

# Health Consultation

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WASTE MANAGEMENT - BROOKFIELD  
(a/k/a WASTE MANAGEMENT OF WISCONSIN, INCORPORATED)

BROOKFIELD, WAUKESHA COUNTY, WISCONSIN

EPA FACILITY ID: WID980901235

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

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## **Public Health and Environmental Consultation**

**Waste Management - Brookfield**  
Brookfield, Waukesha County, Wisconsin

Facility ID#: WID980901235

Prepared by the  
Wisconsin Department of Health and Family Services  
Bureau of Environmental Health  
And  
Wisconsin Department of Natural Resources  
Remediation and Redevelopment Program

Under a Cooperative Agreement With the  
U.S. Department of Health and Human Services  
Agency for Toxic Substances and Disease Registry

## **Summary**

The Department of Health and Family Services (DHFS) and the Department of Natural Resources (DNR) were asked by the city of Brookfield and residents living near the Waste Management-Brookfield Landfill to evaluate the public health implications of a proposed residential subdivision west of the landfill. This public health consultation provides a summary of the information the agencies collected about the issue as well as general conclusions and recommendations regarding the proposed development project.

Methane was detected in gas monitoring wells near the landfill, including some areas proposed for residential development. Methane was identified at three of the proposed lots; however, the agencies believe that more work on the landfill and longer-term monitoring is needed before we can make a recommendation regarding residential development on several additional lots. The developer has voluntarily agreed not to pursue development of those lots at this time. The changes proposed by the developer and Waste Management require the modification of the current gas monitoring system and plan.

DHFS and DNR view that the development of lots immediately west of the site is not expected to result in indoor methane levels that pose a public health or safety hazard to future residents. Long-term gas monitoring indicates a data gap at the southeast corner of the landfill. Landfill gas monitoring should be expanded to fully address future residential development around the landfill. The proposed development is not expected to affect groundwater contamination, but the full degree and extent of off-site groundwater impacts has not yet been defined. While soil gas VOC concentrations are relatively low, more work is needed to better understand this in areas close to the landfill.

## **Background**

In September of 2003, DHFS and DNR (hereafter referred to as “the agencies”) were informed that a developer was proposing a residential subdivision adjacent to the western edge of the site and additional homes at the northern edge of the landfill. The city of Brookfield and residents of the neighborhood near the landfill asked the agencies if there would be public health or environmental concerns related to a proposed residential development called the Shire. The proposal consists of subdividing the vacant land west of the landfill, and some areas to the north and southwest for residential development. In addition to the public health and environmental issues related to the Shire proposal, residents raised questions about the landfill’s relationship to existing residents, as well as whether the development may result in changes in the landfill.

The Waste Management-Brookfield Landfill was originally a gravel quarry cut out of the side of a south sloping hill. Waste disposal began in the late 1940s and continued until the site closed in 1980. Waste Management of Wisconsin, Inc. (WMWI) leased the site in 1969 and continued operating it for disposal of municipal, commercial, and industrial wastes. In 1982 WMWI purchased the site. The site was listed on the National Priorities List of Superfund sites in August of 1990.(1)

The landfill is located in a residential area in the city of Brookfield, Wisconsin. The site is bordered by a residential subdivision to the north, undeveloped land to the west, a wooded

wetland area to the south, and Brookfield Road lies between the site and a subdivision to the east (Figure 1). Some residential properties on the north side of the landfill are within 100 feet of the waste limits of the landfill. There is about 100 feet of topographic relief over the waste mass and 130 feet of relief over the entire site, from the base of the landfill in the south to the top of the landfill in the north. From the northwest side of the landfill, the land surface slopes gently to the west. The wooded wetland at the foot of the hill the landfill is on is part of a large east-west running wetland/environmental corridor.

Like other landfills that operated in that period, there is no layer of clay or other impermeable material lining the waste in the landfill. Disposal consisted of backfilling waste in the excavation left by the gravel quarry. During most of the period that this landfill operated there were no special disposal requirements for various types of waste materials, including hazardous wastes. Therefore, the agencies believe that a variety of chemical wastes were disposed in this landfill. The waste volume is estimated to be 1.9 million cubic yards. The waste thickness is 10 feet on the south side of the landfill and 80 feet on the north side of the landfill similar to the slope of the former hillside and adjacent land.

The geology of the area consists of alternating layers of clay mixed with silt, sand, and gravel sloping to the south. This glacial material varies in thickness from about 140 feet at the base of the slope, to 290 feet at the top of the slope (northern-most portion of the site). Fractured dolomite bedrock lies beneath the glacial material. This bedrock slopes slightly toward the east and is about 800 feet in thickness.

