill located to the north of the site. This landfill currently rises approximately 150 feet above the original land surface. A curving low ridge with a north-south orientation also exists immediately west of the site. Regional geomorphology is primarily the result of depositional processes which occurred during continental glaciation.

The site is situated in an area of glacial ground moraine associated with the Lake Michigan glacier which flowed westerly across the area 13,000 to 15,000 years ago, during the Wisconsin glaciation. The immediate area surrounding the site exhibits the topographic characteristics of ground moraine: gentle undulation with little to moderate relief.

B. Landfill Characteristics

The area of waste disposal is approximately 58 acres. The fill volume is about 1.3 million cubic yards of waste, with an average depth of 30 feet. The waste is overlain by a soil cover that is partially vegetated. Areas of stressed vegetation were noted on the cover, possibly due to landfill gas stress. A large portion of the cover is very flat and was once used for soccer fields. Portions of the site are used for buildings, parking and storage for a waste hauling business. Testing of the existing cover showed it to be from 0.5 to 8 feet deep with a average depth of 3.5 feet. Landfill gas is being produced at the site and is monitored with a series of soil probes. Gas migration is a potential concern. Figure 2 (Drawing 1537101-B20) shows the landfill site area and on-site and adjacent land uses.

C. Surface Water Hydrology

The site is located in the Menomonee River watershed, which has a drainage basin of approximately 137 square miles. The Menomonee River originates in the northeastern corner of the Village of Germantown in Washington County and flows southeasterly through Waukesha and Milwaukee Counties and into Lake Michigan at the confluence of the Menomonee, Milwaukee, and Kinnickinnic Rivers.

The local surface water features include a pond located in the southwest corner of the site which covers approximately 11 acres. This pond is referred to as the site pond. Another pond is located north of the site, adjacent to the auto salvage yard and an intermittent stream along the western edge of the site. The 11-acre site pond originated at the site around 1970 in an area which had been excavated for the landfill but was never used for refuse

disposal. An aerial photograph taken in 1971 shows the area of the present day site pond to consist of small surface accumulations of standing liquid. During the early 1970s, soil from this area was excavated as part of a soil borrow operation and the resulting depression accumulated surface runoff and inflow of leachate to form two separate ponds. These two ponds consisted of the existing large site pond and a separate smaller pond directly to its north. In 1981, the smaller of the two ponds was drained and backfilled with clean soil. A bentonite slurry cutoff wall was placed between the large site pond and the landfill. The site appearance has remained unchanged since then.

The other surface water feature present at the site is an intermittent stream which flows along the western edge of the site. It was diverted to its current position along the western and southern perimeters of the site during the late 1960s, as a consequence of the landfill operations. This stream is an unnamed tributary to the Menomonee River and is separated from the west side of the pond by a clay berm. Surface runoff from the site flows into either this stream (at the northwest and southeast corners of the site), or into the site pond. Outflow from the site pond into the stream is governed by an outflow control structure located at the southeast corner of the pond. Discharge from this pond is regulated under a Wisconsin Pollutant Discharge Elimination System (WPDES) permit.

D. Geology/Hydrogeology

Site Geology - The geology of the site consists primarily of a stiff, brown to gray, silty to lean, clay till (CL). This till is found in most borings from ground surface to the terminus of the deepest borings (100 feet). There are varying degrees of heterogeneity contained within the relatively uniform matrix of silty clay to lean clay soils. The surficial till material (approximately upper 30 feet) contains numerous heterogeneities including silt, sand and gravel, topsoil, and peat. The clay till at depth is more homogeneous than the upper 30 feet. The variable hydraulic conductivity of the surficial till resulted in the need for installation of the slurry trench cut-off wall and leachate collection system (SCW/LCS) along the southern perimeter of the refuse, to limit the potential flow beyond these features. Below these surficial heterogeneities, the till deposit is much more uniform, with only a limited number of sand deposits.

Two lenticular sand deposits were identified during the drilling of the piezometer boreholes (P101, P102, P103, P104, P105C, and P106C). The top of the first sand deposit is located 28 feet to 35 feet below ground surface and is approximately 3.5 feet to 11.5 feet thick. This sand deposit is identified at borings P102 and P103. It is not apparent whether this deposit is continuous across the site. The composition of the deposit varies from a silty sand (SM) to a fine to coarse sand and gravel (SP-GP). The top of the second sand deposit is located 67 feet to 78 feet below ground surface and is approximately 7 feet to 13 feet thick. The composition of the zone is a fine to medium sand with some silt (SP-SM).

The results of cone penetration tests (CPT) which were performed at eight locations on the north, east, and west sides of the site, were used to further

define the surficial geology along the perimeter of the landfill.

It is apparent that surface or near surface sand deposits are present along the west/northwest and east/northeast sides of the site. These sand deposits range in thickness from 3 to 10 feet on the west/northwest sides of the site, and from 5 to 7 feet on the east/northeast sides of the site. These sand deposits may be continuous, however, the near surface glacial deposits are quite heterogeneous. Therefore, it is also possible that silt and/or clay deposits may exist between the CPT test locations, making the sand units less continuous.

The majority of the surficial glacial deposits identified during the CPT program were clays and silts. The thin, interspersed glacial sands and silts are characteristic of near-ice meltwater deposits from the retreating glacier. The silty clayey material underlying the surficial sands and silts is basal clay till deposited during glacial advances. As such, this deeper clay till is generally more laterally extensive than the near surface sand and silt deposits.

Landfill Hydraulics Summary - Based on a comparison between leachate and groundwater head elevations at the site, it is apparent that there is a close hydraulic connection between the landfill and the groundwater system. The base grades of the site are below the surrounding water table over a large portion of the site. The base grade of the site consists of fine grain deposits. The leachate collection system/slurry cut-off wall (LCS/SCW) is operated with the intent of maintaining inward gradients. The landfill was not designed as a zone-of-saturation landfill, but would be considered a zone-of-saturation landfill based on the fact that the base grade is lower than the present elevation of the water table. The water elevations and water/leachate elevations observed in the RI illustrate that there is a potential for increased leachate levels at various times of the year. The RI indicates there were outward gradients to the north and east in the northeastern portion of the site in May 1992. The potential for outward gradients is greater in the northern portions of the site because the LCS withdraws leachate from the south side of the landfill. The current leachate head maintenance level does not allow for additional leachate head reduction across the entire site due to the gradients across the site.

The landfill is unlined, allowing a hydraulic connection between the underlying and adjacent glacial till to the landfill. Although boring logs indicate that the majority of the landfill is underlain by clay till, there is some sand and gravel in the northeast corner of the site. The perimeter of the landfill is surrounded by various thin sand/sand and gravel deposits (from 0 feet to 30 feet). If these deposits are laterally extensive, they may be the primary flow route for groundwater entering the landfill. However, the leachate level on the east side of the site averages approximately 5 feet above the base grade and the leachate level on the west side of the site averages approximately 10 feet above the base grade with a maximum of approximately 15 feet at well TW15R (May 8, 1992), where a trough occurs in the base grade of the landfill. Note that the leachate/groundwater levels listed above do not represent head levels above the surrounding water table

since the base of the landfill is below the surrounding water table. The leachate level is a maximum of 4 feet greater than the water table at the landfill perimeter.

Leachate levels within the landfill show a strong southward gradient within the landfill due to the operation of the LCS/SCW located along the southern perimeter of the landfill. A regular schedule of leachate extraction from the LCS/SCW maintains the leachate head along the collection system at an elevation of approximately 748 feet mean sea level (MSL).

The leachate extraction in the LCS helps to minimize leachate head levels in the southern portions of the site. There is an apparent groundwater divide within the northeast corner of the landfill. Based on the available monitoring points, the leachate head contours show a small divide centered across the northeastern limits of refuse. The highest leachate level is in the northeast corner of the refuse.

Outward gradients exist along the western half of the northern border of the landfill. The outward movement of leachate/groundwater in this area likely occurs in the surficial sand unit located along the northwest corner of the site. This surficial sand unit was identified by the cone penetrometer survey.

Leachate head along the western portion of the landfill is strongly affected by the presence of a clay berm constructed from the northwest corner of the refuse area to the southwest corner of the refuse area. The clay berm acts essentially as a low permeability boundary and the leachate in this area is directed south toward the LCS/SCW. Although the clay berm is saturated with groundwater and/or leachate, it is possible that the rate of movement of leachate through the berm is limited. However, the exact rate of movement is unknown. There appears to be evidence of very limited contamination associated with landfill leachate migrating to the creek that borders the west side of the landfill, given that low levels of VOCs were detected there. This interpretation is supported by the absence of contamination within the sediments of the creek that borders the west side of the landfill, and the limited detects of contaminants in the surface water of the creek (chloroethane = 2, 7, 15 ug/L and 1,1-dichloroethane 0.7, 2 ug/L).

Leachate movement within the refuse along the eastern side of the landfill is also affected by the hydraulic sink created within the LCS/SCW. Leachate movement within the refuse along the east side of the landfill appears to be mostly southward toward the LCS/SCW.

Leachate movement within the refuse along the southern portion of the landfill is controlled by the LCS/SCW (Figure 4). The LCS was constructed from the southwest corner of the landfill to the southeast corner of the landfill. The LCS borders the limits of refuse along the entire south side of the landfill and consists of approximately 2,100 feet of 6-in. diameter perforated PVC pipe, twelve 6-in. diameter solid PVC clean-out risers, and four 4-feet diameter manholes. Clean gravel was used as a bedding material and cover for the leachate collection pipe. A 4-mil thick geotextile fabric was placed

between the gravel and general backfill. Six gravel windows were installed between the LCS and refuse where the collection line was not located in refuse. In order to provide better hydraulic connection. The length of these windows vary from 8 to 20 feet. The collection line is sloped at 0.5% from either end of the system toward a primary leachate collection point at manhole MH3.

The SCW was designed to tie into the laterally continuous and relatively impermeable clay till underlying the site at a depth of 20 to 30 feet. It is approximately 2,200 feet long with a designed minimum width of 2 feet. The SCW was constructed to a base elevation of approximately 725 to 730 feet MSL. which is approximately 20 to 30 feet below ground surface. Laboratory tests conducted on samples of the SCW showed values of hydraulic conductivity ranging from 1.5×10^{-8} cm/s to 4.8×10^{-8} cm/s were achieved.

The leachate elevation data (1987 to present) in Appendix G2 in the RI Report was evaluated to determine the effectiveness of the LCS/SCW. The leachate head within the LCS has exceeded the LCS maintenance level (748 feet MSL) by greater than a foot. five times during the period of record. These periods of slightly elevated leachate head ranged from less than one week. up to 11 weeks. During the periods of elevated leachate head in the LCS. the head within the refuse area was also elevated. Consequently, those areas of the site which experience outward gradients (i.e., the north-central edge of refuse) would experience a somewhat greater outward transport of contaminants during these periods. It is probable that additional periods of elevated leachate head existed within the LCS prior to the period of available record (1980 - 1987). However, the head in the LCS is currently being maintained at required levels (748 MSL) and seems to be performing efficiently.

A LCS evaluation test was conducted during the RI to evaluate the depth to which the LCS was able to capture groundwater flow. Pre-test monitoring of groundwater elevations was performed for 72 hours prior to pumping. Pumping lasted 72 hours. and post-test monitoring was performed for 96 hours after the pumps were shut off. The head in the LCS was lowered by pumping and the effect on groundwater levels in wells below. and on both sides of the LCS were measured. The test was monitored by installation of piezometer nests P105A. B. and C and P106A. B. and C. and instrumenting 10 wells with pressure transducers. The purpose of the test was achieved. as evidenced by the drawdown plots in Figures 2 and 3 in the RI. The water table observation wells on the inside of the slurry wall (TW21R. P105A. MW113. and P106A) had significant drawdowns and showed immediate responses when the pumping began (approximately 3,900 minutes after the start of water level monitoring). These wells remained at a constant head or had slight increases in additional drawdown when the pumping was stabilized at the collection line invert (approximately 4,200 to 8,600 minutes). and recovered quickly when the pump was shut off (approximately 8,600 minutes). This type of response is expected since this group of wells is located so close to the LCS. both laterally and vertically.

The two water table observation wells located outside of the slurry wall. TW22 and TW24. showed very little or no response. Both wells had a 0.4 feet head

loss during the entire length of the test, compared to the approximately 8 feet of head drop inside of the slurry wall. This 0.4 feet head loss may be due to regional groundwater fluctuation caused by a recent rainfall event or may have been caused by the test.

The intermediate depth piezometers, P105B and P106B, are located between the leachate collection line and the slurry wall, and screened within the first sand deposits encountered beneath the LCS (P105B - 36 feet deep, P106B - 45 feet deep). Each had less than 0.5 feet of drawdown over the entire duration of the test. The drawdown versus time plot for these wells was flat, and showed little (very subdued with a long lag time) or no direct response to the initiation or termination of the pumping. This apparently indicates there is very little or limited hydraulic connection between these sand seams and the LCS system. This helps to show that the silty clay till between the base of refuse and the underlying sand deposits has a low hydraulic conductivity.

The lower piezometers, P105C and P106C, had almost identical response plots as the intermediate piezometers. These wells were screened in the second sand seams located beneath the LCS system (P105C - 48 feet deep, P106C - 79 feet deep). These wells indicate that there is an insignificant hydraulic connection between these lower sand seams and the LCS and, therefore, the refuse.

Groundwater Flow Summary - Water level information obtained from groundwater monitoring wells and leachate head wells is included in the RI. Ten rounds of water level measurements were taken during the RI. Historical levels obtained by WMWI are also located in Appendix G of the RI. Two groundwater contour drawings prepared for the RI illustrate groundwater conditions. One of those drawings, Figure 4, shows conditions in May, 1992. At the Boundary Road Landfill, the water table is unconfined and therefore, the water table drawings illustrates local groundwater flow directions. The potentiometric surface map illustrates the flow directions within the sand seam beneath the site. The groundwater flow systems at the site are described in the following sections.

Water Table - As discussed above, a small groundwater divide exists along the northeast side of the landfill. The divide has an east-west orientation, approximately parallel to the northern limits of refuse. This divide would serve as a boundary for contaminant migration in groundwater along the north side of the site.

Groundwater flow in the area northwest of the landfill and the north pond is directly toward the south. Groundwater flow from the north of the site converges at the north pond (north of the site). Groundwater is directed westward from the north pond toward the northwest corner of the site. At this location groundwater discharges into the creek which flows along the west side of the site. Shallow groundwater west of the site also discharges into the western creek. Horizontal groundwater gradients west of the site range from 0.03 ft/ft to 0.01 ft/ft. The large horizontal gradients, due to the low hydraulic conductivity of the silty clay soils, are caused by a shallow groundwater table which closely parallels the steep topography west of the

site dipping toward the western creek.

Groundwater flow east of the landfill is directed toward the creek (east of Boundary Road), which is also a groundwater discharge point. This eastern creek is a topographic low along the entire eastern side of the site and accepts groundwater influx along both banks.

Groundwater flow in the area south of the site is influenced by the LCS/SCW and the site pond. By controlling the water levels in the pond and the LCS it is possible to induce a gradient from the pond toward the LCS.

Groundwater head south of the pond can be evaluated based on water levels measured in wells TW5R, TW6R, TW7, TW13, and TW16. Groundwater flow south of the property limits is directed north toward the creek. This is a wetland area and groundwater is located very close to the ground surface. Water table elevation reflects that the surface topography and horizontal gradients are small.

The water table is present in the surficial sand deposits identified by the cone penetrometer testing program. These sand deposits may be hydraulically connected to the refuse in the landfill. However, the inward gradients produced by the LCS may be limiting outward migration of contaminants from the refuse into the adjacent sands. This is supported by the lack of contamination in the surrounding monitoring wells screened within these sand units. It is possible that these sands are actually contributing groundwater into the site which is ultimately removed by the LCS. The volume of groundwater flowing into the landfill from these sand deposits depends on the transmissivity of the sands (rate at which groundwater can move) and the head differential between the groundwater in the sand units and the leachate within the LCS.

Potentiometric Surface - The head within the lower sand deposits is at an elevation of approximately 680 feet MSL. The sand deposits indicate a small horizontal gradient of approximately 0.0007 ft/ft to the northeast. The flow direction within the lower sand deposits is parallel to the southwest to northeast trending bedrock valley (dolomite) which lies directly beneath the site at a depth of approximately 185 feet from ground surface.

Vertical Gradients - Vertical groundwater gradients were measured at eight locations throughout the site. The gradients on the west side of the site (MW110/P102) were generally low and fluctuating between positive and negative. This is indicative of areas where horizontal flow is dominant. Downward gradients did exist on the east side of the site (nest MW111/P103) and were greater than the horizontal gradients, indicating some potential for downward flow of groundwater in this area. The shallow well nests on the south side of the site were located close to the LCS/SCW (P105A/P105B, P106A/P106B, and TW22/P104). The vertical gradients in these nests were small and fluctuating. The fluctuations were likely caused by the large head changes within the LCS due to leachate withdrawal. The vertical gradients in well nest P106B/P106C were extremely small and fluctuating, indicating primarily horizontal flow at this location. The upward gradients identified in well nest P105B/P105C.

located along the LCS/SCW, enhance the performance of the slurry cutoff wall by reducing the potential for movement of groundwater beneath the base of the wall.

Hydraulic Conductivity - Hydraulic conductivity tests were performed on all new well installations during the RI (Warzyn, July 1993). The data were analyzed using the AQTESOLV aquifer test software (Duffield and Rumbaugh, 1989). The Cooper, Bredehoeft, and Papadopulos method was used to evaluate data for those wells under confined conditions (i.e., piezometers) and the Cooper, Jacobs method was used to evaluate data for unconfined conditions (i.e., water table wells).

The hydraulic conductivities for the groundwater monitoring wells ranged from $1x10^{-2}$ cm/s to $4.1x10^{-6}$ cm/s. Most wells were installed in sand, so the hydraulic conductivity test results are not representative of most of the soils at the site (i.e., clay till). Most of the piezometers had hydraulic conductivities of approximately $1x10^{-3}$ cm/s, because they were screened in sand seams or sand layers beneath the site. Most of the water table observation wells exhibited lower hydraulic conductivities, because the screened intervals often encountered tighter materials such as silty clays. The water table observation wells were usually screened across both thin sands and silty clay tills. This was necessary due to the predominance of clay tills across the site.

E. Contaminant Summary

The locations of monitoring wells, private wells and leachate/gas wells at the site are shown on Figure 3 (Drawing 1537101-B22)

Organic Compound Groups- Organic compounds were grouped together, where possible, to aid in the evaluation of contaminant distribution. Compounds were grouped based on similar chemical characteristics. In addition, there were certain organic compounds associated with degradation sequences (i.e., the formation of breakdown products from the parent compound), which were grouped separately, such as the chlorinated ethanes and ethenes. The specific organic compound groups are set forth below.

Volatiles

- Ketones - Compounds found in resins, paint removers, cement adhesives, and cleaning fluids (e.g., acetone, 2-butanone, 2-hexanone, 4-methyl-2-pentanone, isophorone).

- Benzene, Ethylbenzene, Toluene, Xylene (BETX) Compounds - Partially water-soluble products from gasoline, oil, and other hydrocarbon products.

- Chlorinated Ethenes - Chlorinated ethenes, including tetrachloroethene (PCE), trichloroethene (TCE), dichloroethene (DCE), and vinyl chloride. These compounds are common industrial compounds, and represent a potential degradation sequence.

- Chlorinated Ethanes - Chlorinated ethanes, including 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,1,1-trichloroethane, 1,2-dichloroethane, 1,1-dichloroethane, and chloroethane. These compounds are common industrial solvents and represent a potential degradation sequence.

Semivolatiles

- Phenols - A group of chemicals of similar composition used in adhesives, epoxies, plastics, and a variety of synthetic fibers and dyes. Compounds in the group include chlorinated, methylated, and nitrified phenols. Benzoic acid, a carbolic acid, is also included with the phenols because it may be a degradation product of these compounds.

- Chlorinated Benzenes - Used as solvents and reagents in a variety of chemical manufacturing processes and materials, including certain pesticides (e.g., DDT). Compounds in this group include chlorobenzene, hexachlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, and 1,2,4-trichlorobenzene.

- Polycyclic Aromatic Hydrocarbons (PAHs) - A group of compounds associated with, and derived from, coal and oil (e.g., naphthalene, pyrene, etc.). They are also by-products of the incomplete combustion of carbonaceous materials.

- Phthalates - Compounds associated with plastics and plastic-making processes.

Pesticides/PCBs

- Polychlorinated Biphenyls (PCBs) - Mixtures of chlorinated biphenyls identified as Aroclors, formerly used extensively in industrial applications.

- Pesticides - A group of chlorinated compounds used for insect control (e.g., Aldrin, Endrin, etc.). The use of these pesticides have for the most part been discontinued.

Leachate Sample Results - Leachate samples were collected during the RI from the following locations: LHG101 to LHG107, TW10A, TW14, TW15R, TW18, TW20R, TW21R, and manhole MH03. Dense non-aqueous phase liquids were not found in any of the leachate samples.

Total BETX was the most frequently detected organic group in leachate samples, from both Round 1 (November/December 1991) and Round 2 (March/April 1992) samples. BETX compounds were detected in 13 of 14 Round 1 samples and in each of the 14 Round 2 samples. Total BETX concentrations in the leachate samples ranged from 5 ug/L (TW10A) to 45,000 ug/L (LHG103).

Total chlorinated benzenes were the second most frequently detected organic compound in leachate. This group was detected in 10 of 14 Round 1 samples and

11 of 14 Round 2 samples. Total chlorinated benzene concentrations ranged from 2 ug/L (TW14, TW15R) to 68 ug/L (LHG104).

Total phenols and PAHs were both detected more frequently during Round 2 than Round 1. Total phenols were detected in 4 of 14 Round 1 samples, compared to 10 of 14 Round 2 samples. Total phenol concentrations ranged from 3 ug/L (MH03) to 499 ug/L (LHG105). Total PAHs were detected in 4 of 14 Round 1 samples, compared to 13 of 14 Round 2 samples: the concentration range for the total PAHs was from 2 ug/L (TW21R) to 554 ug/L (LHG106).

The remaining organic compound groupings detected in leachate during the RI include:

- Chlorinated ethenes - detected in 3 of 14 Round 1 samples and 2 of 14 Round 2 samples, at concentrations ranging from 13 ug/L (MH03) to 182 ug/L (LHG103).
- Chlorinated ethanes - detected in 8 of 14 Round 1 and Round 2 samples, at concentrations ranging from 7 ug/L (TW10A) to 5,730 ug/L (LHG107).
- Total ketones - detected in 4 of 14 Round 1 samples and 2 of 14 Round 2 samples, at concentrations ranging from 13 ug/L (TW14) to 2,820 ug/L (LHG103).

Pesticides and PCBs were not detected in leachate.

Compounds not included in the organic groupings, yet detected in leachate during the RI include:

- Tetrahydrofuran (THF)- detected in 9 out of 14 Round 2 samples ranging from 50 ug/L (MH03) to 370 ug/L (LHG106).
- Styrene - detected in one out of 14 Round 1 samples at 3 ug/L (LHG102).
- Methylene chloride - detected in one out of 14 Round 2 samples at 88 ug/L (LHG103).
- Nitrobenzene - detected in one out of 14 Round 1 samples at 130 ug/L (LHG105).
- N-nitrosodiphenylamine - detected in 3 of 14 Round 1 samples and 7 of 14 Round 2 samples ranging from 1 ug/L (LHG104) to 32 ug/L (LHG105).
- Carbazole - detected in 1 of 14 Round 1 samples and 5 of 14 Round 2 samples ranging from 2 ug/L (MH03) to 32 ug/L (LHG104).
- Dibenzofuran - detected in 3 out of 14 Round 2 samples ranging from 1 ug/L (TW15R) to 4 ug/L (LHG107).

Groundwater Monitoring Well Sample Results - This section discusses the analytical results obtained from wells sampled during the RI and not discussed in the previous section. Included in this discussion are wells installed both inside and outside the leachate collection system/slurry cut-off wall (LCS/SCW). A distinction between these two types of wells has been made, based on chemistry, and the results are discussed (and presented in the tables) to reflect this distinction.

Monitoring well locations are shown on Figure 3 (Drawing 1537101-B22). Based on groundwater flow direction at the site, four monitoring wells have been selected for background (upgradient) purposes as used within the baseline risk assessment:

- MW109
- MW110
- P102
- TW7

The following wells are located just inside the SCW:

- TW10B
- TW23
- TW25
- MW113
- P105A
- P106A

The remaining monitoring wells are potentially downgradient or side gradient to the area containing refuse, or isolated vertically from refuse by the presence of clay till (piezometers).

Groundwater Monitoring Wells Installed Outside of Areas of Refuse Disposal that are Considered Points of Standards Application

TW5R	TW11	MW108	P101
TW6R	TW13	MW109	P102
TW7	TW16	MW110	P103
TW8	TW22	MW111	P104
	TW24	MW112	
		MW114	
		MW115	

Wells screened or partially screened in saturated refuse or waste may be classified as monitoring leachate. Wells screened in any other material are classified as monitoring groundwater. Wells installed in borings going through areas of waste disposal, regardless of what they monitor, be it groundwater or leachate, are not points of groundwater standards application at the site. Wells just inside the SCW that are not installed in borings going through areas of waste disposal have now been determined to not be points of standards application, given the role the LCS/SCW plays in the final remedy.

The following wells are located within the waste management area:

Leachate Wells/Groundwater Monitoring Wells

Installed Inside Areas of Refuse Disposal that are Not Considered Points of Standards Application

TW1R	TW19R	LHG104
TW2R	TW20R	LHG105
TW3R	TW21R	LHG106
TW9R	TW23	LHG107
TW10A	TW25	MW113
TW10B	LHG101	P105A
TW14	LHH102	P105B
TW15R	LHG103	P105C
TW18		P106A
		P106B
		P106C

Results obtained from groundwater monitoring wells located outside the waste management area were evaluated with regard to existing State groundwater quality standards. To aid in the evaluation of groundwater constituent concentrations, Table 1 provides a summary of Rounds 1 (November/December 1991), 2 (March/April 1992), 3 (May 1992), and 4 (November/December 1992) sampling results compared to ch. NR 140 Wis. Adm. Code Preventive Action Limits (PAL) and Enforcement Standards (ES).

Dense non-aqueous phase liquids were not found in any of the monitoring wells and are likely not present at this site.

The following discussion describes the nature and extent of organic groups detected in wells located both inside and outside the SCW. Three rounds of samples were collected from each well with the exception of wells P105A, P105B, P105C, P106A, P106B, and P106C, which were sampled during Round 2, only, and wells MW114 and MW115, which were sampled only twice during the investigative phase of the RI. A summary of total organics found in monitoring wells for the 3 RI monitoring rounds is presented on Figure 5.

U.S. EPA target compound list (TCL) organic constituents were not detected in the background (upgradient) wells MW109, MW110, P102, and TW7 located west of the refuse area, with the following exceptions:

- MW109 - THF was detected during Round 3 sampling at 6 ug/L.
- MW110 - Chloroethene was detected during Rounds 2 and 3 sampling at concentrations of 2 ug/l and 3 ug/L, respectively.

Organic compound groupings were not detected in the three rounds of samples collected from the following well locations:

- MW108, TW3R, and P101 located to the north of the refuse fill area.
- TW8, TW11, and P104 located southwest of the refuse area.
- MW112 located east of the refuse area.

Organic group constituents also were not detected in the single round of

samples collected from the P105B, P105C, P106B, and P106C wells located south of the refuse area.

The following well locations had organic group constituents detected in only one of two or three sampling rounds:

- TW5R - 1,1-Dichloroethane was detected during Round 1 at a concentration of 1 ug/L.
- TW6R - Benzene was detected during Round 1 at a concentration of 1 ug/L.
- TW13 - Acetone was detected during Round 1 at a concentration of 21 ug/L. Acetone is a common lab contaminant, detected at similar concentrations in field blanks collected the day prior to this sample.
- MW114 - Benzene was detected in Round 1 (Phase 4) at a concentration of 2 ug/L. Carbon disulfide, ethylbenzene, and styrene were detected in Round 1 (Phase 4) at a concentration of 1 ug/L.
- MW115 - Di-n-butylphthalate was detected in Round 2 (Phase 4), at a concentration of 9 ug/L. Since this compound was detected in only one round and is a common laboratory or sampling contaminant, it is likely that this result is not representative of actual site conditions.

BETX was the most frequently detected and highest concentration organic group in the samples. The highest BETX concentrations were detected in the samples from:

- TW1R and TW2R located north of the refuse area and south of a railroad right of way and auto salvage pond.
- MW113 located south of the refuse area, but inside the slurry wall, and leachate collection system.
- P106A located south of the refuse area, outside the collection system, but inside the slurry wall.

Chlorinated ethenes were detected only in samples collected from well MW113 (location described above). Chlorinated ethene concentrations at this location ranged from 488 ug/L (Round 2) to 628 ug/L (Round 1).

Chlorinated ethanes were the second most frequently detected organic group. Generally, this group was detected at the same well locations as the BETX group, although the higher chlorinated ethane concentrations tended to be located in the southern portions of the site. The highest total chlorinated ethane concentration was at P106A (location described above).

The remaining organic groupings were less frequently detected and at generally

lower concentrations than the three groups described above. The highest concentrations for the total chlorinated benzenes, total phenols, and total PAHs occurred in samples from well locations TW1R and TW2R located at the north edge of the refuse area. As these compounds were also detected in the landfill leachate, the likely source of contamination in these wells is the landfill.

Compounds not included in organic groups, but which were detected at low concentrations in samples, include:

THF - detected in five Round 2 samples and eight Round 3 samples, including the sample from background well MW109.

Bis(2-chloroisopropyl)ether - detected in one Round 3 sample from well TW2R at a concentration of 2 ug/L.

N-nitrosodiphenyl amine - detected in each of the three rounds of samples collected from well TW1R at concentrations ranging from 1 to 3 ug/L. Detected in one Round 3 sample from well TW2R at a concentration of 2 ug/L. Detected in a field blank sample during Round 2 at a concentration of 3 ug/L.

Styrene - detected in one Round 2 (Phase 4) sample (MW114).

Pesticides/PCBs were not detected in samples collected from this site.

Samples were also analyzed for U.S. EPA target analyte list (TAL) metals and cyanide, and general groundwater quality indicators.

Calcium, magnesium, sodium, bicarbonate, chloride, and sulfate are typical major constituents common to naturally occurring groundwater. Concentrations of these constituents in groundwater are primarily a function of the composition, hydrology, chemistry of the aquifer, and the source of groundwater recharge.

Iron, potassium, fluoride, and nitrate are typically minor constituents in naturally occurring groundwater (Davis and DeWiest, 1966 and Table 20 of the RI). The concentration of these constituents in groundwater may be indirectly affected by wastes (e.g., oxygen deficient conditions), or attributable to direct migration from the wastes. Variability in the geologic composition of the aquifer matrix, and the source of groundwater recharge may also influence concentrations of these constituents in groundwater samples.

Aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, phosphate, selenium, silver, thallium, vanadium, and zinc are considered trace constituents in naturally occurring groundwater (Davis and DeWiest, 1966 and Table 20 of the RI). Concentrations of these constituents may or may not be directly related to the wastes. Natural and contaminant-related variations in pH, redox potential,

competing ions, etc., in groundwater may enhance the solubility of some of these metals in the aquifer, resulting in higher concentrations not necessarily originating from the waste.

Fifteen of the trace element constituents were detected in one or more sample(s) at levels higher than those detected in background wells MW109, MW110, P102, or TW7. The fifteen constituents are as follows:

- Antimony
- Arsenic
- Barium
- Cadmium
- Chromium
- Cobalt
- Copper
- Lead
- Manganese
- Mercury
- Nickel
- Selenium
- Silver
- Vanadium
- Zinc

Private Well Sample Results - This section discusses the analytical results from sampling private wells PW1, PW2, PW4, PW5, PW6, PW7, PW8, PW9, and PW10 during the RI. The locations are shown on Figure 3 (Drawing 1537101-B22). The following organic constituents were detected in samples collected from private wells:

- Ethylbenzene - detected at 1 ug/L in private well PW7 during Round 1.
- Phenol - detected at 0.6 ug/L in private well PW8, and at 0.5 ug/L in private well PW9 during Round 1.

Pesticides and PCBs were not detected in the private well samples.

Four naturally occurring groundwater constituents exceed State NR 140 groundwater standards in the private well samples (See Table 1). Each of these constituents were also detected in one or more background well samples at concentrations exceeding State groundwater standards. In summary, these constituents were found to exceed NR 140 standards:

- Arsenic - exceeds the NR 140 Public Health PAL (5 ug/L) in each private well sample. Concentrations ranged from 5.5 to 8.2 ug/L in private well samples. This constituent was also detected in samples from background wells MW110 (6.1 ug/L) and P102 (7.5 ug/L).
- Fluoride - is at or just exceeds the NR 140 Public Health PAL (0.8 mg/L) in 2 private well samples. This parameter also was detected in samples from background wells P102 and TW7.
- Iron - exceeds the NR 140 Public Welfare ES (0.3 mg/L) in each private well sampled with the exception of private well PW9 (Round 2). This constituent also exceeded the ES in the sample from background well MW110.

- Manganese - exceeds the NR 140 Public Welfare PAL (0.025 mg/L) in samples from private well PW6 and private well PW9. This constituent also exceeded the PAL in samples from background wells MW109 and MW110.

The available private well logs near the site (Appendix A of the RI) indicate that the private wells are cased in bedrock at depths of greater than 180 ft. Due to the thickness of clay till between the landfill and bedrock, and the limited extent of landfill related contamination, as documented by vertical profiling, it is very unlikely that the landfill could impact the private wells. Inorganic exceedances in the private wells have all appeared in the site background wells.

Surface Water Sample Results - Ten surface water samples were collected during the RI from locations along the drainage ways, the pond located on the site, and the pond north of the site. Samples collected from locations SW01 and SW02 are considered representative of background conditions. The following organic compounds were detected in surface water samples:

- Chloroethane - detected at 2 ug/l in SW04, 15 ug/L and 7 ug/L in SW05 (Rounds 1 and 2, respectively).
- 1,2-Dichloroethene - detected at 2 ug/L at SW05.
- 1,1-Dichloroethane - detected at 0.7 ug/L at SW05.
- Toluene - detected at 2 ug/L at SW07.
- Phenanthrene, Fluoranthene, and Pyrene - detected at SW06 during Rounds 1 and 2 at concentrations ranging from 0.6 ug/L to 1 ug/L.

Pesticides and PCBs were not detected in the surface water samples.

The following nine metals were detected in one or more surface water samples at concentrations slightly higher than background surface water results (SW01 and SW02):

- Aluminum
- Chromium
- Lead
- Zinc
- Barium
- Iron
- Manganese
- Potassium
- Sodium

Surface water background exceedances were presented in Table 24 in the RI (Warzyn, July 1993). Generally, the higher metal concentrations were in samples from SW03, located southeast of the site, and SW04, SW05, and SW08, located west of the site.

Sediment Sample Results - Sediment samples were collected from ten locations at the site during the RI. Samples collected from locations SD01 and SD02 are considered representative of background.

PAHs were detected in each sediment sample, including background, with the exception of SD07 and SD08. Total PAH concentrations in the sediment samples were as follows:

Sample Location	Total PAH (ug/Kg)
SD01	936
SD02	2,960
SD03	25,530
SD04	98
SD05	395
SD06	683
SD09	20,550
SD10	49

PAHs found in sediment samples may be due to nonpoint contaminant sources in the area. In addition to the PAHs, the following organic compounds were detected in sediment samples:

- Acetone and 4-methyl phenol - detected in samples from SD06 at concentrations of 110 ug/Kg and 77 ug/Kg, respectively (acetone is a common laboratory contaminant).
- Dibenzofuran and Carbazole - detected in samples from SD03 at concentrations of 100 ug/Kg and 330 ug/Kg, respectively.
- Methoxychlor and Endrin-ketone - detected in samples from SD03 at concentrations of 6.1 and 3.9 ug/Kg, respectively.
- Aroclor 1254 - detected at SD06 at a concentration of 90 ug/Kg.
- Endrin, 4,4-DDE, and 4,4-DDT - detected at SD10 at concentrations from 1.6 to 4.2 ug/Kg.

Generally, metals concentrations at sediment locations SD04, SD05, SD09, and SD10 tended to be slightly higher than background locations SD01 and SD02.

Surface Soil Sample Results - Surface soil samples were collected from seven locations at the site during the RI. Sample locations SS101 and SS102 were collected to represent background conditions. PAHs were detected in each of the surface soil samples collected. The following is a summary of total PAH results:

Sample Location	Total PAH (ug/Kg)
SS101	339
SS102	4,613
SS103	235
SS104	1,291
SS105	177
SS106	34,270
SS107	538

All of the surface soil samples, including samples from background locations, contained pesticide DDT residues (refer to Appendix M of the RI for individual sample results). Organic compounds detected in surface soil samples other than background include: xylenes, bis(2-ethyl hexyl)phthalate, Aroclor 1260 (SS104 at 20 ug/Kg; SS107 at 17 ug/Kg), and Aroclor 1254 (SS106 at 160 ug/Kg).

PAHs found in surface soil may be due to anthropogenic sources unrelated to site activity. Ubiquitous anthropogenic background sources of PAHs include residues from the incomplete combustion of coal, oil, refuse, diesel fuel, and tars. A possible source of these residues is the heavy truck traffic on and around the site.

Metals concentrations in the surface soil samples were similar to background samples SS101 and SS102.

V. SUMMARY OF SITE RISKS

A quantitative risk assessment was completed for the site. The purpose of the assessment was to identify human health hazards posed by environmental contamination from the site. The quantitative risk assessment evaluates current as well as future potential exposures to site related contamination. Sample results from the remedial investigation were used to evaluate all environmental pathways with potential human exposure routes.

The RI included an evaluation of risks at the site to human health and the environment if no remedial actions were taken. This process is called a Baseline Risk Assessment (Risk Assessment). The Risk Assessment involves assessing the toxicity, or degree of hazard, posed by substances related to the site, and describing the routes by which these substances could come into contact with humans and the environment. Separate calculations are made for those substances that can cause cancer (carcinogenic) and for those that can cause other, non-carcinogenic health effects. The results are also used to identify the nature and extent of remediation required.

Selection of Chemicals of Potential Concern - The baseline risk assessment was based on data and information regarding the site and surrounding area obtained primarily during the RI and during a site visit. Using this information, the first step of the assessment was to select chemicals of potential concern for detailed evaluation. This was conducted by summarizing and evaluating the RI data, including a consideration of naturally occurring background levels in

soil and groundwater and the presence of chemicals in blank samples. Based on these evaluations, 69 chemicals of potential concern were selected for detailed assessment. These chemicals include those most likely to be of concern to human health and the environment.

For each chemical of potential concern, toxicity information was then compiled. This included brief descriptions of the potential toxicity of each chemical to human health and quantitative toxicity criteria used to calculate risks. The toxicity criteria were primarily obtained from U.S. EPA's Integrated Risk Information System (IRIS) and Health Effects Assessment Summary Tables (HEASTs).

Exposure Assessment - An exposure assessment was conducted to identify potential pathways of concern to human health under both current and future site and surrounding land use conditions. The following pathways were selected for detailed evaluation under current land use conditions:

- Incidental ingestion of surface soil by child/teenager trespassers on the site
- Dermal absorption of chemicals in surface soil by child/teenager trespassers on the site
- Incidental ingestion of surface water by child/teenager trespassers on the site
- Dermal absorption of chemicals in surface water by child/teenager trespassers on the site
- Incidental ingestion of sediment by child/teenager trespassers on the site
- Dermal absorption of chemicals in sediment by child/teenager trespassers on the site
- Ingestion of groundwater by nearby residents
- Inhalation of volatile organic compounds (VOCs) while showering by nearby residents

Under future use conditions, the following hypothetical pathways were selected for evaluation:

- Incidental ingestion of surface soil by child residents on the site
- Dermal absorption of chemicals in surface soil by child residents on the site
- Incidental ingestion of surface soil by adult residents on the site
- Dermal absorption of chemicals in surface soil by adult residents on the site

- Incidental ingestion of surface water by child/teenager residents on the site
- Dermal absorption of chemicals in surface water by child/teenager residents on the site
- Incidental ingestion of sediment by child/teenager residents on the site
- Dermal absorption of chemicals in sediment by child/teenager residents on the site
- Ingestion of groundwater by on-site residents
- Inhalation of VOCs while showering by on-site residents

Toxicity Assessment - Exposures to each of the above pathways were calculated. In accordance with U.S. EPA guidance, the baseline risk assessment examined a reasonable maximum exposure (RME) associated with each pathway of concern. RME risk estimates for future land use of a site, involving exposure pathways that are typically more conservative than current land use pathways, can provide an important basis for evaluating potential remediation of a site (U.S. EPA, 1990). The National Contingency Plan (NCP) defines "reasonable maximum" such that "only potential exposures that are likely to occur will be included in the assessment of exposure" (U.S. EPA, 1990). U.S. EPA risk assessment guidance further defines the RME to be "the highest exposure that is reasonably expected to occur at a site" (U.S. EPA, 1989). The RME is intended to place a conservative upper bound on the potential risks, meaning that the risk estimate is unlikely to be underestimated but it may be over estimated.

Risk Characterization - Chemical concentrations at the potential points of exposure (exposure point concentrations) were calculated and combined with information on the magnitude, frequency, and duration of potential exposures. The exposure point concentrations were based on the RI data where possible following the approach recommended in U.S. EPA's Risk Assessment Guidance for Superfund [the 95th upper confidence limit (UCL) on the arithmetic mean concentration or the maximum, whichever was less]. A mathematical model was used to estimate exposure point concentrations in indoor air while showering.

In the next step, exposure parameters were combined with the exposure point concentrations. The exposure parameters were primarily based on values specified by U.S. EPA in guidance documents. Where regional or national U.S. EPA values were available for the RME case, they were used in this assessment. In the absence of such values, exposure parameter information was derived from the scientific literature.

Summary of Health Risks - Human Health Evaluation - Tables 2 and 3 present the cumulative risks for those pathways that were considered to be appropriate for summation in accordance with U.S. EPA guidance (U.S. EPA, 1989) for combining risks across exposure pathways. The guidance states that one must "examine whether it is likely that the same individuals would consistently face the RME

by more than one pathway".

The cumulative upper bound lifetime cancer risk and hazard index values presented in Tables 2 and 3 can be put into context by considering U.S. EPA's OSWER Directive 9355.0-30 (U.S. EPA, 1991b) as follows:

"Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for current and future land use is less than 10^{-4}, and the noncarcinogenic hazard quotient is less than one, action generally is not warranted unless there are adverse environmental impacts."

Results of the baseline risk assessment indicated that cumulative cancer risks are less than $1x10^{-4}$ for all receptors except adult residents under hypothetical future land use conditions. The cumulative risk of $1x10^{-4}$ for this pathway is primarily due to potential contact with groundwater from on-site northern perimeter monitoring wells. Cumulative hazard indices are less than one for all receptors except under a hypothetical scenario of adult residents ingesting groundwater from monitoring wells. These hazard indices are primarily due to contact with groundwater from off-site southern and on-site northern perimeter monitoring wells.

In the event that exposure to landfill waste were to occur, the primary pathway for exposure would be dermal contact with the landfill waste itself. No chemical analyses were conducted on the waste material, therefore, it is not possible to quantify potential risks under this hypothetical scenario. In addition, the landfill waste is a non-homogeneous mixture, and therefore the magnitude of exposure would vary considerably depending on the type of waste contacted.

Risks from landfill gas were not evaluated in the baseline risk assessment because these risks are difficult to quantify (relative to other media) and a landfill gas extraction system is included as a component of all alternatives other than the no action alternative.

Ecological Assessment - An ecological risk assessment was conducted to evaluate potential impacts on nonhuman receptors associated with the site. This evaluation involved the identification of potential receptors and exposure pathways, including the determination of the presence of endangered or threatened species in the area. Potential risks were evaluated by comparison with chemical-specific toxicity criteria (toxicity reference values or TRVs). Based on information obtained during the RI and a site visit, exposure of terrestrial plants and soil organisms (earthworms) to chemicals of potential concern in sediment and surface water were selected for detailed evaluation. Exposure of birds and mammals to chemicals with potential to bioaccumulate through the food chain was also evaluated.

Adverse impacts to terrestrial plants are unlikely from the chemicals of potential concern in soil. Although potential risks for 16 of the chemicals could not be quantitatively evaluated because toxicity values were unavailable, 15 of those chemicals were PAHs, which do not appear to be toxic to plants. The available toxicity information for earthworms suggests that

adverse effects from chemicals in soil are unlikely. However, all of the chemicals could not be evaluated because toxicity values were not available. Although there is some potential for adverse impacts to sensitive aquatic organisms from exposure to benzo(k)fluoranthene, benzo(g,h,i)perylene, endrin, fluoranthene, and indeno(1,2,3-c,d)pyrene in sediments, no significant impacts are expected due to the uncertainty associated with the sediment toxicity values and the estimate of organic carbon in the sediments. RME concentrations of aluminum and iron in surface water, which consists of both pond and ditch samples, exceeded their TRVs indicating potential risk to sensitive aquatic organisms. However, aquatic organisms in the ponds would not be affected because pond concentrations are at levels that are not harmful. Sensitive aquatic organisms in the ditches, where concentrations are higher, may be impacted from these chemicals, although the ephemeral nature of the ditches might minimize the impacts. No significant impacts to birds and mammals from chemicals that bioaccumulate are expected.

Media of Concern Determined in the Baseline Risk Assessment - Results of the baseline risk assessment indicated that cumulative cancer risks are less than $1x10^{-4}$ for all receptors except adult residents under hypothetical future land use conditions. The cumulative risk of $1x10^{-4}$ for this pathway is primarily due to potential contact with groundwater from the on-site northern perimeter monitoring well grouping. Cumulative hazard indices are less than one for all receptors except under a hypothetical scenario of adult residents ingesting groundwater from monitoring wells. These hazard indices are primarily due to contact with groundwater from the off-site southern and the on-site northern perimeter monitoring well groupings.