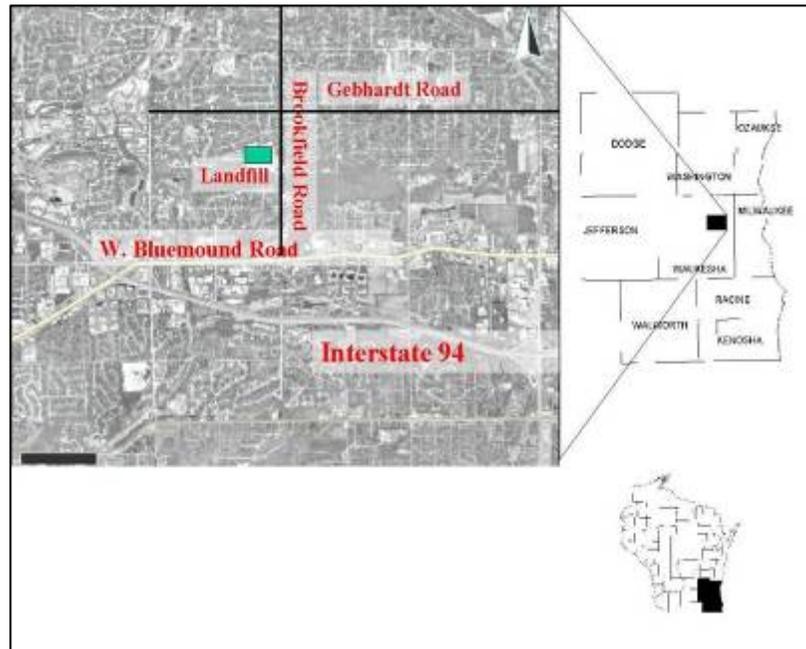


Figure 1: Site Location in Brookfield.

The landfill stopped taking waste in 1980 and was covered with a layer of soil that year. Because the site did not have a liner, rainwater percolating through the wastes (leachate) contaminated the groundwater beneath the site. Investigation of the groundwater in the early 1980s found that contamination was moving off site to the south and southeast. The primary contaminants of interest in groundwater from the site were chlorinated solvents and other common landfill related volatile organic compounds (VOCs)(2). In accordance with updated code requirements, an engineered cap was placed over the site in 1988 to prevent rainwater from infiltrating the landfill and causing additional leachate migration to the groundwater. This cap consisted of at least 2 feet of clay with another 18 inches of rooting zone soil and six inches of topsoil seeded with grass. Cap

maintenance and management has been ongoing since 1988 to repair areas of seasonal erosion and differential waste settling (3).

Groundwater is the primary source of drinking water in the area. The bedrock aquifer currently yields sufficient water to meet domestic, commercial and light industrial needs. Domestic water supply wells also draw water from the portion of the aquifer in the overlying glacial material. Shallow groundwater flow is primarily south-southeast. There are no confining layers separating the groundwater in the glacial material from the bedrock aquifer. The closest municipal wells are located 1.0 and 1.5 miles from the site.

On- and off-site groundwater monitoring has shown evidence of groundwater contamination at the site. Volatile organic chemicals and lead have been detected in samples from residential wells north of the site. The public water supply wells are not located near the potential area of impact of the site.

Brookfield has extended the municipal water supply (in different stages) to residents in the neighborhoods next to the landfill. The last stage was completed in 2002 in the Rolling Meadows subdivision. All residential well owners have been given an extended period of time to connect to the municipal public water supply system. After connecting, residents have been or will be allowed to retain their wells for lawn watering and other outdoor uses through compliance with a simple permitting process. Most residents to the north and east of the site are now connected to Brookfield's public water supply system.

A gas extraction system was constructed at the site in the early 1980s to collect the landfill gas generated by the waste. This system consisted of a series of pipes and wells within the waste connected to a large blower that pulled gasses to the flare building where they were burned before being exhausted to the atmosphere. In 1985 landfill gas migrated through soil into the basement of a nearby home and set off the alarm on a methane detector on two occasions.

WMWI responded by increasing ventilation through the house and adjusting the gas extraction system to prevent the migration of gas into the basement. Methane gas (or combustible gas) has not been detected in the surrounding homes since the 1985 detection. This system is still operating and must be maintained as part of the site closure plan to prevent off-site landfill gas migration (4).



Figure 2: Proposed Locations of Residential Lots for the Shire.

## **Shire Proposal and Issues for Review**

Figure 2 shows the general orientation of the proposed development in relation to the landfill and existing homes. The proposal initially involved subdividing the property into 42 individual lots for single-family residential development. The landfill itself is not part of the development. The homes would rely solely upon the municipal water supply of the City of Brookfield, and private wells will not be constructed at the site.

## **Agency Roles**

The Waste Management-Brookfield Landfill is a Superfund site. Under an agreement with the U.S. Environmental Protection Agency, DNR has lead oversight responsibility for the investigation, cleanup, and long-term monitoring of the site. As a landfill and contamination site in Wisconsin, this site is also subject to State regulations for landfills and remediation that are administered by DNR. The only Wisconsin regulatory requirement related to development near a non-approved landfill boundary is in Natural Resources (NR) code NR 506.07, which states that “operational waste placement cannot take place within 20 feet of the property line or waste boundary.” An exemption to build on an abandoned landfill or disturb the cap per NR 506.085 would not be required for the Shire proposal because no development is proposed over the waste mass.

DHFS has a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry to address public health issues and community health concerns related to Wisconsin’s Superfund sites. DHFS also works with local health departments to identify and address human health hazards related to environmental contamination. Absent specific regulations or guidance specific to this topic, each proposal of this nature is evaluated by the agencies based on site-specific considerations.