As a result of the baseline risk assessment, several media were found to be of concern under particular exposure conditions to human and/or ecological populations. The following is a summary of the media which were estimated to pose a health concern, as well as the nature of the exposure (e.g, ingestion of groundwater) that poses a health concern:

- Groundwater - It was assumed currently and in the future that people ingest contaminated groundwater from on-site or off-site monitoring wells, or inhale contaminants released from using water, such as showering, from on-site or off-site monitoring wells.

- Surface soils - It was assumed that in the future on-site residents ingest or come into dermal contact with contaminated surface soils at the site.

- Sediment - It was assumed that in the future on-site residents ingest contaminated sediment.

- Surface water - It was assumed that currently and in the future sensitive aquatic organisms may be impacted from chemicals detected in surface water.

Groundwater is a medium of concern as a result of a baseline risk assessment hazard index estimate greater than one. Surface soils, sediment, and surface

water are potential media of concern based on a baseline risk assessment cancer risk estimate greater than 10^{-6}, but less than 10^{-4}.

Rationale for Further Action - Actual or threatened releases of hazardous substances from this site, if not addressed by the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VI. Description of the Remedial Alternatives

A. Remedial Action Objectives

Remedial action objectives were developed for this site to address the source of contamination, groundwater contamination, to provide short and long-term protection of human health and the environment and to meet applicable or relevant and appropriate requirements.

The remedial action objective for surface soils is as follows:

- Reduce potential future exposure to contaminants by ingestion and dermal contact.

The remedial action objectives for landfill gas are as follows:

- Reduce off-site migration of landfill gas.
- Control the release of on-site landfill gas to the atmosphere.

The remedial action objective for surface water is as follows:

- Minimize the landfill's potential impact on surface water quality.

The remedial action objectives for groundwater include the following:

- Maintain leachate levels at the leachate head maintenance levels established for the site.

- Maintain an inward groundwater gradient (head inside the landfill is lower than the head in the adjacent area outside the landfill) at the site.

- Reduce the concentration of contaminants that exceed NR 140 groundwater quality standards at site wells outside the waste management area.

The purpose of the groundwater portion of the remedy is to return groundwater at the site to its beneficial use, as an actual or potential groundwater source, within a reasonable period of time. Contaminated groundwater will be returned to its beneficial use when the concentrations of groundwater meet groundwater cleanup standards: the groundwater preventive action limits (PALs) found in NR 140, Wis. Adm. Code. These groundwater cleanup standards are applicable requirements for the groundwater cleanup.

The location of the point of compliance for the groundwater cleanup standards is the edge of the waste management area, e.g., the waste boundary for the landfill and the outside edge of the existing SCW. Groundwater cleanup standards shall be attained throughout the contaminated plume, excluding the area underneath the landfilled waste. This area of attainment includes areas outside the site property as well as the area within the site property up to the waste boundary for landfilled waste.

B. Development of Alternatives

The FS identified groundwater and landfill gas as actual media of concern and surface soils and surface water as potential media of concern to be addressed by the developed remedial alternatives. An extensive list of possible remedial technologies to address the media of concern were screened and narrowed down based on cost, implementability and effectiveness. Alternatives were then assembled from the technologies that survived the screening process. In addition to the remedial action alternatives, the NCP requires that a no-action alternative also be considered for the site. The no-action alternative serves primarily as a point of comparison for the other alternatives.

C. Description of Alternatives

The following alternatives are based on the alternatives in the FS, as modified by the Department in the Proposed Plan (PP) and in this Decision Summary. The Department's modifications are described below.

1. Alternative 1 - No Action

The No Action alternative is included to serve as a baseline against which all other alternatives are compared. This alternative consists of continued monitoring of groundwater, maintaining the existing cover and partial fence, and continued operation and maintenance of the southern leachate collection and slurry cut-off wall.

There is no capital cost for this alternative and the annual operation and maintenance (O&M) cost is estimated at $569,000. The total present worth cost for this alternative is $7,061,000.

2. Alternative 2 - Landfill Cap Enhancement, Groundwater, Leachate and Gas Extraction and Additional Investigations

This alternative consists of regrading the landfill cover to allow better drainage of surface water away from the wastes, establishing new vegetation, installing an active landfill gas extraction system to prevent gas migration, repairing and repaving the existing paved and graveled areas, continuing leachate extraction in the northern and southern portions of the site with a new leachate extraction system in the north central portion of the site, extracting contaminated groundwater at the southeast edge of the site (if found to be necessary after an additional study), constructing a new fence (or using existing fence, where possible), and continuous monitoring of groundwater, leachate, and the environment. Leachate and groundwater removed

from the landfill would be pumped directly to the Milwaukee Metropolitan Sewerage District for treatment. It may also be possible to treat extracted groundwater and discharge it to surface water. The active gas extraction system would use slotted pipes buried in the waste to collect landfill gas that would be sent to a flare or to a gas turbine, if feasible. The flare or turbine would burn the gas, destroying the contaminants. Air emissions would be monitored to make sure they meet standards. New groundwater monitoring wells and other monitoring devices would be added to the site to replace and/or supplement existing monitoring devices. Additional studies of the groundwater quality and leachate head levels would be conducted to determine if additional remedial actions are necessary.

Alternative 2 in the feasibility study assumed that leachate extraction in the northern part of the site would only be done if a study showed it was necessary. This action is now considered necessary, and this action has been included in Alternatives 2, 3, 4 and 4a. The action is necessary to minimize the amount of leachate escaping through the base and sides of the site, as there are downward gradients within the site, contamination has already migrated away from the sides in some areas, and if this migration continues, there continues to be the potential for additional surface and/or groundwater contamination away from the edges of the site.

The capital cost for this action is estimated at $3,189,000. The annual O&M cost is estimated at $565,000. The total present worth cost for this action is $10,200,000.

3. Alternative 3 - Clay Cap, Groundwater, Leachate and Gas Extraction and Additional Investigations (Selected Alternative)

This alternative consists of the same actions described for Alternative 2, with the addition of a new soil cover system. This cover would be constructed with useable soils from the site with some soils brought in from off site, if necessary, as determined during the design. The cover would consist of, from bottom to top: a 6 inch grading layer, 2 feet of compacted clay liner, 1.5 feet of frost protection/rooting zone and 6 inches of topsoil. The top slope steepness would be determined during the design, based on site conditions and rule requirements in effect at the time. Currently, the requirement is for the minimum top slope not to be less than 2%. The cover would be seeded to establish new vegetation.

Alternative 3 in the Feasibility Study assumed that all of the clay needed for the liner would be found on-site, but the proposed plan assumed that 20 percent of the volume of clay would be brought from off-site. The FS also assumed the minimum top slope would be 2%, while the proposed plan assumed it would be 5%. For the purposes of the cost estimate in this document, no clay is assumed to be brought from off site, and the minimum slope is assumed to be 2%. The reasons for these changes are outlined in the responsiveness summary, attached. However, the final determination on the amount of soil needed from off site and the minimum slope would be made during the design phase.

The capital cost for this alternative is estimated at $5,416,000. The annual

O&M cost is estimated at $565,000. The total present worth cost for this alternative is $12,427,000.

4. Alternative 4 - Composite Cap, Groundwater, Leachate and Gas Extraction and Additional Investigations

This alternative consists of the same actions for Alternative 2, with the addition of a new composite cover system. The cover would consist of, from bottom to top: 2 feet of compacted clay, plastic geomembrane, 1 foot of sand for a drainage layer, a felt-like filter fabric to prevent fine soils from entering the drainage layer, 1.5 feet of frost protection/rooting zone and 6 inches of topsoil. The top slope would be set at a minimum of 2 percent. The cover would be seeded for new vegetation.

A plastic geomembrane is a rubber-like sheet over the entire landfill that water cannot penetrate. The geomembrane is an extra layer of protection over the dense clay cover.

The capital cost for this alternative is estimated at $8,446,000. The annual O&M cost is estimated at $546,000. The total present worth cost for this alternative is $15,221,000.

5. Alternative 4A - Modified Composite Cap, Groundwater, Leachate and Gas Extraction and Additional Investigations

This alternative is the same as Alternative 4, with changes to the landfill cover. The cover would consist of, from bottom to top: 1 foot of compacted clay (instead of 2 feet as proposed in Alternative 4), plastic geomembrane, 1 foot drainage layer, filter fabric, 1.5 feet of frost protection/rooting zone and 6 inches of topsoil. The top slope would be set at a minimum of 2 percent. The cover would be seeded to establish new vegetation.

This alternative is slightly different from Alternative 4A in the Feasibility Study. It assumes that a different type and thickness of plastic geomembrane would be used, the drainage layer and fabric would only be needed in areas with steeper slopes, and no additional soil would need to be brought in for the frost protection/rooting zone.

The capital cost for this alternative is estimated at $5,952,000. The annual O&M cost is estimated at $546,000. The total present worth cost for this alternative is $12,727,000.

VII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A. Introduction

U.S. EPA has established in the NCP nine criteria that balance health, technical, and cost considerations to determine the most appropriate remedial alternative. The criteria are designed to select a remedy that will be protective of human health and the environment, attain ARARs, utilize permanent solutions and treatment technologies to the maximum extent

practicable, and be cost effective. The relative performance of each of the remedial alternatives listed above has been evaluated using the nine criteria set forth in the NCP at 40 CFR 300.430(e)(9)(iii) as the basis of comparison. These nine criteria are summarized as follows.

THRESHOLD CRITERIA - The selected remedy must meet the threshold criteria.

1. Overall Protection of Human Health and the Environment
   A remedy must provide adequate protection and describe how risks are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
   A remedy must meet all applicable or relevant and appropriate requirements of federal/state laws. If not, a waiver may be applied.

PRIMARY BALANCING CRITERIA are used to compare the effectiveness of the remedies.

3. Long-term Effectiveness and Permanence
   Once clean up goals have been met, this refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time.

4. Reduction of Toxicity, Mobility or Volume Through Treatment
   The purpose of this criterion is to anticipate the performance of the treatment technologies that may be employed.

5. Short-term Effectiveness
   This refers to how fast a remedy achieves protection. Also, it weighs potential adverse impacts on human health and the environment during the construction and implementation period.

6. Implementability
   This criterion requires consideration of the technical and administrative feasibility of a remedy, including whether needed services and materials are available.

7. Cost
   Capital, operation and maintenance, and 30 year present worth costs are addressed.

MODIFYING CRITERIA deal with support agency and community response to the alternatives.

8. State or Federal Acceptance
   After review of the Feasibility Study and the Proposed Plan, the support agency's concurrence or objections are taken into consideration.

9. Community Acceptance

This criterion summarizes the public's response to the alternative remedies after the public comment period. The comments from the public are addressed in the Responsiveness Summary attached to this document

B. Evaluation of the Remedial Alternatives

THRESHOLD CRITERIA - The selected remedy must meet the threshold criteria.

1. Overall Protection of Human Health and the Environment

Alternative 1 is not protective of human health and the environment. The risks from contaminated soils and groundwater would not be addressed. The potential impacts on aquatic organisms in surface water would not be addressed. Because this alternative would not be protective of human health and the environment, it can't be selected and will not be evaluated further.

Alternative 2 may or may not be protective of human health and the environment, depending on how it would be implemented. Cover regrading would have to assure that contaminated soils are well covered with clean soils. Reducing risks in groundwater and surface water will depend on how aggressively groundwater and leachate were extracted and the amount of water that filters into the regraded cover. This alternative would allow the most infiltration into the cover, which would make it harder for the leachate and groundwater extraction systems to meet cleanup goals.

Alternatives 3, 4 and 4A are expected to be protective of human health and the environment. These alternatives would provide new cover systems that would reduce the risks from contaminated soils and significantly reduce the amount of water that filters into the site. The operation of leachate and groundwater extraction systems, along with the reduction of water in the site, is expected to meet groundwater and surface water quality goals and prevent discharges to surface water. Alternatives 4 and 4A are likely more protective than Alternative 3 because they allow less water to filter into the site. Groundwater and surface water quality goals would likely be reached sooner with Alternatives 4 or 4A. However, if Alternative 3 was implemented and maintained so leachate was removed aggressively from the site, that may provide a similar protectiveness to Alternatives 4 and 4A, as the additional infiltration would expected to be collected as leachate before it could move away from the site and cause additional groundwater and/or surface water impacts.

2. Compliance with State Laws

Alternative 2 does not meet the s. NR 504.07, Wis. Adm. Code, landfill cover requirements, which apply to the site because it is causing groundwater contamination that exceed the ch. NR 140, Wis. Adm. Code, groundwater standards. Because this alternative does not meet state requirements, it will not be evaluated further.

Alternatives 3, 4 and 4A all comply with s. NR 504.07, Wis. Adm. Code, landfill cover requirements.

Chapter NR 140, Wis. Adm. Code, requires that groundwater must be cleaned up to meet state standards in a reasonable amount of time, when it is technically and economically feasible. Alternatives 3, 4 and 4A are expected to meet these standards over time. Provided Alternative 3 is implemented and maintained such that leachate is removed aggressively, it would be expected that all 3 alternatives would meet the standards in a similar time frame.

Section NR 506.08(6), Wis. Adm. Code, requires the control of landfill gas emissions at landfill sites that accepted more than 500,000 cubic yards of waste and contain municipal refuse. The active landfill gas extraction and flaring system are expected to meet this requirement for Alternatives 3, 4 and 4A.

PRIMARY BALANCING CRITERIA - Alternatives which satisfy the two threshold criteria are then evaluated according to the five primary balancing criteria.

3. Long-term Effectiveness and Permanence

Provided Alternative 3 is implemented and maintained such that leachate is removed aggressively after standards are met initially, it would be expected that all 3 alternatives would have similar effectiveness in the long term in reducing the amount of leachate that escapes from the site and the corresponding surface and groundwater impacts.

Alternative 4 is a bit more reliable than 4A in the long-term because it uses a thicker clay layer under the plastic geomembrane and has a drainage layer over the entire capped area.

Alternative 4A may not be a reliable design in the long-term due to the lack of a drainage layer over all portions of the cover. Areas without a drainage layer may be subject to water ponding on the membrane and slope stability problems. If the membrane was damaged during the construction of the frost protection zone due to the lack of a drainage layer to protect it, then the membrane would allow additional infiltration into the site over time.

Alternatives 4 and 4A would be more difficult to maintain in the long-term if settlement causes tears in the plastic geomembrane layer. Landfills of this age normally are not subject to significant settlement. However, the leachate and gas removal activities that are part of Alternatives 2, 3, 4 and 4A could cause significant settlement of the waste.

4. Reduction of Toxicity, Mobility or Volume through Treatment

Alternatives 3, 4 and 4A all include leachate and gas extraction and treatment through the same means. They all include treatment of leachate at the sewage treatment plant and burn landfill gasses in a flare system, eliminating toxic emissions. Alternatives 3, 4 and 4A will reduce the movement of leachate to groundwater and surface water at a similar rate, provided alternative 3 is implemented and maintained with aggressive leachate extraction.

5. Short-term Effectiveness

Alternatives 3, 4 and 4A would be effective to quickly reduce any possible exposure to landfill gasses.

Alternatives 3, 4 and 4A have similar construction time periods and construction impacts. Alternatives 3 and 4 require a greater volume of soil for construction of their final cover systems. If this soil is not available from on-site sources, these alternatives require more soil be hauled to the site from off-site sources than Alternative 4A. They will have greater impacts from truck traffic and the operation of heavy soil moving equipment.

Provided Alternative 3 is implemented and maintained with aggressive leachate extraction, all the alternatives would take a similar amount of time to meet cleanup objectives.

6. Ease of Implementation

Alternatives 4 and 4A would be slightly more difficult to implement than Alternative 3 because they involve using plastic liners, which require more careful construction quality control.

The lack of a drainage layer over all portions of the cover may result in problems with punctures or tears of the plastic geomembrane if the quality of the rooting/frost protection zone is not controlled properly.

Alternative 4 would take slightly more effort to implement than alternative 4A because more clay and drainage layer sand would be placed.

Alternatives 3 and 4 would require a greater volume of soil from off-site sources, so they would require slightly more effort than alternative 4A.

7. Cost

The costs for the alternatives are presented with each alternative. Alternative 4 is the most expensive alternative.

Alternatives 3 and 4A have very similar present worth costs.

8. Agency Acceptance

The Department prepared this decision document and selected Alternative 3 for the site. The Environmental Protection Agency, the federal agency that administers the Superfund program, agrees with this recommendation. Their letter concurring with the selected action is attached to this document

9. Community Acceptance

There was public support expressed for alternative 3 and no public support expressed for alternative 4A. All comments received by the Department, including those expressed verbally at the public meeting, were in opposition to the selection of alternative 4A and favored the selection of alternative 3. The comments and the Department's responses to them are provided in the

responsiveness summary, attached.

VIII. THE SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, as amended by SARA, and the NCP, the detailed analysis of the alternatives and public comments, the Wisconsin Department of Natural Resources (in consultation with U.S. EPA), believes that Alternative 3, the selected remedy, will be the most appropriate remedy for this site. The selected remedy for the site includes the following:

1. Construction of a new landfill soil cover system meeting state solid waste requirements as outlined in ss. NR 504.07 and 506.08, Wis. Adm. Code. The cover shall consist of, from bottom to top: a minimum 6 inch grading layer, 2 feet of compacted clay soil liner, 1.5 feet of frost protection/rooting zone soil and 6 inches of topsoil. The top slope steepness shall be determined during the design, based on site conditions and rule requirements in effect at the time. Currently, the requirement in s. NR 506.08(3)(c), Wis. Adm. Code, is for the minimum top slope not to be less than 2%. The cover shall be seeded to establish new vegetation.

Design investigations meeting the intent of the requirements of s. NR 512.18, Wis. Adm. Code, will examine the quality of clay available on the site and the volume of soil potentially needed from off-site to construct the cover system. Due to site conditions, a site specific protocol for the on-site soils investigation that does not meet the exact requirements of s. NR 512.18, Wis. Adm. Code, may need to be established. It may be determined during the design that a composite (soil and plastic membrane) design may be more economical to construct. Should that be the case, the design described in Alternative 4 shall be required, because the design in Alternative 4A would have reliability problems, as described above. The decision to change the design of the cover system to the composite design described in alternative 4 shall be documented with a revision to this decision.

The existing paved and graveled areas currently used by the waste hauling business on the eastern portion of the site shall be repaired and/or repaved and maintained to prevent contact with the waste and minimize infiltration. The exact extent of these areas will be determined during the design. If any of these areas ceased to be used by the hauling business, the new cover system will be constructed over them in the future.

2. Installation of leachate control measures (vertical dual extraction wells or a horizontal collection trench or trenches) in the northeast area of the site. These measures and the existing leachate collection system adjacent to the slurry cut-off wall will be connected to a new leachate forcemain (pressure pipe) to convey the leachate to the sanitary sewer system (Milwaukee Metropolitan Sewerage District system). The leachate may be discharged directly to the sewer system or it could be pretreated at the Omega Hills leachate pretreatment system. It may also be possible to treat extracted groundwater and discharge it to surface water, if it is found that discharge to the sanitary sewer is not available.

Initial leachate head level goals within the site will be set at "dry base", as defined by the most current Solid Waste Program rules and guidance. WMWI may propose and implement a detailed monitoring and evaluation program during remedial design to evaluate whether or not it is feasible to achieve the "dry base" initial leachate head level goal. If the Department determines that it is not feasible to achieve "dry base" conditions, then an alternative head level goal of maintaining an inward gradient will replace the initial leachate head level goal. A revision to this decision is not required to revise the leachate head level goals.

3. Installation of an active landfill gas extraction system to prevent gas migration. This system will consist of vertical and/or horizontal extraction pipes, tied to a vacuum extraction system that should efficiently extract gas from the depths of the waste. Extracted gas would be flared or used to generate electricity. Air emissions will be monitored to make sure they remain in compliance with air emission standards.

4. Institutional controls shall be put in place, including land use/deed restrictions. These shall be designed to prevent unauthorized excavation, groundwater use or installation of water supply wells on the site.

5. Existing access controls shall be evaluated during the design and improved/replaced where necessary. Existing and new fencing is expected to be used. Temporary fencing may be used during the construction of the final remedy.

6. A groundwater quality evaluation and potential contaminant source removal in the area of monitoring well TW24. The evaluation shall consist of monitoring groundwater quality in the area of that well, through the installation of additional monitoring wells and additional investigations to determine the potential sources of the contamination, such as test pits and soil borings. Any waste contaminant sources that are located shall be removed by excavation as soon as possible. This monitoring and potential source removal shall begin during the design phase. Groundwater quality shall be monitored for 3 years after the completion of the investigation of any potential sources of contamination and the removal of any such sources. Unless the results of the evaluation and potential source removal, to be reported at the end of the 3-year evaluation period, show a significant improvement in groundwater quality in that area, showing a trend towards meeting ch. NR 140, Wis. Adm. Code, PALs within a reasonable amount of time (as determined by applying the criteria listed in s. NR 722.07(4)(a)4, Wis. Adm. Code), groundwater extraction measures utilizing extraction trenches or wells or other suitable technology shall be implemented in that area at the end of the 3-year period to achieve ch. NR 140, Wis. Adm. Code, PALs within a reasonable amount of time (as determined by applying the criteria listed in s. NR 722.07(4)(a)4, Wis. Adm. Code). A revision to this decision is not required to implement these additional groundwater extraction measures.

7. To address contamination found along the north, east and west sides of the site, the selected remedy includes a gradient and water quality evaluation, starting after the remedy is implemented, and completed and reported on during

the first 5-year review pursuant to CERCLA requirements. The monitoring in this evaluation shall include groundwater and surface water contaminant concentrations. Unless the results of the evaluation show the following, a slurry wall or sealable sheet piles (full or partial), leachate extraction measures, or other suitable technology shall be added to help achieve inward gradients and reduce groundwater flow into the site. These shall be located in areas where groundwater inflow results in difficulty in maintaining required gradients in the site. These additional measures shall be taken after the evaluation period unless:

a. A significant improvement in groundwater quality on the north and east sides of the site and surface water quality on the west side of the site is found, and groundwater quality results show a trend towards meeting ch. NR 140, Wis. Adm. Code, PALs within a reasonable amount of time (as determined by applying the criteria listed in s. NR 722.07(4)(a)4, Wis. Adm. Code) in groundwater; and

b. Inward gradients are observed throughout the site and the leachate head levels within the site are at, or expected to reach in a short amount of time, the leachate head level goals ("dry base") outlined above.

If a slurry wall or sealable sheet piles (full or partial), leachate extraction measures, or other suitable technology are constructed in accordance with the above, then a north and east side groundwater water quality evaluation will be conducted after the measures are constructed. The evaluation shall consist of a 3-year period of monitoring groundwater quality in areas outside the waste management area to the north and east of the site. If possible, this evaluation could be timed to be completed at the same time the second 5-year review is completed. Unless the results of the evaluation show a significant improvement in groundwater quality outside of the waste management area on the north and east sides of the site, showing a trend towards meeting ch. NR 140, Wis. Adm. Code, PALs within a reasonable amount of time (as determined by applying the criteria listed in s. NR 722.07(4)(a)4, Wis. Adm. Code), additional groundwater extraction measures utilizing extraction trenches, wells or other suitable technology shall be implemented outside of the waste management area to achieve ch. NR 140, Wis. Adm. Code, PALs within a reasonable amount of time (as determined by applying the criteria listed in s. NR 722.07(4)(a)4, Wis. Adm. Code). A revision to this decision is not required to implement any of the additional future remedial measures described in this point.