## **Initial Evaluation Process**

In order to determine if sufficient information existed to properly review the proposal, the agencies reviewed historic landfill gas and groundwater monitoring data for the site. These data are reported to DNR regularly in accordance with the groundwater and landfill gas monitoring plan for the site (5). The agencies also conducted multiple site visits in the fall of 2003 to observe the current condition of the landfill and the property subject to the development proposal.

### *Landfill Gas*

Landfill gas is composed of a mixture of many different gases including methane, carbon dioxide ammonia, and other trace gases that are formed as wastes decompose and chemicals evaporate within the landfill (6). The primary concern related to landfill gas migration is the potential for a fire and explosion hazard should enough methane accumulate in a nearby building. In addition, low levels of other chemicals that may migrate with landfill gas may pose a health concern if people are exposed to them over the course of many years.

Gas wells located within the landfill indicate that the decomposing waste is still producing methane gas. Gas measurements within the landfill have generally been in the range of 20 to 60% methane by volume. WMWI reports that the volume of landfill gas being generated is roughly one third of the volume that the landfill was producing in the early 1980s. The safety of

residents in existing homes as well as residents of any future development requires continued operation of the gas extraction system until the landfill is no longer producing methane at levels that could support combustion. Because the landfill is expected to continue producing methane for many years, WMWI must continue to operate the gas extraction system to prevent off-site gas migration (7).

A review of gas monitoring data since the early 1990s shows that with one exception, methane has not been detected in gas monitoring probes between the site and existing homes. Gas well DGP12 contained 0.2% methane in June of 2003 but had not contained methane in many years prior, or in monitoring conducted since that date (7). There is a gap in the monitoring network near the southeast corner of the landfill where additional monitoring is needed. Figure 3 shows the general locations of the gas monitoring wells that are part of the current long-term gas monitoring network. A gas well (GP-16R) currently exists in a suitable location to fill the gap in the monitoring network. Recent monitoring of that well indicates that landfill gas is not migrating off-site in that area either.

None of the monitoring points were located between the proposed development and the waste limits of the landfill. Some gas wells were present in these areas. However, they had not been monitored in many years, so long-term monitoring data were not available in these areas. Due to this lack of data, no recommendation on the appropriateness of residential development could be made in October 2003.

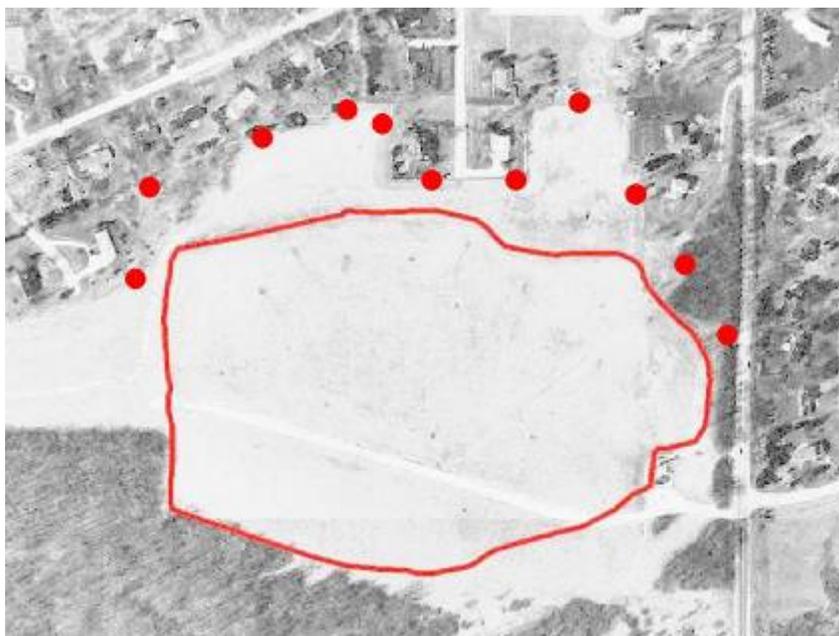


Figure 3: Gas Wells in Current Monitoring Program.

In October of 2003, the agencies recommended that WMWI conduct additional investigation of landfill gas between the landfill and the areas where residential lots were proposed. The agencies also recommended sampling of existing gas monitoring points that had not been routinely monitored. WMWI has conducted much of this additional investigation as requested and some of that investigation is ongoing at this time.

### *Groundwater*

Groundwater monitoring data indicate that groundwater contamination is most significant southeast of the landfill. There are also detections of VOCs in monitoring wells near the edge of the landfill to the northeast and the northwest. Table 1 summarizes groundwater data from wells to the southeast, southwest, northwest, and northeast, respectively. Because there are hundreds of sample results over the course of more than ten years, the summary was simplified to include

only the chemicals found in the past two years at levels above their respective groundwater standards or comparison values. The concentration shown in Table 1 is the highest level detected during the past two years.

A review of all of the groundwater results over the past several years does not indicate a clear trend in any of the monitoring wells. The groundwater standard used for comparison in Table 1 is set to be protective of public health for drinking water uses of the resource. The bold values are above EPA’s vapor intrusion screening values which means that vapor intrusion to indoor air cannot be ruled out simply by comparing the groundwater results to the values in those tables. If these results are representative of other nearby areas of the site, the likelihood of a vapor migration concern is very low. A more detailed evaluation of this pathway is needed, and the agencies expect this to be conducted as part of additional groundwater and soil vapor investigation.

Table 1  
Summary of 2002 and 2003 Groundwater VOC Data (units=µg/L)  
Waste Management-Brookfield Landfill (7)

VOC	Southeast	Southwest	Northwest	Northeast	Groundwater Standard
1,2-Dichloroethane	<b>6.0</b>	ND	ND	ND	5.0
cis1,2-Dichloroethylene	110	ND	ND	ND	70
Tetrachloroethylene	ND	ND	ND	<b>22</b>	5.0
Tetrahydrofuran	ND	73	ND	ND	50
Trichloroethylene	<b>30</b>	ND	ND	<b>55</b>	5.0
Vinyl Chloride	<b>30</b>	0.89	<b>3.8</b>	0.27	0.2

Southeast = wells W21, W21AR, W35A, W35C, and W43

Southwest = wells W6, and W6AR

Northwest = wells W9C, W29, W29B, W30A, and W30R

Northeast = wells W1CR, W34, and W34B

**Bold** indicates a level greater than EPA Vapor Intrusion Screening Values.

ND – Not detected.

Because groundwater at this location was not going to be a source of drinking water for residents of the Shire, the agencies reviewed groundwater data to determine if there would be potential for VOCs to migrate from groundwater through soils, to indoor air of existing homes and future homes in the Shire. The groundwater data itself was not sufficient to rule out the potential for vapor intrusion of chemicals that could evaporate from contaminated groundwater.

The agencies also reviewed the data to update the status of groundwater quality near the site and find out if any remaining private drinking water wells were at risk of contamination. Working with the city of Brookfield, the agencies identified a number of private wells near the site that are upgradient of the landfill, based on our understanding of groundwater flow in the area. In November, the agencies requested that WMWI sample three of these wells for VOCs. With the cooperation of the well owners, those samples were collected in early December. The results for those wells did not find contamination from the landfill (8).

## Second Phase of Evaluation

After determining that not enough data were available to properly evaluate the proposal, WMWI proposed additional investigation closer to the landfill to determine the presence of landfill gas. The agencies met with WMWI to review the investigation workplan and concurred with their general approach with some suggested additions. The agencies recommended monitoring existing probes that were not part of the monitoring program. The agencies also recommended that VOC samples be collected from the gas wells.

The agencies established the criteria for this phase of assessment to be the detection of landfill gas migrating beyond what would be WMWI's new (closer) property line. Because multiple quarters of monitoring data are not available, agency recommendations would have been based on qualitative information rather than quantitative monitoring data.

### *Geoprobe Sampling*

WMWI proposed using a geoprobe to collect soil gas samples along the perimeter of the landfill adjacent to the proposed development area. A geoprobe is a device that pushes a small diameter tube into the ground using both force (weight of the vehicle on which it's mounted) and a vibration or hammering action. The advantage of a geoprobe is that under the proper conditions, samples can be collected from multiple depths and locations in a much shorter period than the construction of permanent wells using a drill rig. WMWI's contractor was on-site in early November of 2003 working with the geoprobe to collect samples. However, sampling success was limited due to the tight clay soils that were encountered at shallow depths in some areas and the presence of large rocks in other areas.

### *Existing Gas Wells*

In response to the request from the agencies, WMWI began monitoring the existing gas probes around the landfill on a regular basis. Gas wells were monitored for methane as well as soil gas pressure at the well. A map of all of the gas wells discussed is attached to this document (9).

Table 2  
Summary of Existing Gas Well Data (Oct 2003 to Jan 2004)  
Waste Management-Brookfield Landfill (10)

Gas Well	Highest % Methane	Frequency Detected
GP-1M	7.3	12/12
GP-7M	3.5	3/12
GP-7S	7.9	5/12
GP-8D	7.9	1/12
GP-HD	3.3	4/12
GP-HM	0.8	1/12
GP-HS	0.2	1/12

*The remaining 42 gas wells did not have any methane detections.*

Gas wells GP-1M, GP-7S, and GP-8D had at least one sample above the lower explosive limit for methane of 5%. The standard for landfill operation is the lower explosive limit at the property boundary. Gas well GP-1M has had elevated methane measurements on each monitoring date. Adjustment to the gas extraction system is apparently influencing soil vapor near GP-1M as

evidence by the measured vacuum pressure on the gas well. However, decreases in methane levels have not yet been sustained. Gas well GP-7S did not initially contain measurable methane. Adjustment to other areas of the extraction system may have resulted in methane migration reaching this gas well. Additional adjustment to the system has resulted in reducing the level of methane at GP-7S; however, the methane has not yet cleared up completely. The first measurement from gas well GP-8D found methane above 5%. After adjusting the extraction system in this area, methane has not been detected at that location after that initial test. This tells us that the gas extraction system does influence soil vapor outside the waste limits, however, achieving the proper balance to the system can take time.

*New Gas Well Installation*

Because the geoprobe sampling did not provide the necessary data, WMWI proposed installation of permanent gas wells. The agencies again met with WMWI to review their workplan and concurred with their proposed approach. Fifteen permanent gas wells were constructed in mid-December at six locations around the perimeter of the landfill. There are two or three wells at each location, constructed at various depths. Table 3 contains a summary of the gas wells with measurable methane and the highest level of methane detected.