8. Long-term environmental monitoring shall initially consist of the following, with a detailed proposal developed during the remedial design:

a. Semi-annual visual inspection of the cap to identify for repair any erosion, differential settlement, or leachate seepage. Cap visual inspections are expected to be more frequent (monthly during the first year and quarterly during the second year) during the first two growing seasons after cap completion, and semi-annually after that.

b. Semi-annual visual inspection of paved surfaces on the landfill to identify any cracks or damaged areas which require repair.

c. Quarterly monitoring at up to 30 new and existing groundwater monitoring wells, leachate wells and private wells for the following analytes:

   i. Indicator parameters (chloride, fluoride, nitrate+nitrite, and sulfate)

   ii. Field parameters (pH, conductivity, temperature) on all wells and groundwater levels on all wells except private wells

   iii. Volatile organic compounds (VOCs)

d. Semi-annual monitoring at up to 30 new and existing groundwater monitoring wells and leachate wells and private wells for the following analytes:

   i. Metals (Al, Sb, As, Ba, Cd, Cr, Fe, Mn, Hg, and Se)

e. Semi-annual monitoring of surface water in drainage ditches on the site and site pond outfall for VOCs.

f. Annual monitoring of surface water in drainage ditches on the site and pond outfall for the following analytes:

   i. Semi-volatile organic compounds
   ii. Metals (Al and Fe)

g. Monitoring of the pond outfall to comply with any additional WPDES permit requirements.

h. Quarterly monitoring of landfill gas at up to 25 gas probes for the following analytes:

   i. Oxygen
   ii. Methane
   iii. Pressure

i. Quarterly monitoring of the landfill gas extraction system air emissions for the first year in accordance with the requirements of the WDNR Air Management Section and ch. NR 445. Subsequent monitoring shall be performed periodically as indicated by the results obtained during the first year.

The Department may approve revisions to the monitoring frequency and the parameters to be sampled for during the design, construction or implementation of the remedy without a revision to this decision document. The existing monitoring well network shall be evaluated during the design to determine if

any wells need to be rehabilitated, abandoned and/or replaced. This evaluation shall examine the usefulness of the well(s), their location relative to the edge of the waste management area, especially wells TW1-3) and potential construction related damage

IX. STATUTORY DETERMINATION

A. Protection of Human Health and the Environment

The selected remedy provides adequate protection of human health and the environment through the implementation of a new cover system, leachate and gas extraction and treatment, access controls and additional future remedial actions, if found to be necessary after additional studies and monitoring. The remedy is expected to prevent persons from being exposed to site contaminants in the soil, surface water and groundwater and to restore groundwater quality to meet ch. NR 140, Wis. Adm. Code, requirements and to minimize or eliminate the movement of contaminants into surface water and groundwater.

B. Attainment of ARARs

The selected remedy will be designed to meet all applicable, or relevant and appropriate requirements under federal and state environmental laws. Since the Boundary Road Landfill is a state lead cleanup, no CERCLA on site permit exemption is available. All permits and approvals required to implement the remedy must be obtained and strictly complied with. The primary ARARs that will be achieved by the selected alternative are:

1. Action Specific ARARs

Resource Conservation and Recovery Act, as amended [42 U.S.C. Sec. 6901 et seq.], Subtitle C; Wisconsin Environmental Protection Law, Hazardous Waste Management Act [Wis. Stat. Sec. 144.60-74]

Most RCRA Subtitle C (hazardous waste) requirements are administered under the State of Wisconsin's implementing regulations. Leachate, groundwater, spoils from any extraction system construction and any other contaminated material or waste that is to be managed as part of any remedy construction and operation shall be managed in accordance with applicable solid and/or hazardous waste requirements. The Department has determined at this time that ch. NR 600, Wis. Adm. Code, hazardous waste requirements for listed hazardous waste are not applicable to this material because there is no information available to the Department indicating that what is now described as a listed hazardous waste was accepted at the site. While the site was operated as a co-disposal (industrial and municipal waste) landfill and appeared to accept a significant amount of what might be hazardous waste, there is no specific information to describe that waste. The Department reserves the right to re-examine this issue in the future, based on any new waste acceptance information that may be compiled for the purpose of identifying potentially responsible parties. Hazardous waste requirements are therefore not applicable to the site at this time, except to the extent that new hazardous wastes (such as excavated wastes

showing a characteristic) are generated during the course of the remedy.

The Department has determined that the only reason the s. NR 660.16, Wis. Adm. Code, composite hazardous waste cover system requirements are not appropriate at this time is that they would be no more effective for reducing infiltration and surface soil exposure than a s. NR 504.07, Wis. Adm. Code, composite cover system, which was evaluated in the FS, PP and this Decision Summary. The s. NR 660.16, Wis. Adm. Code, composite hazardous waste cover system requirements could be relevant because the site was operated as a co-disposal landfill and appeared to accept a significant amount of what might be hazardous waste. The Department reserves the right to re-examine the relevance and appropriateness of the s. NR 660.16, Wis. Adm. Code, composite hazardous waste cover system requirements in the future, based on design considerations and any new waste acceptance information that may be compiled for the purpose of identifying additional potentially responsible parties.

The selected remedy will comply with the following applicable requirements:

Wis. Adm. Code NR 605; 40 CFR 261 - Identification of Hazardous Wastes. These regulations provide requirements for determining when a waste is hazardous. The substantive requirements of these regulations will apply to any on-site TCLP testing of residuals which may be disposed of off-site.

Wis. Adm. Code NR 615; 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste. These regulations provide requirements for the shipment of wastes to treatment, storage or disposal facilities. These requirements may apply to on-site preparations for off-site shipment of treatment residuals and other wastes.

Wis. Adm. Code NR 620; Department of Transportation Hazardous Materials Transportation Act [49 U.S.C. Sec. 1801]; 40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste. These statutes and regulations require record keeping, reporting and manifesting of waste shipments. These requirements may apply to on-site preparations for off-site shipment of treatment residuals and other wastes.

Wis. Adm. Code NR 630.10-17; 40 CFR 264, Subpart B - General Facility Requirements. These regulations establish substantive requirements for security, inspection, personnel training, and materials handling which are relevant and appropriate to on-site activities involving handling of hazardous materials. These requirements may apply to on-site preparations for off-site shipment of treatment residuals and other wastes.

Wis. Adm. Code NR 630.21-22; 40 CFR 264, Subpart D - Contingency Plan and Emergency Procedures. These regulations establish substantive requirements for emergency planning which are relevant and appropriate for on-site activities which may involving handling of hazardous substances.

Wis. Adm. Code NR 675; 40 CFR 268 - Land Disposal Restrictions. These regulations require that hazardous wastes cannot be land disposed unless they satisfy specified treatment standards. These regulations also impose record

keeping requirements on such wastes. These requirements apply to on-site activities related to off-site disposal of any treatment residues or other hazardous wastes. Wis. Adm. Code NR 605 - 40 CFR 261 - Identification of Hazardous Wastes. This code provides requirements for determining when a waste is hazardous. The substantive requirements of these regulations will apply to any on-site TCLP testing of residuals which may be disposed of off-site.

Resource Conservation and Recovery Act, as amended [42 U.S.C. Sec. 6901 et seq.], Subtitle D; Wisconsin Environmental Protection Law, Subchapter IV - Solid Waste [Wis. Stat. Sec. 144.43-47]

The Department has determined that the RCRA Subtitle D closure standards for new or expanding solid waste disposal sites (composite cover system requirements) are not relevant and appropriate requirements at this time because they would be no more effective for reducing infiltration and surface soil exposure than a s. NR 504.07, Wis. Adm. Code, composite cover system, which was evaluated in the FS. The Department reserves the right to re-examine the relevance and appropriateness of the cover system requirements in the future, based on design considerations.

The following requirements are applicable:

Wis. Adm. Code NR 504: - Landfill Location, Performance, and Design Criteria - This code specifies locational criteria, performance standards and minimum design requirements for solid waste disposal facilities.

Wis. Adm. Code NR 504.04, 506.08(6), 506.07, 508.04 - Landfill Gas Control - These codes establish standards for landfill gas control and monitoring practices. These requirements apply to the landfill gas recovery operations at the site.

Wis. Adm. Code NR 506.08 - Additional Closure Standards - This code requires runoff control from closed portions of a landfill. These requirements also apply during construction activities at the Site. In addition, this requirement establishes hazardous air contaminant control for facilities over 500,000 cubic yards.

Wis. Adm. Code NR 504.07, 506.08, 514.07, and 516 - Landfill Closure Requirements - These codes establish substantive requirements for design, operation and maintenance of landfill caps which are applicable to the design and long-term maintenance of the cover system.

Wis. Adm. Code NR 508 - Landfill Monitoring, Remedial Actions and In-field Conditions Reports - This code specifies monitoring requirements for groundwater, leachate, gas, surface water and air.

Wis. Adm. Code NR 512.18 - Borrow Reports - This code establishes the requirements for soil borrow reports.

Wis. Adm. Code NR 700-736 - Investigation and Remediation of Environmental

Contamination - This code specifies standards and procedures pertaining to the identification, investigation, and remediation of sites.

Wis. Adm. Code NR 141 - Monitoring Well Requirements - Any new or replacement monitoring wells shall meet these requirements.

Occupational Safety and Health Administration (OSHA) - Regulates worker safety.

Clean Water Act of 1977, as amended [33 U.S.C. Sec. 1317]

Wis. Adm. Code 108 and 211; 40 CFR 403 - Pretreatment Standards - These regulations prohibit discharges to POTWs which pass through or interfere with the operation or performance of the POTW. The requirements of these regulations apply to the leachate which is collected and discharged to the Milwaukee Metropolitan Sewerage District.

Wis. Adm. Code NR 147, NR 214- Pollution Discharge Elimination - These regulations require point source discharges to obtain a permit from the WDNR. The requirements of the existing permit for the pond discharge and any new treated leachate discharge, if necessary, shall apply.

2. Chemical Specific ARARs

Clean Air Act [42 U.S.C. Sec. 7401 et seq;]; Wisconsin Environmental Protection Law, Subchapter III - Air Pollution [Wis. Stat. 144.30-144.426]

Wis. Adm Code 404, 415-449; 40 CFR 50 - Emissions Standards. These codes establish standards for emission of pollutants into ambient air and procedures for measuring specific air pollutants. These requirements apply to the emissions from the active gas extraction system.

Safe Drinking Water Act [40 U.S.C. Sec. 300 et seq.]

Wis. Adm. Code NR 109; 40 CFR 141 - Maximum Contaminant Levels (MCLs) - MCLs establish drinking water standards for potential and actual drinking water sources. The selected remedy is intended to achieve compliance with MCLs and non-zero Maximum Contaminant Level Goals.

Wis. Adm. Code NR 140 - Groundwater Quality Standards - This code provides for groundwater quality standards including Preventive Action Limits (PALs), Enforcement Standards (ESs) and (Wisconsin) Alternative Concentration Limits (WACLs). The selected remedy is intended to achieve compliance with PALs at and beyond the waste boundary (edge of waste, or edge of the slurry cut-off wall). To the extent the Department subsequently determines that it is not technically or economically feasible to achieve PALs, NR 140.28 provides substantive standards for granting exemptions from the requirement to achieve PALs. Such exemption levels may not be higher than the ESs, for the compounds of concern at this site.

Clean Water Act of 1977, as amended [33 U.S.C. Sec. 1311-17]; Wisconsin

Environmental Protection Law, Subchapter II - Water and Sewage [Wis. Stat. Se. 144.02-27]

Wis. Adm. Codes NR 102, 105, and 220 - Surface water quality standards. NR 102 prohibits toxic substances in surface waters at concentrations which adversely affect public health or welfare, present or prospective water supply uses, or protection of animal life. NR 105 sets compound-specific surface water quality standards. The selected remedy will achieve compliance with any requirements of these regulations for discharges to surface water from the ponds or potential leachate treatment, if necessary, including NR 220, Wis. Adm. Code WPDES Best Available Techrology (BAT) requirements.

Wis. Adm. Code NR 207; 40 CFR 131 - Ambient Water Quality Criteria. Establishes pollutant concentration limits to protect surface waters. These and other water pollution discharge limits are administered under the Wisconsin Pollutant Discharge Elimination System (WPDES) permit program. The selected remedy shall satisfy both general and specific substantive requirements for discharge to surface water. Any wastewater discharged to a surface water must, if necessary, be treated to satisfy these standards prior to discharge. These treatment requirements are administered under NR 200 and 220, Wis. Adm. Code.

3. Location Specific ARARs

Clean Water Act of 1977, as amended [33 U.S.C. Sec. 1344]

Wis. Adm. Code NR 103 - Water Quality Standards for Wetlands; Executive Order 11990 and 40 CFR 6 - Protection of Wetlands - These requirements provide protection against loss or degradation of wetlands. A wetland is located south of the Boundary Road site. The proposed remedy should not have an adverse impact on the nearby wetlanc. If wetlands are encountered at any off-site borrow sources, these requirements shall be met at those sources to minimize the impacts on those wetlards.

Ch. 30, Wis. Stats.

A permit may be required in accordarce with ch. 30, Stats., if remedial activities change ditches or streams at the site or borrow source sites.

C. Cost Effectiveness

The selected remedy provides for overall cost effectiveness. It is the lowest cost alternative that meets the threshold criteria.

D. Use of Permanent Solutions anc Alternative Treatment Technologies

The selected alternative represents the best balance of alternatives with respect to the nine evaluation criteria. The cover system eliminates the direct exposure pathway to contaminated surface soils and reduces the amount of leachate generated within the site. The leachate extraction measures will reduce the movement of contaminants away from the site. The existing slurry

cut-off wall and clay berm will further restrict contaminant movement. The active landfill gas extraction system provides for removal and treatment of additional contaminants and will effectively control the migration of landfill gases. Both leachate and gas will be treated.

E. Preference for Treatment as a Principal Element

By treating the waste mass with leachate and active gas extraction, the remedy satisfies the statutory preference for remedies that employ treatment of the principal contaminant threat to permanently and significantly reduce toxicity, mobility or volume through treatment.

RESPONSIVENESS SUMMARY

This Responsiveness Summary has been prepared to meet the requirements of Sections 113 (k) (2) (B) (iv) and 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires the United States Environmental Protection Agency (EPA) or the state, for state lead sites, to respond "... to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan or draft Record of Decision for the remedial action. The Responsiveness Summary addresses concerns by the public and potentially responsible parties (PRPs) in written and oral comments received by the state regarding the proposed remedy at the Boundary Road site.

A. Proposed Plan (PP) and Public Comment Period

The Proposed Plan for the site was made available for public comment in early February, 1995. A public meeting to explain the Proposed Plan, and to receive public comments was held on February 16, 1995. The public comment period was originally between February 16 and March 16, 1995, and was extended twice at the request of Waste Management of Wisconsin, Inc. (WMWI) for a total extension of 60 days (2 30-day extensions). All comments which were received by the Department prior to the end of the public comment period, including those expressed verbally at the public meeting, were considered in making the final decision and are addressed in this Responsiveness Summary.

B. Community Interest

Interest by residents near the site has not been high. However, significant comments were prepared by WMWI, their consultant and a local politician. All comments received by the Department, including those expressed verbally at the public meeting, were in opposition to the selection of alternative 4A and favored the selection of alternative 3.

C. Summary of Significant Public Comments

Comments received during the public comment period are summarized below. Some of the comments are paraphrased to effectively summarize them in this document. The source of the comments are shown in brackets, preceding each comment.

1. [WMWI, Rep. Lolita Schneiders, Wis. Manufacturers and Commerce, Montgomery Watson, Melvin Mueller] Since Alternatives 3, 4 and 4A all meet the threshold criteria for protectiveness, when considering the balancing criteria, Alternatives 3 and 4A are similar except for cost. Therefore, any additional cost associated with the implementation of Alternative 4A is unwarranted. The design assumptions used in the PP for the cost estimates are inappropriate. The cost estimates in the PP are inaccurate and the FS cost estimates should be used.

Response: Alternatives 3 and 4A differ under other balancing criteria, such

as effectiveness and implementability, as described in the Decision Summary. WMWI used different cost estimates than the Department in the FS and their comments, which showed a more significant cost difference between these 2 alternatives. Comments on the cost estimates are addressed below.

2. [WMWI] The PP should not have used a minimum slope specification for Alternative 3 that exceeds the s. NR 506.08, Wis. Adm. Code, minimum specification of 2% for the purposes of preparing the cost estimates.

Response: The Department approved the FS on the condition that a minimum slope goal for the design be 5%, but the minimum slope allowed be 2%. The subsequent PP contained some additional cost for placing additional soils to meet this goal. The Department agrees that for the purposes of the Decision Summary, the additional cost is not really necessary. As stated in the Decision Summary, the minimum slope requirement will be determined during the design.

3. [WMWI] The PP cost estimate for Alternative 3 should not include a contingency for importing up to 20% more clay. There is already a sufficient contingency volume at the site based on initial investigations.

Response: At the time the PP was prepared, the Department was concerned about the ability to locate a sufficient volume of acceptable clay at the site, accounting for the results of the preliminary soil investigation in the Remedial Investigation (RI) and the s. NR 504.05 Wis. Adm. Code, minimum clay specifications. Also, the preliminary investigation did not meet s. NR 512.18, Wis. Adm. Code, borrow source investigation requirements. Since that time, it has been proposed to make the s. NR 504 clay specification less stringent. The Department has now determined that any plan approval for the design would likely use the less stringent specifications. Therefore, the likelihood of finding a sufficient volume of clay has increased, so the Department now agrees that the 20% volume contingency is no longer necessary. However, an investigation meeting the goals of s. NR 512.18, Wis. Adm. Code, borrow source investigation will still be necessary at the site.

4. [WMWI] The drainage blanket in alternative 4A should extend over the entire cover area. The design described in the PP could have long-term stability problems due to liquids accumulation and slope stability problems. The placement of a frost protection/rooting layer directly over the geomembrane may be a problem due to the risk of angular rock and other foreign materials.

Response: The Department generally agrees with this comment and has accounted for it in the Decision Summary. The Department now believes that Alternative 4A would have implementability and reliability problems, as discussed in section VII.B. of the Decision Summary.

5. [WMWI] The Department should not rely on the contingencies in the cost estimates for specific items or activities, such as textured geomembrane on side slopes.

Response: The Department does not agree with this comment in this context. When preparing the cost estimates for the PP, the Department used engineering judgement to determine that a single cost per square foot estimate for plastic geomembrane would be generally accurate (in the correct range), conservative and would account for the relatively small additional cost for textured plastic membrane on steeper slopes. It should also be noted that per U.S. EPA guidance, cost estimates for this purpose have an error range of -30 to +50 percent. The Department still believes the estimate is correct for these purposes.

6. [WMWI] The unit cost for 40 mil VLDPE plastic geomembrane in the cost estimates should be $0.50 per square foot rather than $0.35 per square foot, based on vendor quotes and WMWI's experience. The actual type of membrane used should be left to the design phase.

Response: The Department believes the figure it used is correct in this context. The figure is based on estimates accepted for similar projects by the Solid Waste Program and was confirmed by information on bid prices for the Holtz-Krause site. The figure has further validity given the additional percentages used in the cost estimates for administration, engineering, a contingency and mobilization/demobilization.

7. [WMWI] The difference in total present worth costs between Alternatives 3 and 4A are not presented properly in the PP, due to the differences between the cost estimates used by the Department and WMWI, as described by the previous comments on the cost estimates.

Response: See the response to the comments relating to the cost estimates in this responsiveness summary.

8. [WMWI] The cost estimates are incomplete because they do not include actual cost estimates for leachate extraction in the northeast portion of the site, nor groundwater extraction south of the slurry wall, which are described in the remedies in the PP.

Response: The Department agrees that normally, cost estimates would include these items. However, given that all of Alternatives 2-4 and 4A would include the same dollar amount estimates for these systems, it doesn't make any difference from a **cost comparison basis** whether the items are there or not, as the costs for all the alternatives would go up equally. Therefore, the cost estimates may be used in the Proposed Plan and the Decision Summary for a comparison basis.

9. [WMWI, Montgomery Watson] The Department should use a formal CERCLA waiver for equivalent standard of performance for Alternative 4A, because it does not meet state landfill standards under s. NR 504.07, Wis. Adm. Code.

Response: The Department disagrees. The design, as presented, meets the requirements of s. NR 504.07, Wis. Adm. Code, because par. (4)(intro.) gives the Department the ability to approve such alternative designs. No waiver is needed.

10. [WMWI] The PP is inconsistent with U.S. EPA's Phased Implementation of Remedies guidance, because Alternatives 3 and 4A are described differently than the FS.

Response: The Department disagrees and believes the alternatives presented in PP and the Decision Summary are consistent with the referenced guidance. The Department-described alternatives are implemented in a phased approach, with the implementation of several remedy elements being dependent on the results of the initial elements. These include:

a. Groundwater extraction south of the slurry wall is conditional on the results of source removal south of the wall and additional investigations.

b. Actions to minimize leachate movement away to the west, north and east and to minimize groundwater infiltration into the site at the edges are conditioned on the effectiveness of the initial actions. Additional studies will determine if these actions are necessary.

c. Actions to remediate groundwater to the north and east of the site are also conditioned on the effectiveness of the initial actions. Again, additional studies will determine if these actions are necessary.

11. [WMWI] Repair of a geomembrane cover is more difficult and costly than a soil cover, especially if significant settlement occurs, which is expected at this site if leachate and landfill gas removal are to be implemented.

Response: The Department generally agrees with this comment and has accounted for it in the Decision Summary. See section VII.B. of the Decision Summary for a discussion of this.

12. [WMWI] The installation of additional leachate extraction measures in the northern portion of the site is not necessary at this time and was not justified in the PP.

Response: The Department believes the results of the remedial investigation showed that this action is necessary, and documented the reasons in the conditional FS approval letter. As stated in that letter, the action is necessary to minimize the amount of leachate escaping through the base and sides of the site, as there are downward gradients within the site, contamination has already migrated away from the sides in some areas, and if this migration continues, there continues to be the potential for additional surface and/or groundwater contamination away from the edges of the site. The Department does not believe that extracting leachate only from the southern portion of the site from the existing leachate collection system would have a significant enough effect on the leachate head levels in the northern portions of the site to effectively minimize the migration of leachate away from the site.

13. [WMWI] Groundwater extraction in the TW-24 area is not warranted as an

initial action. WMWI should be given the opportunity to investigate the source(s) of this contamination first and remove it.

Response: The Department generally agrees that an investigation and additional monitoring should be conducted before any groundwater extraction system is installed. As described in the decision document, a 3-year effort would be made to investigate this area. Groundwater extraction measures would have to be installed after the 3-year investigation and monitoring period, unless it is shown that there is a significant improvement in groundwater quality in that area, showing a trend towards meeting ch. NR 140, Wis. Adm. Code, PALs within a reasonable amount of time (as determined by applying the criteria listed in s. NR 722.07(4)(a)4, Wis. Adm. Code).

14. [WMWI] The PP is misleading because it identifies "Current Exposures that Could Cause Risk". There are no current actual uses that would lead to the exposure scenario described.

Response: The Department does not believe the title is misleading, once the introduction to the section is considered. The section referred to in the PP refers to risks from using contaminated groundwater from monitoring wells. The introduction to this section states that the theoretical risk to people was calculated, based on current and assumed future site use. One of the current uses of the groundwater near the site is for drinking and showering. A clearer title may have been "Current Theoretical Exposures that Could Cause Risk".

15. [WMWI, Wis. Manufacturers and Commerce, Montgomery Watson] The Department's statements in the PP alleging the increased reliability associated with the cover in Alternative 4A, over Alternative 3 are not supported by the FS. Soil covers have been consistently and routinely implemented as remedial components at waste sites. It is unclear how the Department could now question the reliability of such systems.

Response: The Department performed its own analysis in the PP and did not rely only on the FS. The Department was not questioning the reliability of soil cover systems in the PP, only indicating that composite systems are more reliable at reducing infiltration. The Department indicated in the PP and still believes that the composite cover alternatives are more reliable for reducing infiltration into the site than the soil cover alternative, Alternative 3.

16. [WMWI] The Department's statements in the PP alleging the increased effectiveness associated with the cover Alternative 4A, over that provided by the cover in Alternative 3, are not supported by the FS. Establishing and maintaining inward gradients utilizing leachate extraction is the action that will reduce the movement of leachate to groundwater. This is primarily a function of the capabilities of the extraction network and the rate of leachate extraction. The difference in time between Alternatives 3 and 4A to achieve inward gradients is insignificant.

Response: The Department performed its own analysis in the PP and did not

rely only on the FS. The Department generally agrees that if aggressive leachate extraction is implemented and maintained for Alternative 3 that the time to achieve inward gradients may be similar for the alternatives

17. [WMWI] The Department's statements in the PP alleging increased protectiveness associated with the cover Alternative 4A. over that provided by the cover in Alternative 3. are not supported by current research or the FS. The infiltration rate is not inversely related to the ability or time required to meet cleanup goals. Recent case studies and research show that additional infiltration may help to accelerate cleanup by expediting stabilization of landfill refuse (the landfill bioreactor theory). As described in the FS. as long as containment is maintained. the remedies are equivalent in terms of protectiveness.

Response: The Department performed its own analysis in the PP and did not rely only on the FS. Again. the Department generally agrees that if aggressive leachate extraction is implemented and maintained for Alternative 3 that the time to achieve inward gradients may be similar for the alternatives. The Department agrees that maintaining additional refuse saturation in a contained environment may accelerate anaerobic decomposition. but at the increased risk of loosing containment effectiveness. Because of that potential risk. new landfills that are completely lined must minimize the amount of leachate ponding on the base of the site. Should a portion of the base liner fail. higher leachate head levels would cause more leachate to escape from the site. because the higher levels would act as an additional driving force. Allowing higher leachate head levels within this site. which is unlined. increase the chances of migration away from the sides and bottom of the site. Therefore. the selected remedy includes achieving and maintaining "dry base" conditions.

18. [WMWI] The statements that alternative 4 and 4A are expected to meet standards more quickly than Alternative 3 because they allow less water to filter into the site are not correct. Stabilization of the waste would be accomplished more quickly with additional infiltration into the site. Compliance with ARARs is a threshold criteria: alternatives either comply or they do not. The time until standards may be achieved as a result of remedial actions should not be considered as part of the evaluation of ARARs criteria.

Response: As indicated above. the Department generally agrees that with aggressive leachate extraction. Alternative 3 may achieve remedial goals in a similar time frame to Alternatives 4 and 4A. The point on stabilization of saturated waste is addressed in the previous comment. The Department disagrees with the last point; ch. NR 140 requires that groundwater standards be achieved in a reasonable amount of time (as determined by applying the criteria listed in s. NR 722.07(4)(a)4. Wis. Adm. Code). when it is technically and economically feasible. Alternatives that achieve standards more quickly that are technically and economically feasible should be selected to meet those requirements.

19. [WMWI] Statements in the PP identifying decreased soil and transportation needs for Alternative 4A relative to Alternative 3 are not factual or

supported by the FS. Additional material for a drainage layer would have to be imported for Alternative 4A.

Response: The statements in the PP on importing soil are correct for the alternatives evaluated in the PP. Alternative 3 in the PP assumed that 100,800 cubic yards of additional clay and rooting zone material would have to be imported. Alternative 4A assumed that the only soil to be imported would be 16,100 cubic yards of drainage material sand. The revised Alternative 3 in the Decision Summary follows the volumes described in the FS, where 72,000 cubic yards of rooting zone material are imported.

20. [Melvin Mueller] It is difficult to understand why the existing conditions at the site warrant a multi-million dollar cleanup effort. The fact that the site has been closed for 25 years, the degree and extent of the contamination is minimal, and there are no water supply wells impacted by the landfill do not seem to justify the costs associated with either Alternative 3 or 4A.

Response: Based on the results of the RI, the site does pose an existing and potential future risk to human health and the environment and state groundwater standards are exceeded, as described in the Decision Summary. Therefore, a cleanup action is warranted. Also, a goal of the remedial action is to prevent future additional groundwater impacts, and potential future impacts on private wells. Given the size and nature of the site, all the ARAR-compliant actions examined do have total present worth costs of several million dollars (the "no-action" alternative does too, due to the O&M costs). Soil covers, gas collection systems and monitoring costs at a site of this nature have total present worth costs in the several million dollar range.

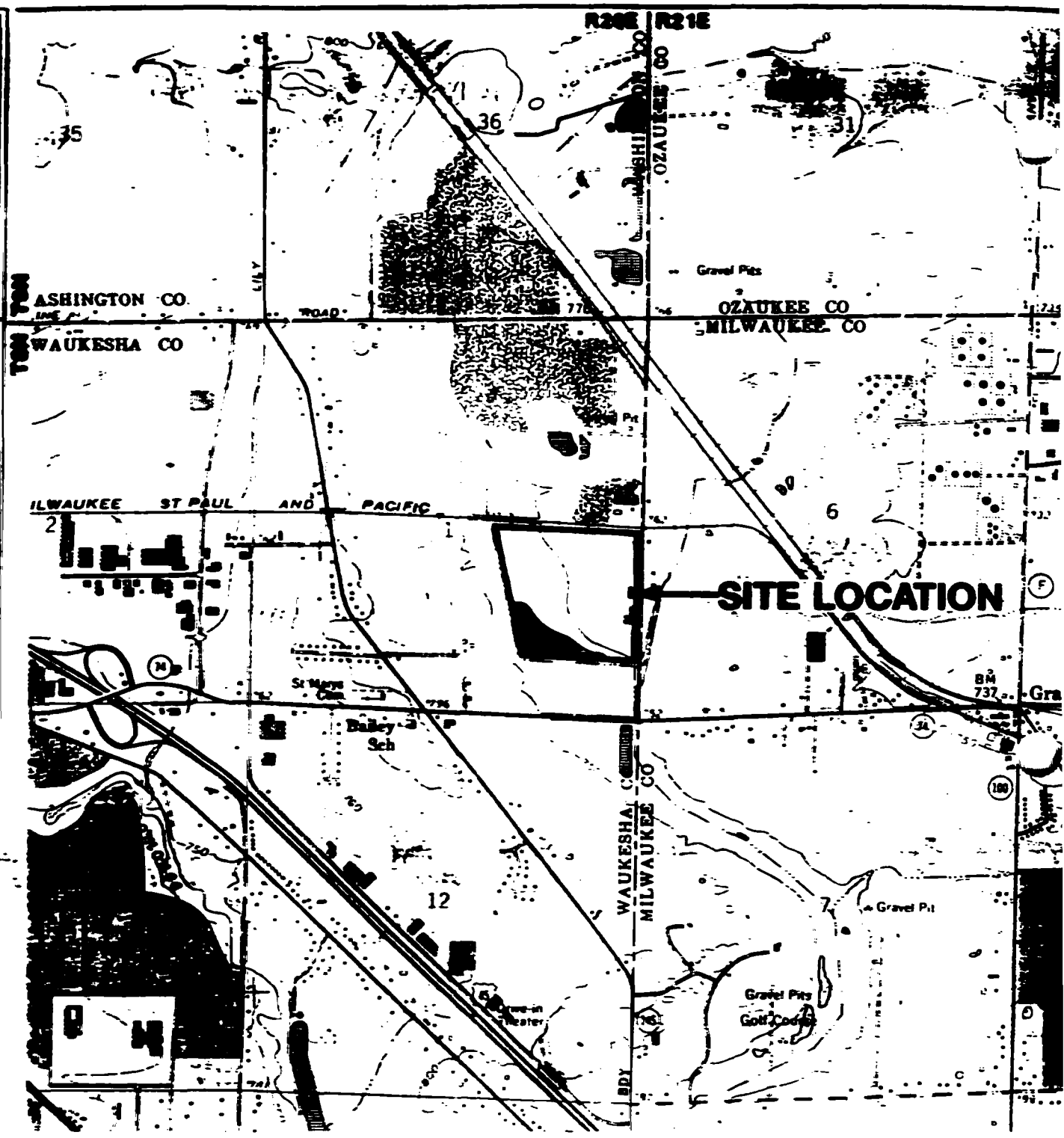


FIGURE 1

NOTES

1. BASE MAP DEVELOPED FROM THE MENOMONEE FALLS, WISCONSIN, 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP, DATED 1958, PHOTOREVISED 1971 & 1976.

north

0 2000 400

SCALE IN FEET

Developed By: DJW Drawn By: DLF

Approved By: [signature] Date: 4-26-13

Reference:

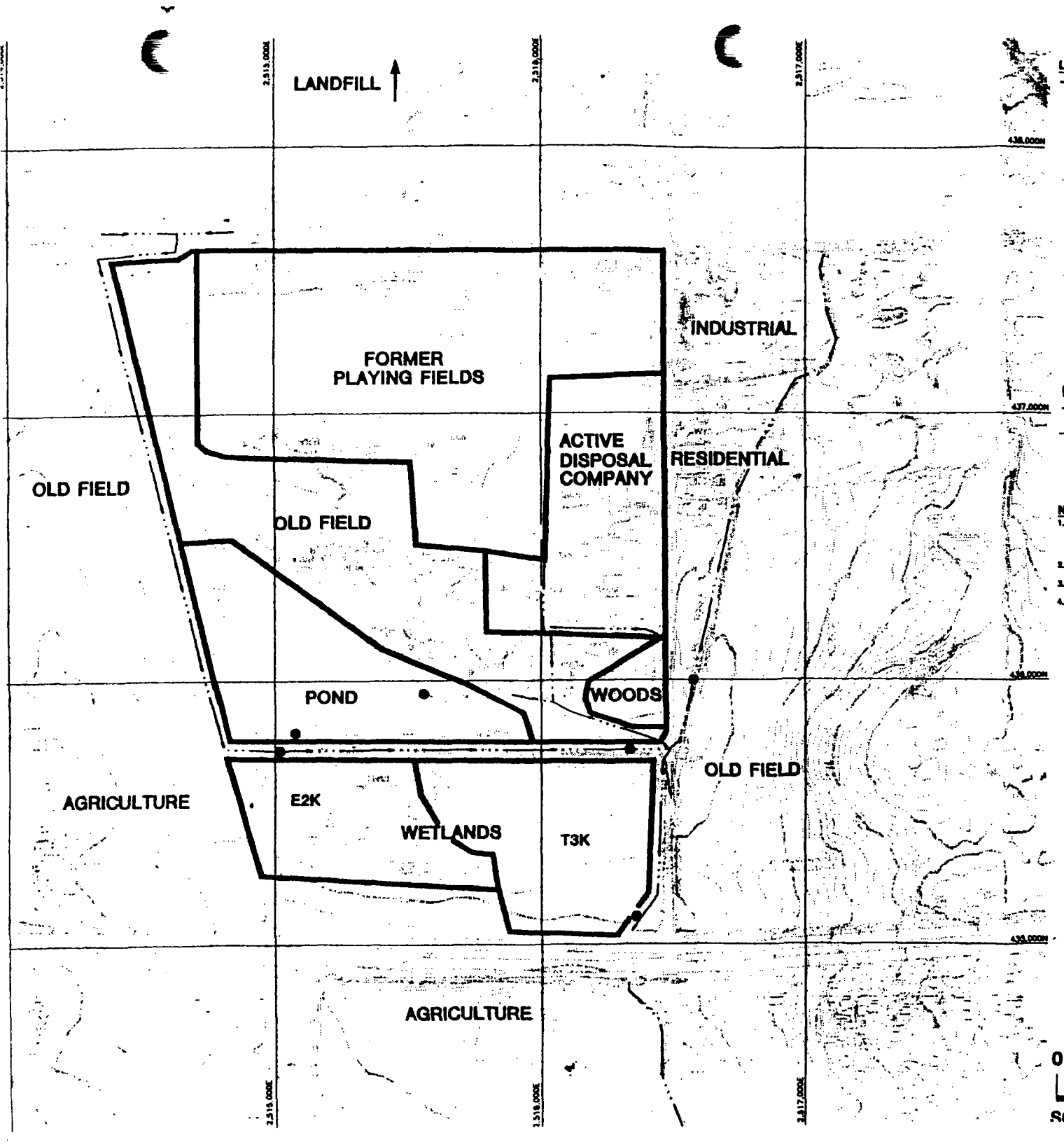
Revisions:

SITE LOCATION MAP

FEASIBILITY STUDY
BOUNDARY ROAD LANDFILL
WASTE MANAGEMENT OF WISCONSIN, INC.
VILLAGE OF MENOMONEE FALLS
WAUKESHA COUNTY, WISCONSIN

Drawing Number
1537101

WARZYN INC.



LEGEND

- GROUND CONTOUR
- DEPRESSION
- BUILDING
- TREES AND SHRUBS
- FENCE LINE
- PAVED ROAD
- ACCESS ROAD
- SURFACE WATER
- WETLANDS
- TEMPORARY GAS PROBE LOCATION AND NUMBER
- LEACHATE HEAD AND GAS WELL LOCATION AND NUMBER
- GROUNDWATER OBSERVATION WELL LOCATION AND NUMBER
- PIEZOMETRIC WELL LOCATION AND NUMBER
- LEACHATE COLLECTION SYSTEM MANHOLE LOCATION AND NUMBER
- STAFF GAUGE LOCATION AND NUMBER
- PRIVATE WELL LOCATION AND NUMBER
- AQUATIC MACROINVERTEBRATE SAMPLING AREA
- E2K EMERGENT, NARROW-LEAF PERSISTENT, WET SOIL, PALUSTRINE WETLAND
- T3K FORESTED, BROAD-LEAF DECIDUOUS, WET SOIL, PALUSTRINE WETLAND
- DRAINAGE SWALE AND FLOW DIRECTION

NOTES

1. BASE MAP WAS PROVIDED BY WASTE MANAGEMENT OF WISCONSIN, INC. AND IS AN AERIAL SURVEY PERFORMED BY AERO-METRIC ENGINEERING, INC., SHEBOYGAN, WISCONSIN, FLOWN APRIL 28, 1991.
2. TOPOGRAPHY IS BASED ON U.S.G.S. DATUM.
3. TOPOGRAPHIC CONTOUR INTERVAL IS TWO FEET.
4. GRID BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM.

FIGURE 2

north

0 400 800

SCALE IN FEET

Developed By: DJW Drawn By: JSL Date: 4-26-93

Approved By: [signature]

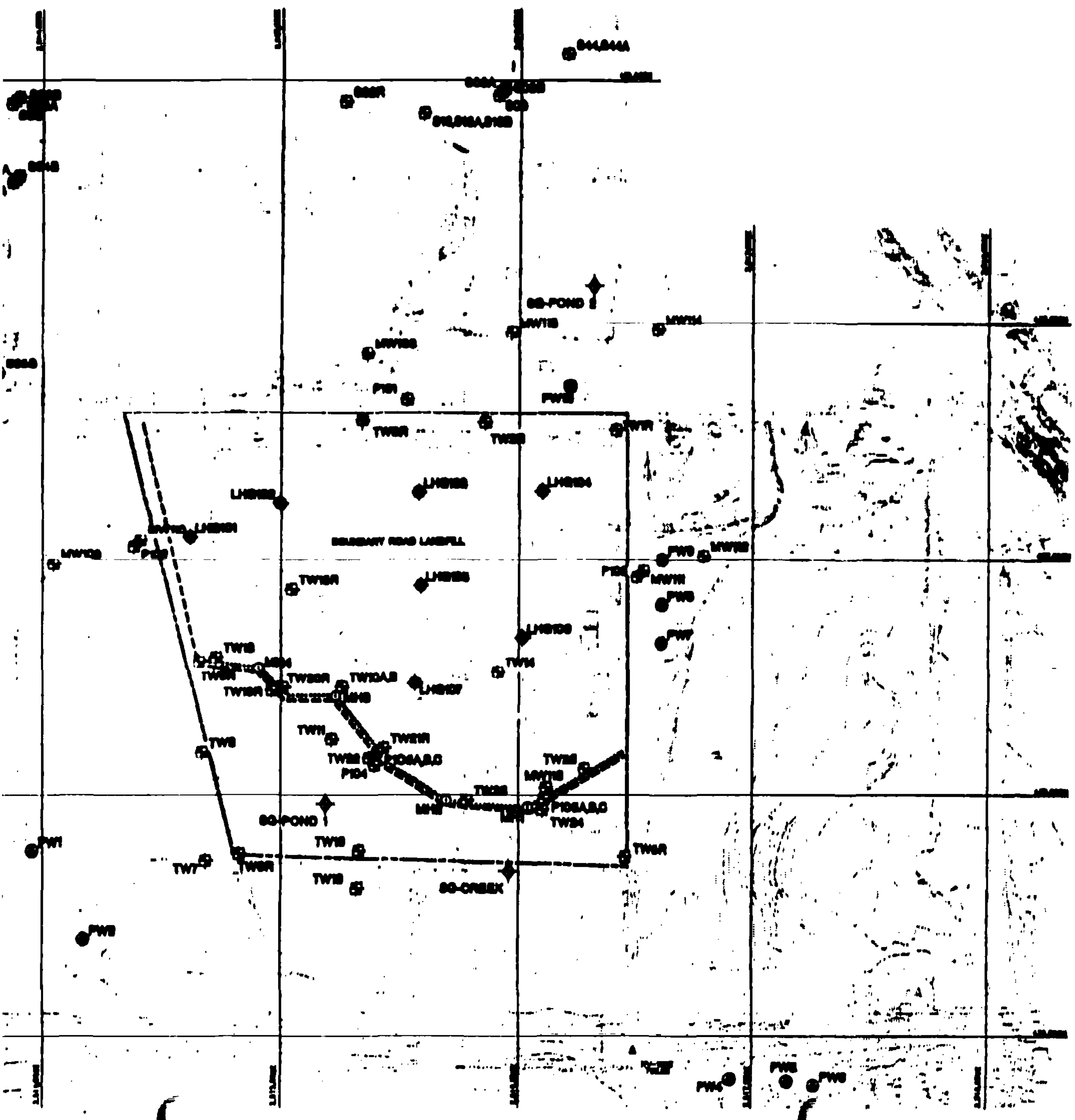
References: 1537101-B15

Revisions:

ECOLOGICAL FEATURES MAP

FEASIBILITY STUDY
BOUNDARY ROAD LANDFILL
WASTE MANAGEMENT OF WISCONSIN, INC.
VILLAGE OF MENOMONEE FALLS, WAUKESHA COUNTY, WISCONSIN

Drawing Number
1537101 B20



LEGEND

GROUND CONTOUR

DEPRESSION

BUILDING

TREES AND SHRUBS

FENCE LINE

PAVED ROAD

ACCESS ROAD

SURFACE WATER

WETLANDS

LEACHATE HEAD AND GAS WELL LOCATION AND NUMBER

GROUNDWATER MONITORING WELL LOCATION AND NUMBER

PIEZOMETRIC WELL LOCATION AND NUMBER

LEACHATE COLLECTION SYSTEM MANHOLE LOCATION AND NUMBER

APPROXIMATE PROPERTY LINE

LEACHATE COLLECTION LINE

CLAY BERM

SLURRY WALL

STAFF GAUGE LOCATION AND NUMBER

PRIVATE WELL LOCATION AND NUMBER

NOTES

1. BASE MAP WAS PROVIDED BY WASTE MANAGEMENT OF WISCONSIN, INC. AND IS AN AERIAL SURVEY PERFORMED BY AERO-METRIC ENGINEERING, INC., SHEBOYGAN, WISCONSIN, DATED OCTOBER 21, 1992.
2. TOPOGRAPHY IS BASED ON U.S.G.S. DATUM.
3. TOPOGRAPHIC CONTOUR INTERVAL IS TWO FEET
4. GRID BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM.
5. ALL WELLS AND MONITORING POINTS INDICATED BY "LGP", "LHG", "MW", AND "TW-R" WERE INSTALLED BY EXPLORATION TECHNOLOGY, INC., UNDER THE SUPERVISION OF WARZYN INC., FROM SEPTEMBER 24, 1991 TO OCTOBER 31, 1991. WELLS MW14 AND MW15 WERE INSTALLED ON OCTOBER 7, 1992 AND OCTOBER 27, 1992, RESPECTIVELY. BOREHOLE LOGS AND WELL CONSTRUCTION REPORTS ARE LOCATED IN APPENDIX A AND B OF THE REMEDIAL INVESTIGATION REPORT (WARZYN PROJECT NO. 1537101, JULY 1993).
6. ALL WELLS WERE SURVEYED BY NATIONAL SURVEY ON NOVEMBER 20-21, 1991, AND DECEMBER 2, 1992. ALL OTHER SURVEY DATA RECEIVED FROM WASTE MANAGEMENT OF WISCONSIN, INC.