Table 3  
Summary of New Gas Well Data (Dec 2003 to Jan 2004)  
Waste Management-Brookfield Landfill (10)

Gas Well	Highest % Methane	Frequency Detected
GP-100S	0.1	1/6
GP-100M	0.1	1/6
GP-101D	1.1	2/6
GP-102D	0.2	1/6
GP-103D	0.9	2/6
GP-106D	0.7	3/6

Nine of the fifteen newly installed gas wells did not show measurable levels of methane during any of the monitoring events. These wells include GP-100D, GP-101S, GP-102S, GP-103S, GP-104S, GP-104D, GP-105S, and GP-105D.

None of the measurements exceeded the 1.25% standard used for evaluating compliance at a landfill boundary. The higher methane levels in the existing gas wells only a short distance from these newly installed wells implies variability in gas migration potential over short distances near the landfill.

*VOC Samples*

At the agencies request, VOC samples were collected from four of the gas wells. These wells were GP-8D, GP-100M, GP-AD across the northern side of the landfill and GP-106S on the southern side of the landfill. The VOC samples are intended to serve two purposes. The first purpose is to provide a more sensitive measure of landfill gas migration because of the very low detection limits offered by this testing method. The second purpose for these samples was to provide data that could be used to infer whether or not vapors could migrate from groundwater or soils into buildings that would be built on the proposed lots. As of this time the agencies have not received the results from these samples. Verbal communication from WMWI indicates that

each sample will contain detectable VOCs. This indicates that additional investigation will be needed to further explore this pathway (11).

### Discussion of Proposed Development

The testing of both the existing gas wells and the wells installed in December of 2003 found evidence of landfill gas migration beyond the waste limits. As the agencies explained to the involved parties at the beginning of this process, this finding tells us that it is possible for landfill gas to migrate from the waste. In areas where no, or very little methane was detected, the monitoring results at this stage are not capable of demonstrating that a hazard does or does not exist.

The agencies' next task is to determine the portions of the proposed plat that are affected by this finding. Lots 37, 38, and 42 had measurable levels of methane on the lot on at least one occasion. While only three lots north of the landfill have had methane measurements, the agencies do not have enough monitoring data to make a decision regarding residential development for the remaining fourteen lots numbered in Figure 4. The variability in methane measurements within short distances on the north side of the landfill, combined with low level detections of methane in some near landfill areas, indicates that a greater number of gas monitoring wells, monitored over a longer period, are needed in order to make a decision about development.

In light of the methane detections in some areas near the landfill, WMWI has indicated they plan to work to modify or upgrade parts of the gas extraction system in the landfill. The Developer has voluntarily agreed to place the numbered lots identified in Figure 4 into outlots at this time. The plat will be revised to include only the 25 lots on the western portion of the property. Under the revised plat, another plat review process would be needed prior to the

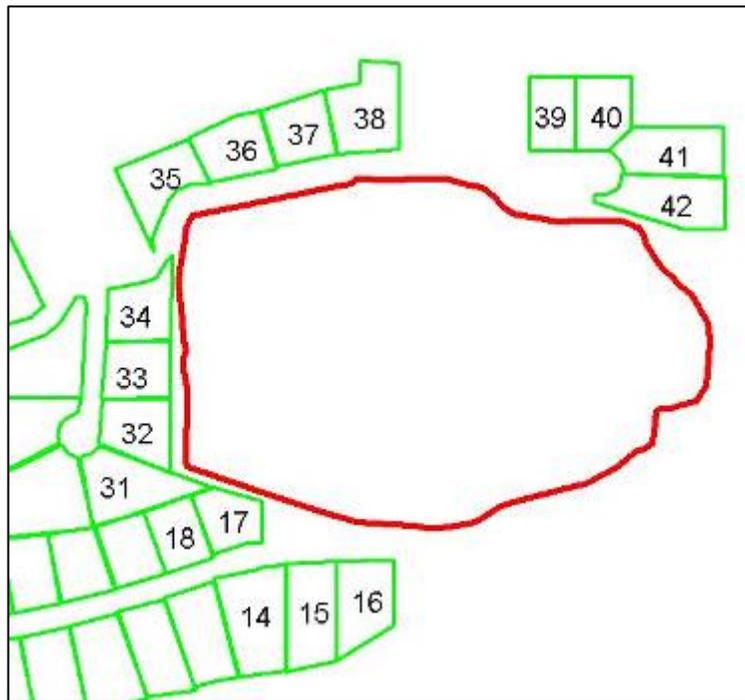


Figure 4: General location of numbered lots for discussion,

development of the lots near the landfill. At this point it is not clear what level of longer-term investigation along with adjustment or modification of the gas extraction system would be needed in order to establish that residential development in these areas would be appropriate. The agencies have agreed to work with WMWI to identify clear criteria which could be used to determine when residential development of these lots would be appropriate with respect to protecting public health and the environment. Local governments will continue to have their existing land use related authorities and will have a role in this process (12).