FIGURE 3

north

0 500 1000

SCALE IN FEET

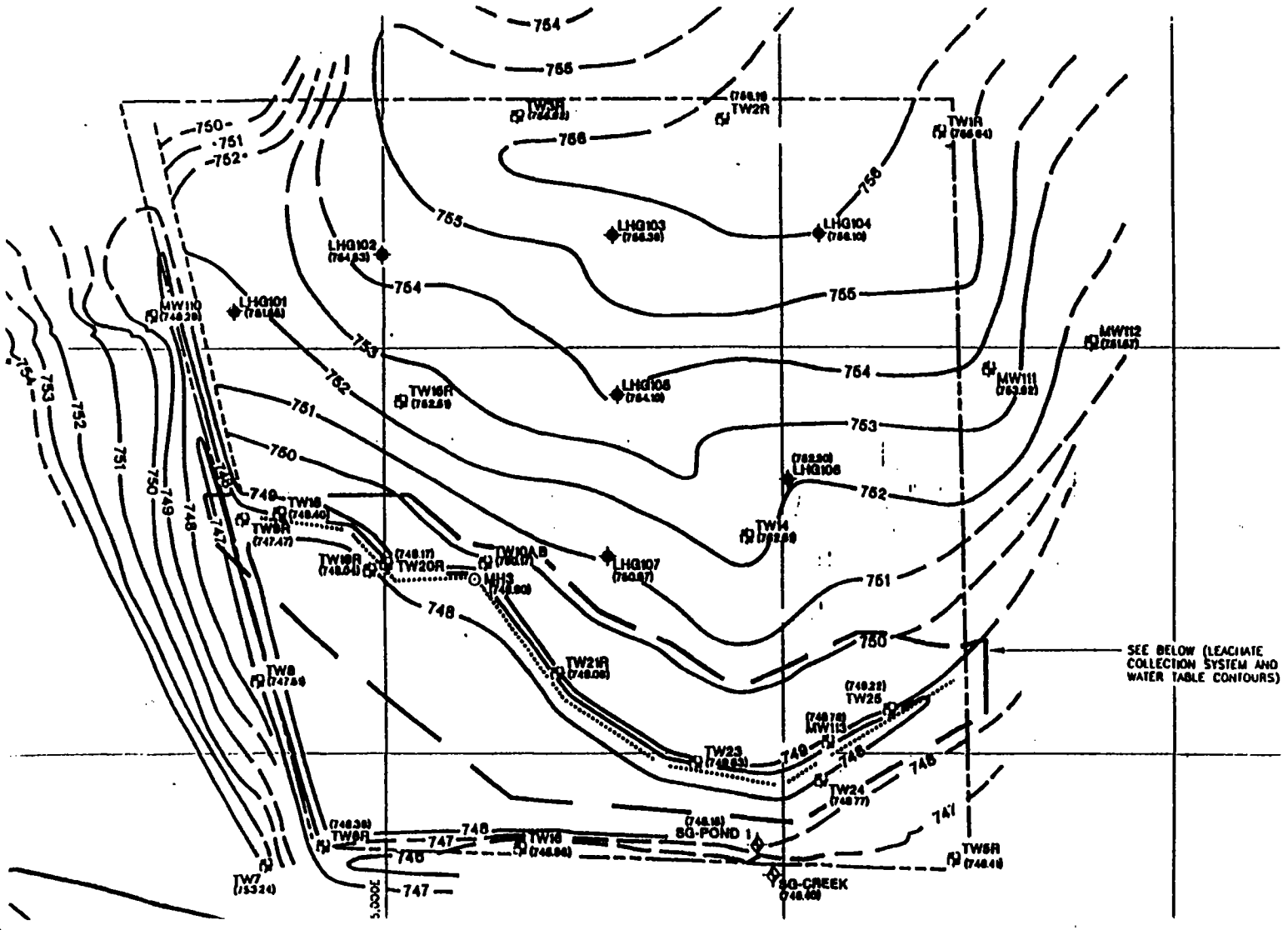
Developed By: DJW Drawn By: TPB/LCL
Approved By: [signature] Date: 9-26-93
Reference: 1537101-07
Revisions: △1 REVISED HERE NO 5, DLF …/93 DJW

SITE FEATURES AND MONITORING WELL LOCATION MAP

FEASIBILITY STUDY
BOUNDARY ROAD LANDFILL
WASTE MANAGEMENT OF WISCONSIN, INC.
VILLAGE OF MENOMONEE FALLS, WAUKESHA COUNTY, WISCONSIN

Drawing Number
1537101 B22

Figure 4 - Groundwater/Leachate Elevations on May 8, 1992



LEGEND

- BUILDING
- TREES AND SHRUBS
- FENCE LINE
- PAVED ROAD
- ACCESS ROAD
- SURFACE WATER
- WETLANDS
- LGP1R — TEMPORARY GAS PROBE LOCATION AND NUMBER
- P1R — PIEZOMETRIC WELL LOCATION AND NUMBER
- MH1 — LEACHATE COLLECTION SYSTEM MANHOLE LOCATION AND NUMBER
- PW1 — PRIVATE WELL LOCATION AND NUMBER
- APPROXIMATE PROPERTY LINE
- LEACHATE COLLECTION LINE
- CLAY BERM
- SLURRY WALL
- TW5R — GROUNDWATER MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION
- LHG105 — LEACHATE HEAD AND GAS WELL LOCATION, NUMBER, AND LEACHATE/WATER TABLE ELEVATION
- SG-CREEK — STAFF GAUGE LOCATION, NUMBER, AND SURFACE WATER ELEVATION
- MH9 — LEACHATE COLLECTION SYSTEM MANHOLE LOCATION, NUMBER AND WATER TABLE ELEVATION
- 747 — WATER TABLE CONTOUR (CONTOUR INTERVAL 1 FT, DASHED WHERE INFERRED)

NOTES

1. BASE MAP WAS PROVIDED BY WASTE MANAGEMENT OF WISCONSIN, INC. AND IS AN AERIAL SURVEY PERFORMED BY AERO-METRIC ENGINEERING, INC., SHEBOYGAN, WISCONSIN, FLOWN APRIL 28, 1991.
2. GRID BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM.
3. ALL WELLS AND MONITORING POINTS INDICATED BY "LGP", "LHG", "MW", AND "TW-R" WERE INSTALLED BY EXPLORATION TECHNOLOGY, INC., UNDER THE SUPERVISION OF WARZYN INC., FROM SEPTEMBER 24, 1991 TO OCTOBER 31, 1991. BOREHOLE LOGS AND WELL CONSTRUCTION REPORTS ARE LOCATED IN APPENDIX A AND B. BOREHOLE LOGS AND CONSTRUCTION REPORTS FOR ALL "TW" WELLS ARE LOCATED IN THE "MONITOR WELL EVALUATION REPORT" (HYDRO-SEARCH, 1991).
4. ALL WELLS WERE SURVEYED BY NATIONAL SURVEY ON NOVEMBER 20-21, 1991.
5. WATER TABLE ELEVATIONS OBTAINED BY WARZYN INC., ON MAY 8, 1992.

Figure 5 - Groundwater Monitoring Well VOC Results

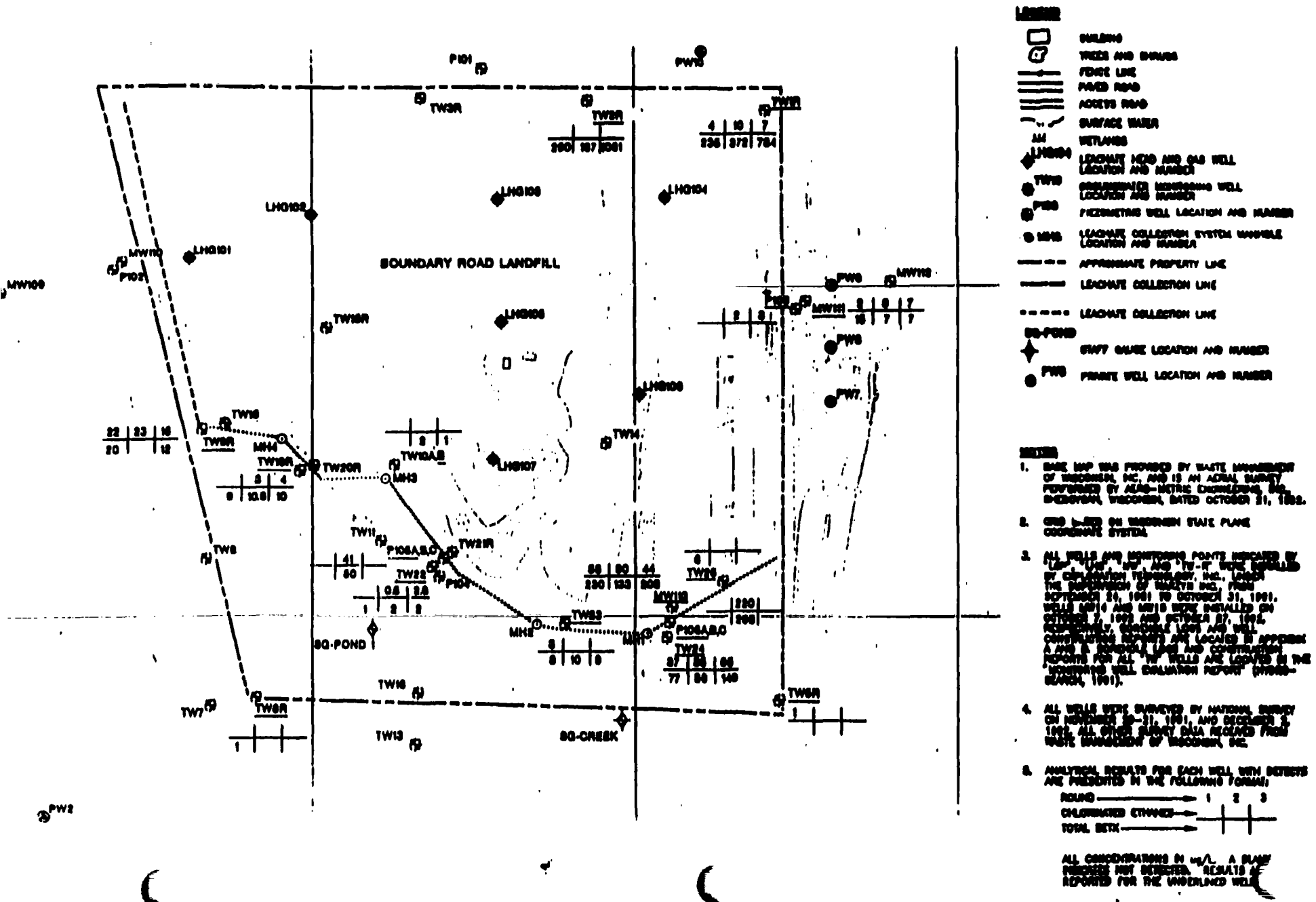


TABLE 1

Summary of Groundwater Monitoring Well
Data Exceeding Federal and/or State Regulations
Boundary Road Landfill Feasibility Study

BACKGROUND WELLS

Well	Parameter	Sampling Date	Maximum Concentration	NR 140(1) ES(2)	NR 140(1) PAL(3)
MW109	Chloride (mg/L)	11/18/91	160	250	125
		3/30/92	138	250	125
		5/18/92	127	250	125
	Manganese (ug/L)	11/18/91	170	50	25
		3/30/92	85	50	25
MW110	Aluminum (ug/L)	11/18/91	379	--	--
	Arsenic (ug/L)	11/18/91	6.1	50	5
	Iron (ug/L)	11/18/91	402	300	150
		3/31/92	710	300	150
	Manganese (ug/L)	11/18/92	96.5	50	25
		3/31/92	37	50	25
		5/18/92	49	50	25
P102	Antimony (ug/L)	3/31/92	5.5	6	1.2
		5/18/92	11.4	6	1.2
	Arsenic (ug/L)	11/20/91	7.5	50	5
		3/31/92	5.8	50	5
		5/18/92	6.9	50	5
P103	Antimony (ug/L)	4/1/92	5.3	6	1.2

TW7	Antimony (ug/L)	3/31/92	6.8	6	1.2

WELLS OUTSIDE WASTE MANAGEMENT AREA
(Not Including Background Wells)

Well	Parameter	Sampling Date	Maximum Concentration	NR 140(1) ES(2)	NR 140(1) PAL(3)
MW111	Arsenic (ug/L)	11/19/91	16.7	50	5
		4/1/92	9.2	50	5
		5/19/92	9.1	50	5
	Barium (ug/L)	11/19/91	706	2.000	400
		4/1/92	658	2.000	400
		5/19/92	637	2.000	400
	Benzene (ug/L)	11/19/91	15	5	0.5
		4/1/92	7	5	0.5
		5/19/92	7	5	0.5
	Chloride (mg/L)	11/19/91	462	250	125
		4/1/92	374	250	125
		5/19/92	389	250	125
	Iron (ug/L)	11/19/91	1.770	300	150
		4/1/92	2.240	300	150
		5/19/92	2.460	300	150
	Manganese (ug/L)	11/19/91	456	50	25
		4/1/92	814	50	25
		5/19/92	975	50	25
	Nickel (ug/L)	11/19/91	29.5	100	20
		4/1/92	24	100	20
	1.1.2.2-Tetra-chloroethane (µg/l)	4/1/92	2	0.2	0.02
	THF (ug/L)	5/19/92	78	50	10

MW112	Chloride (mg/L)	11/19/91	350	250	125
		4/1/92	296	250	125
		5/18/92	322	250	125
	Iron (ug/L)	11/19/91	1,260	300	150
		4/1/92	453	300	150
		5/18/92	901	300	150
	Manganese (ug/L)	11/19/91	299	50	25
		4/1/92	399	50	25
		5/18/92	340	50	25
	Sulfate (mg/L)	11/19/91	151	250	125
		4/1/92	138	250	125
		5/18/92	140	250	125
	THF (ug/L)	5/18/92	25	50	10
MW114	Antimony (ug/L)	12/4/92	6.2	6	1.2
	Benzene (ug/L)	11/2/92	2	5	0.5
	Chloride (mg/L)	11/2/92	238	250	125
		12/4/92	255	250	125
	Manganese (ug/L)	11/2/92	65	50	25
		12/4/92	26	50	25
MW115	Cadmium (ug/L)	12/4/92	2.9	5	0.5
	Manganese (ug/L)	11/2/92	2,300	50	25
		12/4/92	2,360	50	25
P103	Arsenic (ug/L)	4/1/92	5.3	50	5
	Chloride (mg/L)	11/19/91	159	250	125
		4/1/92	157	250	125
		5/19/92	219	250	125

	Manganese (ug/L)	11/19/91	28.7	50	25
		4/1/92	68	50	25
		5/19/92	134	50	25
TW5R	Antimony (ug/L)	3/31/92	5.5	6	1.2
		5/19/92	6.8	6	1.2
	Barium (ug/L)	11/20/91	413	2.000	400
	Chloride (mg/L)	11/20/91	377	250	125
		3/31/92	265	250	125
		5/19/92	219	250	125
	Manganese (ug/L)	11/20/91	1.350	50	25
		3/31/92	1.200	50	25
		5/19/92	572	50	25
	Nickel (ug/L)	3/31/92	30/29 (dup)	100	20
		5/19/92	26	100	20
TW6R	Antimony (ug/L)	3/31/92	5.5	6	1.2
	Arsenic (ug/L)	11/19/91	7.6	50	5
	Benzene (ug/L)	11/19/91	1	5	0.5
	Manganese (ug/L)	11/19/91	41.6	50	25
TW7	Antimony (ug/L)	3/31/92	6.8	6	1.2
TW8	Antimony (ug/L)	3/31/92	15.1	6	1.2
TW11	Antimony (ug/L)	5/20/92	18.3	6	1.2
	Sulfate (mg/L)	11/20/91	258	250	125
		4/1/92	287	250	125
		5/20/92	448	250	125

		4/1/92	6,790	300	150
		5/19/92	5,830	300	150
	Manganese (ug/L)	11/21/91	136	50	25
		4/1/92	138	50	25
		5/19/92	126	50	25
	Nickel (µg/l)	4/1/92	64/62 (dup)	100	20
		5/19/92	79	100	20
	Sulfate (mg/L)	11/21/91	605	250	125
		4/1/92	182	250	125
		5/19/92	156	250	125
	THF (ug/L)	5/19/92	43	50	10
TW24	Arsenic (ug/L)	11/20/91	25.3	50	5
		3/31/92	13.1	50	5
		5/20/92	13.5	50	5
	Benzene (ug/L)	11/20/91	77	5	0.5
		3/31/92	86	5	0.5
		5/20/92	140	5	0.5
	Chloride (mg/L)	11/20/91	432	250	125
		3/31/92	348	250	125
		5/20/92	289	250	125
	Iron (ug/L)	11/20/91	4,860	300	150
		3/31/92	2,570	300	150
		5/20/92	4,790	300	150
	Mercury (ug/L)	5/20/92	0.21	2	0.2
	Nitrate+Nitrite (mg/L)	11/20/91	5.22	10	2
	Nickel (µg/l)	11/20/91	41.1	100	20

TW13	Chloride (mg/L)	11/20/91	132	250	125
	Iron (ug/L)	11/20/91	586	300	150
		4/3/92	2.060	300	150
		5/18/92	3.400	300	150
	Manganese (ug/L)	11/20/91	186	50	25
		4/3/92	262	50	25
		5/18/92	311	50	25
	Sulfate (mg/L)	11/20/91	214	250	125
		4/3/92	184	250	125
		5/18/92	197	250	125
TW16	Iron (ug/L)	11/18/91	558	300	150
		4/1/92	857	300	150
		5/19/92	1.220	300	150
	Manganese (ug/L)	11/18/91	151	50	25
		4/1/92	240	50	25
		5/19/92	270	50	25
	Mercury (ug/L)	11/18/91	0.41	2	0.2
TW22	Antimony (ug/L)	5/19/92	15.6	6	1.2
	Benzene (ug/L)	11/21/91	1	5	0.5
		4/1/92	2	5	0.5
		5/19/92	2	5	0.5
	Chloride (mg/L)	11/21/91	140	250	125
		4/1/92	728	250	125
		5/19/92	889	250	125
	Iron (ug/L)	11/21/91	5.480	300	150

		5/21/92	6.2	50	5
	Iron (ug/L)	12/5/91	1,480	300	150
		5/21/92	678	300	150
	Manganese (ug/L)	12/5/91	26	50	25
PW7	Arsenic (ug/L)	12/5/91	7	50	5
		4/9/92	7.2	50	5
	Iron (ug/L)	12/5/91	955	300	150
		4/9/92	837	300	150
PW8	Arsenic (ug/L)	12/5/91	6.8	50	5
		4/9/92	7.2	50	5
	Iron (ug/L)	12/5/91	440	300	150
		4/9/92	346	300	150
PW9	Arsenic (ug/L)	12/5/91	8.2	50	5
		4/9/92	7.9	50	5
	Iron (ug/L)	12/5/91	297	300	150
		4/9/92	230	300	150
	Manganese (ug/L)	12/5/91	35	50	25
PW10	Arsenic (ug/L)	12/5/91	5.9	50	5
		4/9/92	5.5	50	5
	Iron (ug/L)	12/5/91	359	300	150
		4/9/92	336	300	150

Key:

MW, TW = Monitoring Wells
P = Piezometer
PW = Private Well

General Notes:

		3/31/92	45.2	100	20
		5/20/92	35.1	100	20
	Sulfate (mg/L)	11/20/91	1,000	250	125
		3/31/92	1,150	250	125
		5/20/92	984	250	125
	THF (ug/L)	3/31/92	17	50	10
		5/20/92	37	50	10
PW1	Arsenic (ug/L)	12/5/91	7	50	5
		4/9/92	7.2	50	5
	Iron (ug/L)	12/5/91	1,050	300	150
		4/9/92	1,800	300	150
PW2	Arsenic (ug/L)	12/5/91	7.5	50	5
		4/10/92	5.7	50	5
	Iron (ug/L)	12/5/91	1,260	300	150
		4/10/92	1,040	300	150
PW4	Arsenic (ug/L)	12/5/91	5.3	50	5
		4/10/92	6.5	50	5
	Iron (ug/L)	12/5/91	570	300	150
		4/10/92	1,070	300	150
PW5	Arsenic (ug/L)	12/5/91	6.3	50	5
		4/10/92	6.8	50	5
	Iron (ug/L)	12/5/91	537	300	150
		4/10/92	964	300	150
PW6	Arsenic (ug/L)	12/5/91	7.8	50	5

TABLE 2

Cumulative Risks Associated with Current or Potential Future Land-Use Conditions at the Boundary Road Landfill Site[1]

Exposure Pathway	Upper Bound Excess Lifetime Cancer Risk[2]	Hazard Index for Noncarcinogenic Effects[3]
Child/Teenager Trespasser		
Ingestion of Soil	1E-06	1E-03
Dermal Contact with Soil	1E-06	1E-02
Ingestion of Surface Water	3E-08	2E-02
Dermal Contact with Surface Water	6E-08	3E-02
Ingestion of Sediment	3E-07	1E-04
Dermal Contact with Sediment	2E-08	3E-04
TOTAL RISK:	2E-06	6E-02
Adult Residents		
Off-Site Northern Monitoring Wells		
Ingestion of Groundwater	4E-07	9E-02
Inhalation of VOC's in Groundwater	4E-07	5E-03
TOTAL RISK:	7E-07	1E-01
Off-Site Eastern Monitoring Wells		
Ingestion of Groundwater	6E-06	1E-01
Inhalation of VOC's in Groundwater	4E-06	4E-04
TOTAL RISK:	1E-05	1E-01
Off-Site Southern Monitoring Wells		
Ingestion of Groundwater	NA	1E+00
Inhalation of VOC's in Groundwater	NA	NE
TOTAL RISK:	NA	1E+00
Private Wells		
Ingestion of Groundwater	NA	4E-01
Inhalation of VOC's in Groundwater	NA	4E-05
TOTAL RISK:	NA	4E-01

General Notes:

NA = Not applicable. No carcinogenic chemicals were selected as chemicals of potential concern.

NE = Not evaluated.

1. Data for leachate and groundwater monitoring wells located within the waste management area (within the limits of refuse and slurry cutoff wall) are not included in this table.

2. Total dissolved solids (TDS) data was not included in this table

3. THF = Tetrahydrofuran

Footnotes:

(1) Chapter NR 140. Wisconsin Administrative Code.
(2) Enforcement Standard
(3) Preventive Action Limit

TABLE 3

Cumulative Risks Associated with Future Land-Use Conditions at the Boundary Road Landfill Site

Exposure Pathway	Upper Bound Excess Lifetime Cancer Risk[1]	Hazard Index for Noncarcinogenic Effects[2]
Hypothetical On-Site Child/Teenager Resident		
Ingestion of Soil	3E-05	3E-02
Dermal Contact with Soil	2E-06	4E-02
Ingestion of Surface Water	2E-07	1E-01
Dermal Contact with Surface Water	2E-07	1E-01
Ingestion of Sediment	2E-06	7E-04
Dermal Contact with Sediment	4E-08	6E-04
TOTAL RISK:	3E-05	3E-01
Hypothetical On-Site Adult Resident		
Ingestion of Soil[3]	1E-05	4E-03
Dermal Contact with Soil[3]	3E-06	1E-02
On-Site Northern Perimeter Monitoring Wells		
Ingestion of Groundwater	5E-05	1E+00
Inhalation of VOC's in Groundwater	4E-05	2E-02
TOTAL RISK[3]:	1E-04	1E+00
On-Site Monitoring Wells South of Slurry Wall		
Ingestion of Groundwater	4E-05	1E+00[4]
Inhalation of VOC's in Groundwater	2E-05	3E-03
TOTAL RISK[3]:	7E-05	1E+03[4]
On-Site Monitoring Wells South of Site Pond		
Ingestion of Groundwater	2E-07	7E-02
Inhalation of VOC's in Groundwater	2E-07	9E-05
TOTAL RISK[3]:	1E-05	8E-02

Footnotes:

(1) The upper bound individual excess lifetime cancer risk represents the additional probability that an individual may develop cancer over a 70-yr lifetime as a result of the exposure conditions evaluated.

(2) The hazard index indicates whether or not exposure to mixtures of noncarcinogenic chemicals may result in adverse effects.

(3) Risks from soil exposure pathways were added into the cumulative risk for each groundwater well grouping.

(4) The hazard index summed for each target organ/critical effect is less than one for this exposure pathway.

Footnotes:

(1) Although ingestion of groundwater from off-site monitoring wells by nearby residents is evaluated under the current land-use condition in the risk assessment, it may be more appropriate under hypothetical future land-use conditions at the site. This is true since off-site monitoring wells, which are currently not used for consumption, are screened in the surficial aquifer while all private wells which are used in the vicinity of the landfill are screened in the lower bedrock aquifer.

(2) The upper bound individual excess lifetime cancer risk represents the additional probability that an individual may develop cancer over a 70-yr lifetime as a result of the exposure conditions evaluated.

(3) The hazard index indicates whether or not exposure to mixtures of noncarcinogenic chemicals may result in adverse effects.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

MAR 11 1996

R-19J

Mr. George E. Meyer
Secretary
Wisconsin Department of Natural Resources
101 South Webster Street
Madison, Wisconsin 53707

Dear Mr. Meyer:

The United States Environmental Protection Agency ("U.S. EPA") hereby concurs with the selected remedy in the Record of Decision ("ROD") completed by the Wisconsin Department of Natural Resources ("WDNR") for the Boundary Road Landfill Superfund Site (the "Site"). This concurrence is in accordance with 40 CFR Section 300.515(e)(2)(i) and (ii).

U.S. EPA understands that this ROD identifies the final remedy and/or decision for the Site. The final remedy for this Site includes the construction of a new soil cover system, establishment of new vegetation, installation of an active landfill gas extraction system and continued leachate extraction in the northern and southern portions of the Site, with a new leachate extraction system in the north central portion of the Site to control the source of groundwater contamination. Extraction of contaminated groundwater at the southeast edge of the Site, construction of new fencing and continuous monitoring of groundwater, leachate, and the environment are also included in the final remedy.

U.S. EPA understands that a 3-year groundwater quality evaluation and potential contaminant source removal in the area of monitoring well TW24 will begin during the design phase and

unless the results of this evaluation show a significant improvement in groundwater quality in that area, additional groundwater extraction measures shall be implemented. The long term monitoring of the groundwater will be evaluated after five years to determine the remedy's compliance with the legal requirements and the terms set forth in this ROD.

U.S. EPA congratulates the State of Wisconsin for using a common sense presumptive remedy approach in an expedited time frame, for the Boundary Road Landfill site.

Sincerely yours,

David A. Ullrich

Valdas V. Adamkus
Regional Administrator

DOC #	Date	Title	Pages	Author	Recipient	Document Type
			REPORTS AND STUDIES			
1	2/91	Boundary Road Landfill, Superfund Site Community Relations Plan	25	WDNR Jim Leverance		Report/Study
2	4/91	Monitor Well Evaluation Report		Hydro-Search Robert Karnauskas	Gary Edelstein	Report/Study
3	8/91	Work Plan: (including the following documents) Sampling and Analysis Plan Quality Assurance Project Plan Health and Safety Plan Data Management Plan		Warzyn & HSI		Report/Study
4	8/92	Remedial Investigation/Feasibility Study, Investigative Results and Analysis Report (Vol. I-III)		Warzyn		Technical Memorandum
5	12/92	Technical Workplan for the Boundary Road Landfill Baseline Risk Assessment		Clement International Corp.	Gary Edelstein	Report/Study
6	1/93	Boundary Road Landfill RI/FS Phase 4 Report		Warzyn Thomas Karwoski Alan Schmidt	Gary Edelstein	Report/Study
7	2/93	Groundwater Quality Results		Warzyn John Hurtenbach Alan J. Schmidt	Gary Edelstein	Report/Study
8	4/93	Alternatives Array Document		Warzyn		Report/Study
9	7/93	Remedial Investigation Report (Vol. I-V)		Warzyn		Report/Study
10	2/94	Baseline Risk Assessment		Clement Risk Assessment Division of ICF Kaiser Engineers		Report/Study
11	9/94	Feasibility Study		Warzyn		Report/Study

Doc #	Date	Title	Pages	Author	Recipient	Document Type
12	7/94	Plan Modification Proposal for the Boundary Road Landfill (F/K/A Lauer I Landfill) Menominee Falls, Wisconsin		RUST Environment & Infrastructure		Report/Study Request for modification
		GENERAL CORRESPONDENCE				
12a	6/9/81	US EPA CERCLA Section 103(c) Notification of Hazardous Waste Site Form for the Lauer Landfill (aka Lauer I)	2	Completed by Waste Management, Inc.	US EPA	US EPA Form
13	7/17/90	Lab Report	2			Report
14	8/1/90	Env. Repair Contract #SF-90-01	33	N/A	N/A	Contract
14a	7/16/90	Statement of Work for Conducting the Remedial Activities	66	Hydro-Search, Inc.	N/A	Attachment A to ER Contract
14b	5/4/90	Clarification of the Application of NR 140 to the Lauer I Landfill Superfund Site	2	Suzanne Bangert, WDNR	Dave Lindorff, WDNR	Internal Memorandum, Attach. B to ER Contract
14c	5/23/90	Application of NR 140 to the Lauer I Landfill Superfund Site	2	Dave Lindorff, WDNR	Suzanne Bangert, WDNR	Internal Memorandum, Attach. C to ER Contract
15	8/22/90	Renaming of site	1	Stewart, David - WMI	Didier, Paul - DNR	Letter
16	9/10/90	Letter to attendee of kick-off meeting	1	Leverance, Jim - DNR	Pittman, Gene - Citizen	Letter
17	9/10/90	Review of existing conditions report	1	Edelstein, Gary	Hamblin, Gerald - WMI	Letter
18	9/10/90	History of site	1	Leverance, Jim - DNR	Biedrzycki, Paul - Division of Environmental Health & Technology	Letter
19	9/14/90	Request to rename site to Boundary Road Landfill	1	Cheely, Susan - WMI	Meyer, Linda - DNR	Letter

DOC #	Date	Title	Pages	Author	Recipient	Document Type
20	9/17/90	Health Concerns	2	Williams, Robert - US Dept. of Health and Human Service	Edelstein, Gary	Letter
21	9/25/90	Request to rename site to Boundary Road Landfill	2	Meyer, Linda - DNR	Cheely, Susan - WMI	Letter
22	10/15/90	Comments on Task 1 review	5	Edelstein, Gary Ales, Steven	Smith, March - WMI	Letter
23	10/30/90	Response to DNR's comments on Task 1	4	Wong, Gene Karnauskas, Robert - HSI	Edelstein, Gary	Letter
24	10/3/90	Comments on existing conditions report	3	Ales, Steve - DNR	Edelstein, Gary	Memo
25	12/13/90	Conditional approval of Task 1	2	Edelstein, Gary Ales, Steve - DNR	Smith, March - WMI	Letter
26	12/30/90	Submittal of draft community relations plan	1	Leverance, Jim - DNR	Pastor, Sue - EPA	Letter
27	1/2/91	Community relation plan submittal	1	Leverance, Jim - DNR	Nelson, John Schmidt, Jim - DNR	Memo
28	1/10/91	Administrative record file and public information record files	1	Leverance, Jim - DNR	Edelstein, Gary	Memo
29	1/15/91	Administrative Record File	4	Leverance, Jim - DNR	Reid, Ann - Maude Shunk Public Library	Letter
30	1/18/91	Letter regarding phone conversation	1	Ales, Steve - DNR	Edelstein, Gary	Letter
31	1/18/91	Existing monitor well integrity evaluation	4	Wong, Gene - HSI Smith, March - WMI	Ales, Steve Edelstein, Gary	Letter
32	2/28/91	Use of site by soccer club	2	Didier, Paul - DNR	Smith, March - WMI	Letter
33	3/3/91	Letter explaining oversight services, problems, etc.	2	Barker, Francis Baghat, Snehal Camp Dresser & McKee	Edelstein, Gary	Letter

DOC #	Date	Title	Pages	Author	Recipient	Document Type
34	3/6/91	Review of project plan	1	Edelstein, Gary	Smith, March - WMI	Letter
35	3/7/91	Schedule or approval of work plan	2	Edelstein, Gary	Bangert, Sue Giesfeldt, Mark Schmidt, Jim - SED	Memo
36	3/19/91	Comments on work plans	3	Ales, Steve - DNR	Edelstein, Gary	Memo
37	3/19/91	Comments on work plans	5	Edelstein, Gary	Smith, March - WMI Novy, Mary Beth - EPA	Fax
38	3/20/91	First draft review of PRP QAPP	8	Schupp, George - EPA	Dikinis, Jonas - EPA	Memo
39	3/21/91	Comments on QAPP	10	Edelstein, Gary	Smith, March - WMI	Fax
40	3/26/91	Request for Environmental Fund Monies for oversight contract	1	Bangert, Susan	Tierney, Ray Giesfeldt, Mark	Memo
41	3/28/91	Handwritten conference call notes	3	Edelstein, Gary		Meeting Notes
42	4/2/91	Conference call notes - handwritten	3	Edelstein, Gary		Meeting Notes
43	4/3/91	SAS Analysis for QAPP	1	Novy, Mary Beth - EPA	Karnauskas, Robert - Hydro-Search	Letter
44	4/9/91	Comments on Risk Assessment plan handwritten	3	Podowski, Andrew - EPA	Novy, Mary Beth	Memo
45	4/10/91	Comments on Risk Assessment Plan	2	Novy, Mary Beth - EPA	Edelstein, Gary	Letter
46	4/10/91	Comments on Risk Assessment Plan	2	Novy, Mary Beth	Edelstein, Gary	Letter
47	4/11/91	Review of Task 2 RI/FS	6	Edelstein, Gary	Smith, March - WMI	Letter
48	4/19/91	Follow up to SOP request	1	Novy, Mary Beth - EPA	Wong, Gene - Hydro-Search	Letter

DOC #	Date	Title	Pages	Author	Recipient	Document Type
49	5/7/91	Submittal letter of Task 2 work plan and Monitor Well Evaluation Reports	1	Wong, Gene Karnauskas, Robert - Hydro-Search	Novy, Mary Beth - EPA	Letter
50	5/28/91	DNR will review revised Task 2	1	Edelstein, Gary	Smith, March - WMI	Letter
51	5/31/91	WMI lab choice	39	Novy, Mary Beth - EPA	Edelstein, Gary	Letter
52	6/12/91	Work plan comments	2	Ales, Steve - DNR	Edelstein, Gary	Memo
53	6/18/91	EPA's comments on QAPP	1	Edelstein, Gary	Smith, March - WMI	Fax
54	6/19/91	Draft response to work plans	6	Smith, March - WMI Karnauskas, Robert - Hydro-Search	Edelstein, Gary	Fax
55	6/20/91	Consultant Change	1	Smith, March - WMI	Edelstein, Gary	Letter
56	6/20/91	Completion of Task 2 and DNR's non-approval	5	Edelstein, Gary Ales, Steven	Smith, March - WMI	Letter
57	6/24/91	Nomination of Boundary Road Landfill as an enforcement pilot program	2	Giesfeldt, Mark	Priddy, Lynda - EPA	Letter
58	6/26/91	Planned response to comments on work plan	8	Asbury, Gregory	Edelstein, Gary	Letter
59	7/3/91	A thank you and clarification on 5/30/91 meeting	2	Schubert, William - WMI	Sridharan, Lakshmi - DNR	Letter
60	7/10/91	Comments from EPA & DNR regarding revision 1 of work plan	2	Asbury, Greg - Warzyn	Edelstein, Gary Novy, Mary Beth - EPA	Letter
61	7/15/91	Handwritten letter with a summary of what took place during a phone conversation	1	Ales, Steve - DNR	Edelstein, Gary	Letter
62	7/18/91	Letter giving estimated days required to perform field activities	1	Karwoski, Thomas Asbury, Greg - Warzyn	Edelstein, Gary	Letter

DOC #	Date	Title	Pages	Author	Recipient	Document Type
63	7/18/91	Letter with Lab reports for private wells	20	Asbury, Gregory - Warzyn	Edelstein, Gary	Letter
64	7/18/91	Comments on ecological assessment	3	Edelstein, Gary	Smith, March - WMI Asbury, Greg - Warzyn	Fax
65	7/24/91	Review of work plan findings	1	Edelstein, Gary	Smith, March - WMI Asbury, Greg - Warzyn	Fax
66	7/24/91	Review of 2nd revision of Task 2 RI/FS	3	Edelstein, Gary	Smith, March - WMI	Letter
67	7/24/91	Comments on Task 2 revisions	1	Felix, Binyoti - DNR	Edelstein, Gary	Memo
69	7/29/91	Public Informational Meeting on Boundary Road Superfund Site	1			Press Release
71	8/8/91	Agenda for Superfund meeting	2			Meeting Agenda
72	8/9/91	EPA comments on QAPP	3	Edelstein, Gary	Smith, March - WMI Asbury, Greg Karwoski, Tom - Warzyn	Fax
73	8/12/91	Memo to file regarding the first public meeting minutes	1	Edelstein, Gary	File	Memo
74	8/13/91	Letter FYI and use of latest copy of work plans	4	Edelstein, Gary	Buss, Dan - CDM	Letter
75	8/23/91	Letter giving approval of Task 2 RI/FD project plans	2	Edelstein, Gary	Smith, March - WMI	Letter
76	8/28/91	Fax regarding the revised pages to the work plan	1	Edelstein, Gary	Buss, Dan - CDM	Fax
77	9/5/91	Letter indicating proposed well movement	2	Karwoski, Thomas Asbury, Gregory Warzyn	Edelstein, Gary	Letter
78	9/5/91	Letter transmitting 1 copy of Decontamination Pad Design Sketch	2	Asbury, Gregory - Warzyn	Edelstein, Gary	Letter

DOC #	Date	Title	Pages	Author	Recipient	Document Type
79	9/5/91	Fax regarding landfill investigative liquids management	3	Edelstein, Gary	Ebersohl, Walt - DNR	Fax
80	9/5/91	Letter giving EPA approval if QAPP	3	Edelstein, Gary	Smith, March - WMI	Letter
81	9/6/91	Letter correcting DOT classification	1	Smith, March - WMI	Edelstein, Gary	Letter
83	9/23/91	Fax confirming conference call minutes	2	Edelstein, Gary	Buss, Dan - CDM	Fax
84	9/24/91	Fax confirming conference call minutes	1	Edelstein, Gary	Buss, Dan - CDM	Fax
85	9/30/91	Fax confirming conference call minutes	1	Edelstein, Gary	Buss, Dan - CDM	Fax
86	10/7/91	Fax confirming conference call minutes	1	Edelstein, Gary	Buss, Dan - CDM	Fax
87	10/16/91	Fax on well depths	10	Karwoski, Tom - Warzyn	Edelstein, Gary	fax
88	10/16/91	Fax on oversight	1	Edelstein, Gary	Buss, Dan - CDM	fax
89	10/21/91	Fax providing direction on oversight activities	1	Edelstein, Gary	Buss, Dan	
90	10/22/91	Letter regarding oversight activities	2	Buss, Daniel Bhagat, Snehal - CDM	Edelstein, Gary	letter
91	10/22/91	Memo on a cover inspection which was conducted on 10/18/91	3	Edelstein, Gary	File	memo
92	10/30/91	Letter regarding the analytical results and the chain of custody for the samples	7	Wayne, Janet - Warzyn	Smith, March - WMI	letter
93	11/1/91	Letter regarding the completed installation of leachate/gas wells	1	Smith, March	Morsan, James - WMI	letter
94	11/5/91	Letter regarding a summary of oversight activities.	2	Buss, Daniel Bhagat, Snehal - CDM	Edelstein, Gary	letter
95	11/7/91	Fax regarding Leachate Wells and proposed parameters	2	Karwoski, Thomas	Edelstein, Gary	fax

DOC #	Date	Title	Pages	Author	Recipient	Document Type
96	11/12/91	Letters requesting permission to sample private wells in the area.	20	Straw, Ann - WMI	Sanders, Ron Schwartz, Thomas Fisher, Brian Schwartz, Henry Magestro, Joseph Brill, William Strauss, Gerhardt Liebherr, Lester Arthur, Douglas Rowe Sand & Gravel	letter
97	11/13/91	Letter documenting several phone conversations regarding changes or additions to the work scope.	2	Edelstein, Gary	Karwoski. Thomas Asbury, Gregory Warzyn	letter
98	11/15/91	Letter listing monitoring points for Round 1 Groundwater Sampling	1	Asbury, Greg Karwoski, Thomas Warzyn	Edelstein, Gary	letter
99	11/25/91	Fax regarding oversight activities	1	Edelstein, Gary	Barker, Francis - CDM	Fax
100	12/12/91	Fax regarding oversight activities	1	Edelstein, Gary	Barker, Francis	fax
101	12/2/91	Letter with enclosures of copies of all access agreements.	10	Smith, March - WMI	Edelstein, Gary	Letter
102	12/26/91	Response letter to recent correspondence regarding sampling activities	2	Edelstein, Gary	Asbury, Greg - Warzyn	Letter
103	1/7/92	Fax regarding oversight activities	1	Edelstein, Gary	Barker, Francis - CDM	Fax
105	1/31/92	Boundary Rd. Field Sampling Activities	1	Asbury, Gregory - Warzyn	Edelstein, Gary	Letter

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107	3/18/92	Letter regarding endangered resources near project site	2	Weisensel, Wendy - DNR	Kelly, Jerry - Warzyn	Letter
108	3/19/92	Submittal Letter of the Target Compounds Short List and Well Location Summary	6	Smith, March - DNR	Edelstein, Gary	Letter
109	3/24/92	First Round Private Well Sampling Results, Boundary Rd. Landfill Superfund Site	52	Edelstein, Gary	Schmidt, Jim- SED Pilarski, Greg - SED	Memo
110	3/25/92	Private Well Results, Target Compound Short List (TCSL) and Point of Standards Application	2	Edelstein, Gary	Smith, March - WMI	Letter
111	4/2/92	Sampling of well nests P105 and P106	1	Edelstein, Gary	Smith, March - WMI Asbury, Greg/ Karowski, Tom - Warzyn	Fax
112	4/7/92	Expansion of United Waste Container Storage Area	3	March, Thomas - WMI	Klett, Roger - DNR	Letter
113	4/15/92	Boundary Road RI/FS Schedule	1	Asbury, Greg - Warzyn	Edelstein, Gary	Letter
114	4/16/92	Confirmation of Recent *Telephone Conversations*	3	Edelstein, Gary	Smith, March - WMI	Letter
116	4/23/92	Boundary Road Master Schedule	6	Smith, March - WMI	Edelstein, Gary	Letter
117	4/24/92	Boundary Road Landfill, Postponement of LCS Tests	2	Smith, March - WMI	Edelstein, Gary	Letter
119	5/5/92	RI/FS Work Plan Addendum	3	Asbury, Greg - Warzyn	Edelstein, Gary	Letter
120	5/26/92	Work Plan Amendment and Revision to Approved Schedule	2	Edelstein, Gary	Smith, March - WMI	Letter

DOC #	Date	Title	Pages	Author	Recipient	Document Type
121	7/8/92	Guidelines for Groundwater Point of Standards Application at Superfund Sites	6	Giesfeldt, Mark - DNR	DNR Personnel	Memo
122	8/20/92	Recommendation Acceptance and Initial Comments, Technical Memorandum #1	2	Edelstein, Gary	Smith, March - WMI	Letter
123	8/24/92	First Round Private Well Sampling Results, Boundary Rd. Landfill Superfund Site	1	Edelstein, Gary	Schmidt, Jim- SED Pilarski, Greg - SED	Memo
124	9/4/92	Comments on Technical Memorandum #1	4	Edelstein, Gary	Smith, March	Letter
125	9/18/92	Handwritten Meeting Notes	2	Edelstein, Gary		Meeting Notes
126	9/23/92	WMWI Responses to DNR Comments on Technical Memo #1	8	Karwoski, Thomas/Schmidt , Alan - Warzyn	Edelstein, Gary	Letter
127	9/24/92	Work Plan Addendum	4	Karwoski, Thomas/Schmidt , Alan - Warzyn	Edelstein, Gary	Letter
128	9/24/92	Fax on Work Plan Addendum	1	Edelstein, Gary	Schmidt, Alan/Karwos ki, Thomas - Warzyn	Fax
129	9/30/92	Ron Sanders Property	1	Otter, Donald - WMI	McLario, John, Attorney	Letter
130	10/2/92	Denial for Well on Property	1	Smith, March - WMI	Edelstein, Gary	Letter
131	10/8/92	Revised Schedule/Revised Health and Safety Plan	8	Karwoski, Thomas/Schmidt , Alan - Warzyn	Edelstein, Gary	Letter
132	10/15/92	Revised Schedule	3	Schmidt, Alan - Warzyn	Edelstein, Gary	Fax
133	10/21/92	Submittal of Work Plan Addendum	4	Karwoski, Thomas/Schmidt , Alan - Warzyn	Edelstein, Gary	Letter

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134	10/21/92	Well Location Acceptance	1	Karwoski, Thomas/Schmidt, Alan - Warzyn Smith, March - WMI	Edelstein, Gary	Fax
135	10/22/92	Work Plan Amendment	2	Edelstein, Gary	Smith, March - WMI	Letter
136	10/27/92	Summary of Well Data	34	Karwoski, Thomas/Schmidt, Alan - Warzyn	Pilarski, Greg - DNR	Letter
137	12/24/92	Submittal of Technical Workplan	2	Smith, March - WMI	Edelstein, Gary	Letter
138	1/25/93	Risk Assessment Technical WP Comments	9	Edelstein, Gary	Smith, March - WMI Novy, Mary Beth - EPA	Fax
139	1/26/93	Handwritten Conference Call Notes	2	Edelstein, Gary		Conference Call Notes
140	2/2/93	Work Plan Addendum for Cone Penetrometer Tests	1	Edelstein, Gary	Karwoski, Thomas/Schmidt, Alan - Warzyn Smith, March - WMI	Fax
141	2/2/93	Comments on Phase 4	1	Felix, Binyoti - DNR	Edelstein, Gary	Memo
142	2/3/93	Handwritten Conference Call Notes	1	Edelstein, Gary		Handwritten Conference Call Notes
143	2/9/93	Draft Response to Phase 4	5	Edelstein, Gary	Karwoski, Thomas/Schmidt, Alan - Warzyn Smith, March - WMI	Fax
144	2/15/93	Comments on Phase 4 Report	3	Edelstein, Gary	Smith, March - WMI	Letter

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145	2/15/93	RI/FS & bis(2-Ethylhexy)phthalate (BEHP)	1	Khazae, Charlene - DNR	Edelstein, Gary	Memo
146	2/22/93	Boundary Road Landfill RI/FS	1	Schmidt, Alan - Warzyn	Edelstein, Gary	Letter
147	2/25/93	BEHP Letter of 2/1/93	1	Smith, March - WMI Schmidt, Alan - Warzyn	Edelstein, Gary	Fax
148	2/25/93	Comments on Baseline RA	7	Pearsall, Lorraine - Clement	Edelstein, Gary	Letter
149	2/25/93	WMWI Responses to DNR' Comments on Phase 4 Report	2	Karwoski, Thomas/Schmidt , Alan - Warzyn	Edelstein, Gary	Letter
150	4/13/93	Boundary Road Landfill RI Report	3	Khazae, Charlene - DNR	Edelstein, Gary	Memo
151	4/15/93	Comments on RI/FS	1	Amungwafor, Binyoti - DNR	Edelstein, Gary	Memo
152	5/4/93	Boundary Rd. "HELP" Model Information	16	Karwoski, Tom - Warzyn	Edelstein, Gary	Fax
153	5/10/93	Remedial Investigation Report	4	Sharp, Rauland - US EPA	Edelstein, Gary	Letter
154	5/14/93	Comments on Draft Remedial Investigation	6	Edelstein, Gary	Smith, March - WMI	Letter
155	5/20/93	Review of Alternatives Array	3	Morrow, William - EPA	Sharp, Rauland - EPA	Memo
156	5/24/93	Review of Alternatives Array	1	Sharp, Rauland - EPA	Edelstein, Gary	Memo
157	5/25/93	Review of Alternatives Array	3	Bandemehr, Angela - EPA	Sharp, Rauland - EPA	Memo