### *Existing Homes*

There are many gas wells on the north side of the landfill, only a portion of them are monitored as part of the formal long-term monitoring plan for the site. The gas monitoring wells used for long-term monitoring of the perimeter of the landfill property have not shown evidence of a landfill gas migration problem. A close evaluation of the gas monitoring results for the wells that had not been routinely sampled indicates the need for additional work to control gas migration and potentially improve monitoring locations near the two homes on the end of Revere Drive. Those homes are located between the numbered lots 38 and 39 identified in Figure 4. As previously mentioned, gas well GP-16R should be added to the formal long-term gas monitoring plan to permanently address the gap in the existing plan for that area.

Because lot 41 has an existing residential building and a gas probe on the property that has not shown methane detections, the agencies recommend focusing on improved confidence in monitoring between the landfill and that existing building.

### *Plan Modification Process*

In order to move existing groundwater or gas monitoring wells that are part of the current long-term monitoring plan, a formal request for landfill gas and groundwater monitoring plan modification must be made by Waste Management to DNR as required in ch. NR 500. DNR must give written approval before any actions occur that would relocate monitoring points identified in the long-term monitoring plan. DNR must also approve any new monitoring plan. The plan modification request would involve the participation of staff from the DNR Remediation & Redevelopment Program and the Solid Waste Program per chapters NR 700 and NR 500, respectively. Additional gas and groundwater investigation and a long term monitoring plan will be part of the necessary plan modification for the site independent of the proposal.

Ongoing discussions with DNR and Waste Management have focused on in-situ options for groundwater remediation on the southeast portion of the site. Additional investigation will be conducted off site.

### *Review Process*

Brookfield, like many other municipalities, has a clearly defined review process. At the state level, there appears to be a significant need for clear and publicly available guidance on this issue. Such guidance would ensure that state agencies can be consistent in their review of similar proposals and that developers will know what to expect from the process because of a common understanding of its goals. The process for reviewing the proposed Shire development on land adjacent to the Waste Management-Brookfield Landfill was not defined by the existing regulatory structure involving either development or landfill management. As part of the technical review of the proposal, the agencies met with a group of DNR Solid Waste Engineers working in other parts of the state. In addition to discussion of the technical merits of the proposal, it became clear that the existing regulatory structure involving landfill management does not provide a framework for this type of decision-making. However, it was also clear that others are evaluating related development proposals across the state.

### *Surface Water Runoff*

During discussion with area residents and city of Brookfield staff, questions were raised about how altering surface features near the landfill could affect the amount of water that enters the landfill or whether the existing groundwater flow system could be altered. The agencies are unable to predict whether or not there would be a significant change. However, we agree that it would be prudent to control stormwater runoff from developed areas so that surface water infiltration is not increased in areas close to the landfill waste limits. Any development activity near the landfill site should include the appropriate engineering design and stormwater runoff controls to ensure there is not an increase in infiltration in areas near the limits of the landfill.

### *Community Interest and Involvement*

There has been a high level of interest among residents in the neighborhoods surrounding the landfill property regarding the Shire proposal. Discussion about the proposal has also increased awareness about other issues related to the landfill itself. Since September, the agencies have participated in several public meetings with community members and local officials. These meetings have been a useful method of discussing the issues with residents. Residents have provided the agencies with important insight into the questions and concerns regarding the proposed Shire development as well as long-term issues related to the landfill itself. There are a number of issues beyond the scope of this report that remain to be addressed. The agencies will continue to meet with residents as we work through those issues.

The lack of a clearly defined process added complexity and frustration to the situation for each of the parties or groups working through the issue. The agencies would like to express gratitude to each of parties involved for their efforts and support during the decision-making process. The city of Brookfield was instrumental in providing important information related to the review of the proposal and continually coordinating with the many interested parties to make sure no interested party was left out of the process. WMWI and the developer were responsive to agency requests for additional information and investigation related to environmental conditions at the landfill. The neighboring residents played an important role in organizing and planning the logistics of public informational meetings, which provided an effective means for identifying community concerns and providing for community involvement in overall decision making.

### *Child Health Considerations*

Residents in the neighborhood currently use the site for walking dogs, hiking and playing. Because the landfill cap has been upgraded and is continually inspected and maintained, there is no opportunity for children playing on the site to come into direct contact with waste materials or site related contaminants. If private drinking water wells or indoor air quality are impacted by environmental contaminants children can be more sensitive to health effects associated with exposure than adults. Based on the current revised proposal we do not expect children who would live in the proposed development area to be at risk of exposure to contaminants from the site.

## **Conclusions**

- ◆ The additional investigation conducted by WMWI from October 2003 through January 2004 indicates that landfill gas can and has migrated outside the landfill waste limits in some areas.

Indications of landfill gas migration were also found in areas where three residential lots were proposed. Because methane, which can pose a public health hazard if it accumulates in a building, was found on three lots, the developer has agreed with the agencies that lots 14-18 and 31-42 initially proposed for development will be designated as outlots on the pending preliminary plat. The developer has the option of going through the plat/development process for those outlots again in the future. Based on existing environmental data and the recent landfill gas investigation, the development of lots 1-13 and 19-30 (the westernmost lots) poses no public health hazard to residents as a result of accumulation of indoor methane gas.

- ◆ A review of long-term gas monitoring results indicates there is a gap in the formal monitoring network at the southeast corner of the landfill. There is a suitable gas well in that area (GP-16R) that has not shown landfill gas measurements during recent monitoring. Long-term monitoring of that gas well would help fill the data gap. Recent monitoring of gas wells inside the existing network identified two discrete areas on the north side of the landfill where methane has migrated outside the waste limits.
- ◆ On- and off-site groundwater monitoring has shown evidence of VOC contamination in groundwater. Due to the depth of water and the groundwater flow direction, most contamination appears to be migrating south and southeast, away from the proposed Shire development. The proposed development is not expected to result in a change to the current degree and extent of groundwater contamination. The full degree and extent of off-site groundwater impacts have not yet been defined.
- ◆ The results of VOC samples collected from landfill gas wells could be an indication of landfill gas migration or volatilization of chemicals from the water table. Although concentrations are relatively low, more work is needed to better understand the implications of these VOCs in areas close to the landfill.
- ◆ The agencies found that there is a lack of existing guidance on the review of this type of proposal. This makes it difficult for the parties involved to know what to expect from the decision-making process.

## **Recommendations**

- ◆ The agencies recommend that WMWI submit a landfill gas monitoring plan modification request to DNR consistent with the revised plat for residential development.
- ◆ The agencies recommend that WMWI monitor gas well GP16R near the southeast corner of the landfill to be included with their gas monitoring program. The agencies further recommend that WMWI continue to focus attention on landfill gas measurements in wells GP-1M and GP-7S. If gas measurements cannot be reduced in these areas over the short term, consideration should be given to revising the monitoring network in this area as well as part of the formal gas monitoring plan in the NR500 plan modification process.
- ◆ Additional work is recommended to better characterize the VOCs in soil vapor around the landfill, particularly southeast of the site.

- ◆ Additional groundwater investigation will be necessary, independent of the landfill gas survey, to determine the degree and extent of the groundwater contamination.
- ◆ Clear guidance should be created by the appropriate state agencies for use in assessing future proposals. The guidance could then be made available to developers considering residential or other development projects near landfills producing methane gas.

### Public Health Action Plan

The following table provides information on how the recommendations will be implemented.

Public Health Action	Who Will Implement the Action	Time Frame for Implementation	Desired Outcome When Implemented	Public Health Impact
Inform community members	DHFS and DNR	On-going Public meetings have been held 10/14, 12/16, 12/22, and 2/25/04	People will have an opportunity to discuss the issues with community leaders.	Future actions or decisions made locally will have the advantage of input from citizens informed about the project.
Provide guidance to WMWI as to what additional investigation would be needed to develop remaining areas in the future.	DNR and DHFS	Spring 2004	WMWI will know what level of gas monitoring and control necessary prior to future development.	Future development would not take place until conditions were demonstrated to be safe.
Revise long-term gas monitoring plan to address current deficiencies in network.	WMWI with input from DNR and DHFS	Summer - 2004	Network will be more protective for existing residents and those who may move into the area west of the site.	Residents will have greater assurance of long-term health and safety related to the potential for gas migration from the site.
Develop more comprehensive guidance to address residential development next to a large landfill.	DNR and DHFS	January - 2005	Future decision-making of this type will be clearer to all parties involved.	Appropriate considerations will consistently be made prior to residential development near landfills.
Determine the degree and extent of groundwater contamination and assess the vapor intrusion pathway.	WMWI with input from DNR and DHFS	Begin Summer - 2004	We will be able to determine if the groundwater or vapor intrusion pathways are completed.	Actions could be taken to reduce or prevent exposure if indicated by additional investigation.

Preparers of Report

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Wisconsin Department of Health and Family Services

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**Attachment A: Summary of Gas Well Monitoring Data, Waste Management – Brookfield Landfill (Electronic Attachment) (10)**

**Attachment B: Map of Gas Well Locations, Waste Management – Brookfield Landfill (Electronic Attachment) (9)**

## **Certification**

This public health consultation for the Waste Management—Brookfield site was prepared by the Wisconsin Department of Health and Family Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the Public Health Consultation was begun.

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Technical Project Officer, CAT, SAAB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this Public Health Consultation and concurs with the findings.

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Lead, Cooperative Agreement Team, DHAC, ATSDR