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158	5/25/93	Alternatives Array	1	Kleiman, Judy - EPA	Sharp, Rauland - EPA	Fax
159	5/26/93	Handwritten Notes on Discussion of RI Letter	2	Edelstein, Gary		Handwritten Discussion Notes
160	5/27/93	Draft Comments from EPA	4	Sharp, Rauland - EPA	Edelstein, Gary	Fax
161	5/27/93	Comments on Alternatives Array	1	Amungwafor, Binyoti - DNR	Edelstein, Gary	Memo
162	5/28/93	Boundary Rd. Risk Assessment (RA) Comments	2	Edelstein, Gary	Smith, March - WMI	Fax
163	6/7/93	Additional EPA Geologist Comments	4	Edelstein, Gary	Karwoski, Thomas/Schmidt, Alan - Warzyn Smith, March - WMI	Fax
164	6/8/93	Comments on Alternatives Array Document	6	Smith, March - WMI	Edelstein, Gary	Letter
165	6/9/93	Submittal letter for RI/RA	1	Schmidt, Alan - Warzyn	Edelstein, Gary	Letter
166	6/10/93	Remedial Investigation Report	3	Schmidt, Alan - Warzyn	Edelstein, Gary	Letter
167	6/11/93	Response to EPA Comments on RI Report	31	Karwoski, Thomas/Schmidt, Alan - Warzyn	Edelstein, Gary	Letter
168	6/14/93	Change Name of Site to Boundary Road Letter	1	Smith, March - WMI	Sharp, Rauland - EPA	Letter
169	6/16/93	Fax Changing Estimate	3	Wessley, Joe - Warzyn	Edelstein, Gary	Fax

DOC #	Date	Title	Pages	Author	Recipient	Document Type
170	6/16/93	Fax Responding to Comments on Draft Baseline RA	9	Bailey, Lisa - Clement	Edelstein, Gary	Fax
171	6/25/93	Review Memo Attached to Feasibility Study	2	Longest II, Henry L. - EPA	Waste Management Division Directors Regions I, IV, V, VII; Emergency and Remedial Response Division Director Region II; Hazardous Waste Management Division Directors Region III, VI, VIII, IX; Hazardous Waste Division Director Region X	Memo
172	6/30/93	Response to DNR/EPA Comments on Alternatives Array Document	14	Wessley, Joe/Schmidt, Alan - Warzyn	Edelstein, Gary	Letter
173	7/2/93	Submittal of Final RI w/attachments	49	Schmidt, Alan Karwoski, Thomas - Warzyn	Edelstein, Gary	Letter w/attachments
174	7/7/93	Update on Boundary Rd. and Agency Reviews	1	Edelstein, Gary	Smith, March - WMI	Fax
175	7/14/93	Conference Call notes re: Alternative Array (handwritten)	1	Edelstein, Gary		Meeting Notes
176	7/15/93	Geological Comments on Final RI	3	Sharp, Rauland - EPA	Edelstein, Gary	Fax

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177	7/20/93	Request for Surface Water Discharge Limits	1	Wessley, Joseph Schmidt, Alan - Warzyn	Edelstein, Gary	Letter
178	7/20/93	Meeting Minutes	5	Schmidt, Alan - Warzyn	Edelstein, Gary	Letter w/Attachments
179	8/2/93	Private Well Sample Results		Payne, Nancy	MacArthur, Douglas and Mary	Speed Memo
180	8/4/93	Private Well Sample Results		Payne, Nancy - DNR	Schwartz, Thomas Schwartz, Henry Brill, William Fisher, Brian Magestro, Joseph Liebherr, Lester Rowe Sand & Gravel Sanders, Ron	Letters
181	8/5/93	Agenda for 8/10 Meeting	1	Edelstein, Gary	Smith, March Karwoski, Tom/Schmidt, Al Felix, Binyoti, Felix	Fax
182	8/10/93	Conference Call Notes - RI Issues (handwritten)	2	Edelstein, Gary		Meeting Notes
183	8/24/93	Public Meeting Set to Discuss Boundary Road Landfill Investigation Results	2	DNR	News Media	News Release
184	8/25/93	Remedial Investigation (RI) Report Approval, Remedial Investigation/Feasibility Study (RI/FS), Boundary Road LF (F/K/A Lauer I LF)	1	Edelstein, Gary	Smith, March - WMI	Letter
185	9/3/93	Revised Risk Assessment Comments from US EPA	3	Edelstein, Gary	Forney, Jim - WMI	Fax

DOC #	Date	Title	Pages	Author	Recipient	Document Type
186	9/9/93	Public Meeting Agenda	1			Public Meeting Agenda
187	9/14/93	Re: Response to U.S. EPA Second Set of Comments on RI Report Boundary Road Landfill RI/FS	4	Schmidt, Alan - Warzyn Karwoski, Thomas - Warzyn	Edelstein, Gary	Letter
188	10/1/93	ICF Kaiser's responses to second round of comments	1	Bailey, Lisa	Clarke, Rosita Edelstein, Gary	Letter
189	10/7/93	Conference Call Notes on Boundary Landfill Risk Assessment Letter and Points from I.C.F. 10/1/93 Letter (handwritten)	1	Edelstein, Gary		Meeting Notes
190	10/27/93	Conference Call Notes, Risk Assessment Comments (handwritten)	2	Edelstein, Gary		Meeting Notes
191	10/28/93	Comments on the Draft Feasibility Study (FS), Remedial Investigation/Feasibility Study (RI/FS), Boundary Road LF Superfund Site (F/K/A Lauer I LF)	8	Edelstein, Gary	Kuyawa, Lydia - WMI	Letter
192	11/15/93	Boundary Road Landfill Remedy Selection	14	Edelstein, Gary	Kuyawa, Lydia - WMI	Fax
193	12/9/93	Boundary Rd. FS and Technical Impracticality Waivers	1	Edelstein, Gary	Kuyawa, Lydia - WMI	Fax
194	12/14/93	Meeting Notes (handwritten)	1	Edelstein, Gary		Meeting Notes
195	12/15/93	Meeting Correspondence	2	Edelstein, Gary	Kuyawa, Lydia	Fax
196	12/23/93	Lauer 1 Superfund Site Final Feasibility Study	2	Hantz, Dave - DNR	Edelstein, Gary	Memo

DOC #	Date	Title	Pages	Author	Recipient	Document Type
197	1/6/94	Boundary Road Landfill Feasibility Study Comments	1	Clarke, Rosita	Edelstein, Gary	Letter
198	1/6/94	Supplemental Response on the Boundary Road Baseline Risk Assessment	32	Bailey, Lisa - I.C.F. Kaiser	Clarke, Rosita Edelstein, Gary	Letter with Attachments
199	1/12/94	Boundary Road Landfill Baseline Risk Assessment	1	Clarke, Rosita	Edelstein, Gary	Letter
200	1/19/94	Meeting Notes	4	Edelstein, Gary		Meeting Notes
201	1/19/94	Meeting Agenda	4	Kuyawa, Lydia - WMI	Edelstein, Gary Lemcke, Jane Clarke, Rosita Quinn, Ken Conner, Gary Forney, Jim	Meeting Agenda and Handout
202	1/20/94	Revised Cost estimates By DNR	6	Edelstein, Gary	Kuyawa, Lydia - WMI	Fax
203	2/1/94	Submittal of Final Baseline Risk Assessment for the Boundary Road Landfill Site	4	Bailey, Lisa - I.C. F. Kaiser	Edelstein, Gary Clarke, Rosita - EPA	Letter
204	2/7/94	Re: Meeting Minutes, WMI Response to fax, Conceptual Proposal, Proposed Plan	3	Forney, James - WMI Kuyawa, Lydia - WMI	Edelstein, Gary	Letter
205	2/22/94	Conceptual Cover Layout Drawing	2	Kuyawa, Lydia - WMI	Edelstein, Gary	Fax
206	2/22/94	Conference Call Notes on Selection Issues and FS Revisions (handwritten)	1	Edelstein, Gary		Meeting Notes
207	3/2/94	Re: Boundary Road Landfill Risk Assessment Review	1	Moran, Erin - EPA	Clarke, Rosita, EPA	Memo

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208	3/3/94	Letter of transmittal including a prelim. cover design calcs. and bid summary - drainage letter	9	Wessley, Joe - Warzyn	Edelstein, Gary	Letter of transmittal
209	3/30/94	Re: Boundary Rd. Risk Assessment	2	Edelstein, Gary	Lydia Kuyawa - WMI	Fax
210	4/11/94	Re: Boundary Road Landfill Baseline Risk Assessment	1	Clarke, Rosita - EPA	Edelstein, Gary	Letter
211	5/24/94	Re: Risk Assessment (RA) Portion of the Remedial Investigation (RI) Report Approval, Remedial Investigation/Feasibility Study (RI/FS), Boundary Road LF (F/K/A Lauer I LF)	1	Edelstein, Gary	Kuyawa, Lydia - WMI	Letter
212	6/15/94	Re: Conditional Approval for the Revised Feasibility Study (FS), Remedial Investigation/Feasibility Study (RO/FS), Boundary Road LF Superfund Site (F/K/A Lauer I LF)	9	Edelstein, Gary	Kuyawa, Lydia - WMI	Letter
213	7/1/94	Handwritten notes on conference call	3	Edelstein, Gary		meeting notes
214	7/11/94	Notes form Meeting w/WMI (handwritten)	1	Edelstein, Gary		Meeting Notes
215	8/9/94	Boundary Road Landfill (F/K/A Lauer I Landfill) - Plan Modification Proposal	1	Kuyawa, Lydia - WMI	Sridharan, Lakshmi	Letter
216	8/21/94	Private Well Sampling Results	15	Schmidt, Alan - Warzyn	Edelstein, Gary	Letter
217	8/22/94	Boundary Road Landfill - Review of the Plan Modification Proposal	1	Clarke, Rosita	Edelstein, Gary	Letter

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218	8/25/94	Your Response to the Conditional Approval for the Revised Feasibility Study (FS), Remedial Investigation/Feasibility Study (RI/FS), Boundary Road LF Superfund Site (F/K/A Lauer I LF)	3	Edelstein, Gary	Kuyawa, Lydia	Letter
219	8/29/94	WMWI Response to the WDNR June 15, 1994 Letter Granting Conditional Approval for the Revised Feasibility Study (FS), Boundary Road Landfill Superfund Site (F/K/A Lauer I Landfill)	5	Kuyawa, Lydia - WMI	Edelstein, Gary	Letter
220	9/16/94	Oversight Cost Reimbursement, Boundary Road LF Superfund Site (F/K/A Lauer I LF) Environmental Repair Contract #SF-90-01	1	Edelstein, Gary	Kuyawa, Lydia	Letter
221	9/20/94	Final Revised Feasibility Study Report Boundary Road Landfill	1	Quinn, Kenneth	Edelstein, Gary	Letter
222	10/26/94	Oversight Cost Reimbursement Boundary Road Landfill Superfund Site Environmental Repair Contract #SF-90-01	2	Prattke, Michael	Edelstein, Gary	Letter
223	10/28/94	Boundary Road Landfill - Feasibility Study Comments	1	Clarke, Rosita	Edelstein, Gary	Letter
224	11/3/94	Oversight Cost Reimbursement, Boundary Road LF Superfund Site (F/K/A Lauer I LF) Environmental Repair Contract #SF-90-01 ("Contract")	1	Edelstein, Gary	Prattke, Michael	Letter
225	11/23/94	Conditional Approval for the Final Revised Feasibility Study (FS), Remedial Investigation/Feasibility Study (RI/FS), Boundary Road LF Superfund Site (F/K/A Lauer I LF)	5	Edelstein, Gary	Prattke, Mike	Letter

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226	11/28/94	Boundary Rd. Alternative Revisions	1	Edelstein, Gary	Prattke, Mike	Fax Cover Sheet
227	11/28/94	Revisions to the FS Cost Estimates for the Preparation of the Proposed Plan	6	Edelstein, Gary	File	Letter w/attachments
228	1/9/95	Comments on Draft Proposed Plan for the Boundary Road Landfill Site	2	Clarke, Rosita	Edelstein, Gary	Letter
229	1/19/95	Revision to the FS Cost Estimates for the Preparation of the Proposed Plan	2	Edelstein, Gary	File	Memo
230	1/20/95	Boundary Rd. Proposed Plan Cost Estimates	1	Edelstein, Gary	Prattke, Mike	Fax Cover Sheet
231	1/27/95	Public Commentary	1	Mueller, Melvin	Edelstein, Gary	Letter
232	1/30/95	Letter Sending Out a Copy of the Final Feasibility Study	1	Edelstein, Gary	Anthony, Susan - Milw. Metropolitan Sewage District	Letter
233	1/31/95	Comments from Air Toxics & Radiation Branch for Draft Proposed Plan	2	Clarke, Rosita	Edelstein, Gary	Fax
234	2/3/95	Boundary Rd. Plan Modification	1	Edelstein, Gary	Prattke, Mike	Fax Cover Sheet
235	2/3/95	Boundary Rd. Plan Modification	1	Edelstein, Gary	Clarke, Rosita	Fax Cover Sheet
236	2/3/95	Notice of Intent to Modify a Plan Approval for the Waste Management of Wisconsin Boundary Road Landfill (f/k/a Lauer I Landfill), Lic. No. 0011	10	Sridharan, Lakshmi - DNR	Prattke, Michael - WMI	Letter w/Attachments
237	2/16/95	Boundary Road Landfill Superfund Site Public Meeting Agenda	1	DNR	Public	Meeting Agenda

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238	2/16/95	Boundary Rd. Plan Mod. Meeting Notes (handwritten)	2	Edelstein, Gary		Meeting Notes
239	2/23/95	Request for Extension to the Public Comment Period	1	Prattke, Michael	Edelstein, Gary	Letter
240	2/25/95	Target Compound Short List	120	Asbury, Gregory - Warzyn	Edelstein, Gary	Letter w/ attachments
241	2/27/95	Boundary Rd. Proposed Plan Comment Period Extension	1	Edelstein, Gary	Prattke, Mike - WMI	Fax
242	3/3/95	Response to the Notice of Intent to Modify a Plan Approval for the Boundary Road Landfill (f/k/a Lauer I Landfill), Lic. No. 0011 - dated February 3, 1995	9	Prattke, Michael - WMI	Edelstein, Gary	Letter
243	4/4/95	Citizen Letter Regarding Site Remedy	2	Mueller, Melvin	Edelstein, Gary	Letter
244	4/12/95	Request for Extension to Public Comment Period 0 Boundary Rd. Landfill Site	1	Prattke, Michael - WMI	Edelstein, Gary	Letter
245	4/13/95	Responses to your questions	2	Clarke, Rosita	Edelstein, Gary	e-mail
246	4/14/95	Request for Extension to Public Comment Period - Boundary Road Landfill Site	1	Prattke, Michael - WMI	Edelstein, Gary	Letter
247	4/17/95	Boundary Rd. Proposed Plan Comment Period Extension	1	Edelstein, Gary	Prattke, Mike	Fax Cover Letter
248	4/25/95	April 27 Meeting to Discuss DRAFT Comments on the Boundary Rd. Landfill Proposed Plan	1	Lemcke, Jane - DNR	Prattke, Mike - WMI	Letter
249	5/15/95	Submittal Letter of Comments to Proposed Plan, with attachments	3	Prattke, Michael - WMI	Edelstein, Gary	Letter

Doc #	Date	Title	Pages	Author	Recipient	Document Type
249a	5/15/95	Attachment A to Mike Prattke's Cover letter commenting on the Proposed Plan	12	WMI		Detailed comments
249b	5/15/95	Attachments B-E to Mike Prattke's letter commenting on the Proposed Plan		WMI		Support documents for detailed comments
250	5/16/95	Briefing Memo on the Proposed Remedy for the Boundary Road Landfill (Formerly known as Luer 1) Superfund Site, Menominee Falls, WI	6	Giesfeldt, Mark - DNR	Meyer, George Sylvester, Susan Didier, Paul McCutcheon, Gloria Kazmierczak, Ron	Memo
251	5/17/95	Response to DNR Proposed Plan	2	Wessley, Joe/Quinn, Kenneth - Montgomery Watson	Edelstein, Gary	Letter
252	5/17/95	Boundary Corp. Landfill	2	Stevens, Pat - Wisconsin Manufacturers and Commerce	Edelstein, Gary	Letter
253	5/19/95	Concern for DNR's Recommendations for Boundary Rd. Site	1	Schneiders, Lolita - Representative Wisconsin Assembly	Edelstein, Gary	Letter
254	6/5/95	Boundary Rd. Landfill	1	Edelstein, Gary	Schneiders, Lolita - Representative Wisconsin Assembly	Letter
255	9/8/95	Boundary Road Landfill Project Status	4	Prattke, Michael - WMI	Edelstein, Gary	Letter

DOC #	Date	Title	Pages	Author	Recipient	Document Type
256	12/19/95	Conversation with Mike Prattke Regarding Cost Estimates	1	Edelstein, Gary	File	Memo
		FACT SHEETS AND TAPES				
70	8/91	Superfund Investigation to begin at Boundary Road Landfill	7			Fact Sheet
257	8/93	Investigation Complete at Boundary Road Landfill	10	DNR		Fact Sheet
258	9/93	Boundary Road Landfill (formerly Lauer Landfill)	4	Department of Health and Social Services		Fact Sheet
259	2/95	DNR Recommends Cleanup Action	11	DNR		Fact Sheet
259a	2/16/95	February 16, 1995 Proposed Plan Meeting Audio Tape				Cassette Audio Tape
		GUIDANCE AND REFERENCE DOCUMENTS				
260	8/25/93	Region 5 Standard Operating Procedure for Validation of CLP Organic Data,			U.S. EPA Region 5 CRL	Guidance Document
261	2/91	Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites	307	EPA OSWER		Guidance Document
262	2/92	Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites	9	EPA		Guidance Document
263	9/90	Streamlining the RI/FS for CERCLA Municipal Landfill Sites	5	EPA OSWER		Guidance Document
264	9/93	Presumptive Remedies: Policy & Procedures, EPA 540-F-93-047	8	EPA OSWER		Quick Reference Fact Sheet
265	9/93	Presumptive Remedy for CERCLA Municipal Landfills, EPA 540-F-93-035	14	EPA OSWER		Quick Reference Fact Sheet

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266	10/18/89	Considerations in Groundwater Remediation at Superfund Sites	10	EPA OERR		Guidance Document
267	2/92	In-Situ Bioremediation of Contaminated Groundwater	13	EPA OSWER		Guidance Document
268	1/92	Chemical Enhancements to Pump and Treat Remediation Groundwater Issue	22	EPA OERR		Guidance Document
269	11/89	Guide to Developing Superfund Proposed Plans	6	EPA OERR		Guidance Document
270	11/89	Feasibility Studies: Development and Screening of Remedial Action Alternatives	7	EPA OERR		Guidance Document
271	4/90	Guide to Selecting Superfund Remedial Actions	9	EPA OERR		Guidance Document
272	1/81	Costs of Remedial Response Actions at Uncontrolled Hazardous Waste Sites,	164	Rishel et al.		Guidance Document
273	4/13/87	Environmental Review Requirements for Remedial Actions	6	EPA OERR		Guidance Document
274	4/19/88	Information on Drinking Water Action Levels	17	EPA OSWER		Guidance Document
275	6/1/85	EPA Guide for Minimizing the Adverse Environmental Effects of Cleanup of Uncontrolled Hazardous Waste Sites,	250	EPA Environmental Research Laboratory		Guidance Document
276	7/23/87	RI/FS Improvements	11	EPA OERR		Guidance Document
277	6/1/86	Superfund Remedial Design and Remedial Action Guidance	100	EPA OERR		Guidance Document
278	12/1/86	Superfund State Lead Remedial Project Management Handbook	120	EPA OERR		Guidance Document

DOC #	Date	Title	Pages	Author	Recipient	Document Type
279	3/1/87	Data Quality Objectives for Remedial Response Activities: Development Process	150	EPA OERR		Guidance Document
280	7/1/88	Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses	20	EPA		Guidance Document
281	2/1/88	Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses	45	EPA		Guidance Document
282	9/1/82	Evaluating Cover Systems for *Solid and Hazardous Waste*	58	Lutton, et al.		Guidance Document
283	8/1/78	Guidance Manual for Minimizing Pollution From Waste Disposal Sites	83	Tolman, et al.		Guidance Document
284	7/1/82	RCRA Guidance Document: *Landfill Design Liner Systems* and Final Cover,	30	EPA		Guidance Document
285	11/1/85	Leachate Plume Management,	590	Repo, et al.		Guidance Document
286	8/1/84	Ground-Water Protection Strategy	65	EPA, Off. of GW Protection		Guidance Document
287	12/1/86	Guidelines for Ground-Water Classification Under the EPA Ground-Water Protection Strategy	600	EPA Off. of GW Protection		Guidance Document
288	8/88	CERCLA Compliance with Other Laws Manual	approx. 250	EPA OERR		Guidance Document
289	8/89	CERCLA Compliance with Other Laws Manual: Part II	approx. 150	EPA OSWER		Guidance Document
290	12/19/86	Final RCRA Comprehensive Ground-Water Monitoring Evaluation Guidance Document	55	Lucero, EPA		Guidance Document
291	7/1/87	Alternative Concentration Limit Guidance Part 1, ACL Policy Information Requirements,	124	EPA OSW/WMD		Guidance Document

Doc #	Date	Title	Pages	Author	Recipient	Document Type
292	2/1/88	Guidance Document for Providing Alternate Water Supplies	64	EPA OERR		Guidance Document
293	5/1/87	Quality Criteria for Water 1986	325	EPA Off. of Water Regulations and Stds.		Guidance Document
294	4/19/88	Information on Drinking Water Action Levels,	17	Fields EPA		Guidance Document
295	11/25/85	Endangerment Assessment Guidance	11	Porter EPA/OSWER		Guidance Document
296	5/16/88	Interim Guidance on Potentially Responsible Party Participation in Remedial Investigations and Feasibility Studies	37	Porter EPA/OSWER		Guidance Document
297	12/24/86	Interim Guidance on Superfund Selection of Remedy,	10	Porter EPA/OSWER		Guidance Document
298	6/24/85	RCRA/CERCLA Decisions Made on Remedy Selection	3	Kilpatrick EPA/OWPE		Guidance Document
299	6/1/88	Community Relations in Superfund: A Handbook	188	EPA OERR		Guidance Document
300	8/1/85	Toxicology Handbook	126	Life Systems Inc.		Guidance Document
301	10/1/86	Superfund Public Health Evaluation Manual,	500	EPA OSWER		Guidance Document
302	2/89	Methods & Method Detection Limits for Chapter NR 219	21			Technical Guidance
303	4/1/86	Superfund Exposure Assessment Manual	160	EPA OERR		Guidance Document