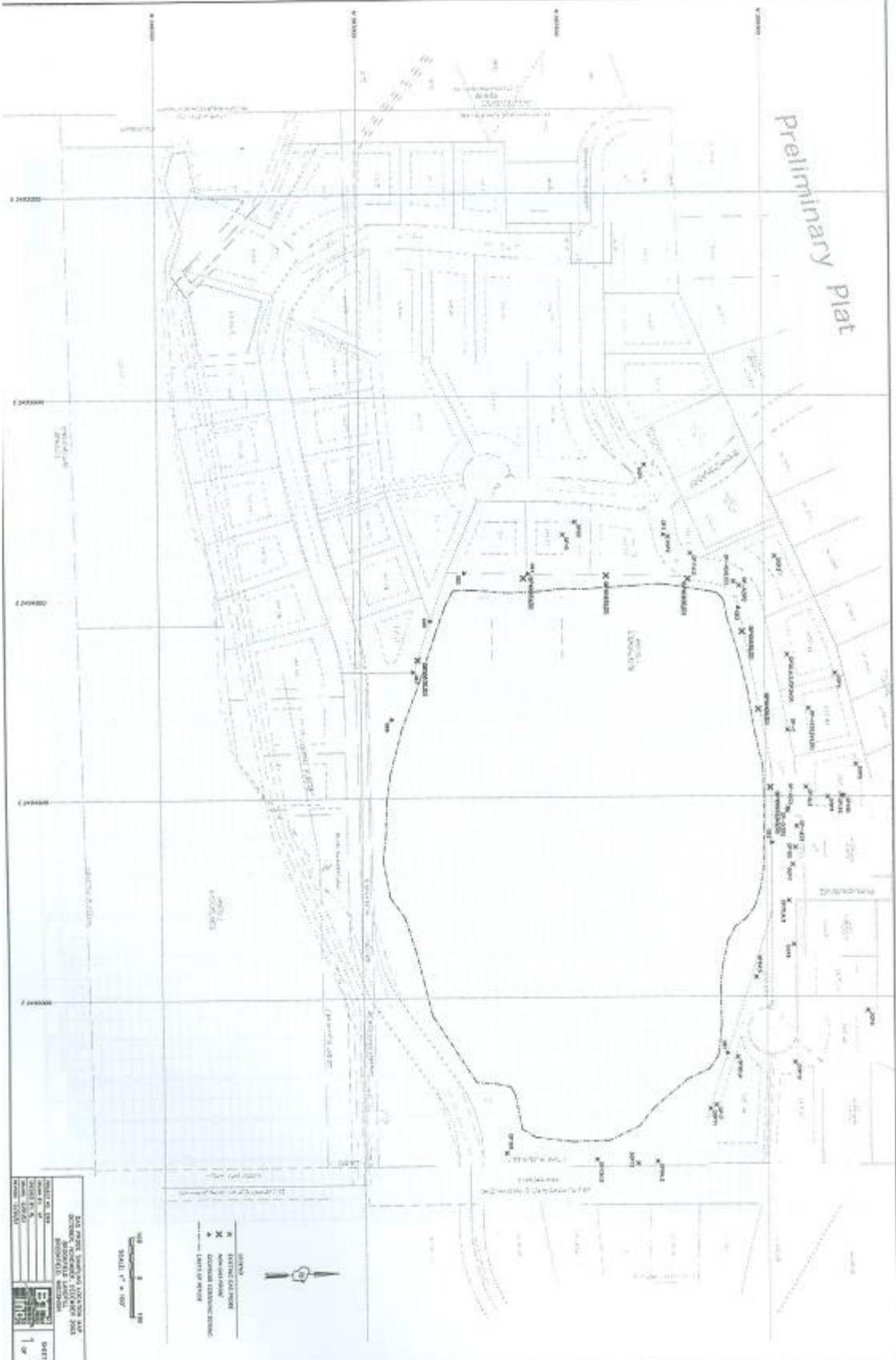
## References

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- <sup>1</sup> USEPA. “National Priorities List, Federal Register Notice.” 35502-35512 Federal Register, Vol. 55, No. 169, August 30, 1990.
- <sup>2</sup> WDNR. “Summary of GEMS Database Results for Private Wells Near Wisconsin Landfills.” Summary provided by Randell Clark. January 3<sup>rd</sup>, 2002.
- <sup>3</sup> WMWI. “Brookfield Landfill History & Status Fact Sheet.” Distributed by Lynn Morgan, December 22, 2003.
- <sup>4</sup> DHFS. “Public Health Assessment for Waste Management of Wisconsin-Brookfield.” January 14, 1994.
- <sup>5</sup> WMWI. “Groundwater/Landfill Gas Monitoring Plan Modification Request – Brookfield Sanitary Landfill.” October, 1995.
- <sup>6</sup> ATSDR. “Landfill Gas Primer – An Overview for Environmental Health Professionals.” November, 2001.
- <sup>7</sup> WDNR. “Summary of GEMS Database Results for Waste Management-Brookfield Landfill.” Summary provided by Mary Wegner. October 2<sup>nd</sup>, 2003.
- <sup>8</sup> TestAmerica Analytical Testing Corporation. Analytical reports for private well samples collected December 3, 2003. Reported December 16, 2003.
- <sup>9</sup> BT2, Inc. “Gas Probe Sampling Location Map, October, November, December, 2003, Brookfield Landfill.” December 30, 2003.
- <sup>10</sup> BT2, Inc. “Gas Probe Monitoring Summary – Brookfield Landfill.” Submitted January 30<sup>th</sup>, 2004.
- <sup>11</sup> WMWI. Telephone conversation with Larry Buechel about preliminary VOC results. January 23<sup>rd</sup>, 2004.
- <sup>12</sup> Niebler, Joseph C. Sr. Facsimile “Re: City of Brookfield / The Shire.” February 5, 2004.



# Preliminary Plat



- SYMBOLS
- X EXISTING CUSTOMER
  - X PROPOSED CUSTOMER
  - LOTS TO BE REVISED

SCALE: 1" = 100'

DATE: 10/15/2010  
 TIME: 10:00 AM  
 DRAWN BY: BT  
 CHECKED BY: BT  
 PROJECT: 1001  
 SHEET: 1 OF 1