

REPORT

Remedial Action Plan for Residential Properties

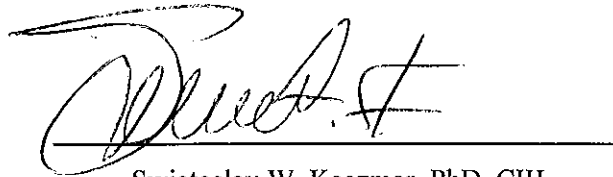
Residential Properties in the Windiate
Park/Dixieland Subdivision
Flint, Michigan

February 1997

Remedial Action Plan for Residential Properties

*Residential Properties in the Windiate Park/Dixie and Subdivision
Flint, Michigan*

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Contents

1. Introduction	1
2. Site specifics	3
2.1. Site description	3
2.2. Site history	3
2.3. Nature and extent of waste fill material and related substances	4
2.4. Property zoning	5
2.5. Future use	5
3. Remedial Action Plan	6
3.1. Changes to the RAP	6
3.2. Construction activities	7
3.3. Exposure pathway evaluation	7
3.3.1. Surface soil	8
3.3.2. Subsurface waste fill material	9
3.3.3. Localized ground water	9
3.4 Limited residential category provisions	10
3.4.1. Land use restrictions	11
3.4.2. Monitoring	12
3.4.3. Operation and maintenance	12
3.4.4. Permanent markers	12
3.4.5. Financial assurance	12
3.5. Restrictive covenant	13
4. Summary of RAP	14

List of Tables

3-1. SOPCs above MDEQ criteria or screening values per media type	8
3-2. Waste fill materials observed at residential properties	10

Tables located at end of report

- 1 Property Specific Categorical Cleanup Summary
- 2 Final Remedy Summary

List of Figures

- 1 Site Location Map
- 2 Site Plan
- 3 Identification of Blocks 1-4
- 4 Approximate Extent of Subsurface Waste Fill
- 5 Properties with Surface Soil Average Lead Concentrations above 400 ppm
- 6 Final Remedy Construction Activities
- 7 Soil Cover Final Design Grades

List of Appendices

- A Report of Windiate Park Health Survey
- B Blood Lead Level Survey Data
- C Property Specific Final Remedy Description

1. Introduction

This Report is the final Residential Remedial Action Plan (Residential RAP) for twenty-two residential properties identified for remediation within the Residential Remedial Investigation/Feasibility Study by O'Brien & Gere, February 1997 (Residential RI/FS). This Residential RAP is one of two RAPs that address the environmental conditions in the Windiate Park/Dixieland Subdivision. A RAP for the Park involving a Limited Residential/Recreational Closure with recreational deed restrictions has been approved, as expressed in a Notice of Intent to Approve from the Michigan Department of Environmental Quality (MDEQ), dated July 19, 1996.

Evaluation of the residential properties, which are the subject of this Residential RAP, was performed in three phases: the Remedial Investigation (RI), the Feasibility Study (FS), and this RAP. The Residential RI served as the mechanism to collect data to characterize site conditions, identify the nature and extent of potential environmental impact, including substances of potential concern (SOPCs), summarize the actions developed as interim remedial measures (IRMs), and assess risk to human health following implementation of the IRMs. The IRMs were initiated by General Motors Corporation (GM) as a proactive measure, in the absence of an indication of conditions representing a threat to human health and the environment. The FS served as the mechanism for the development, screening, detailed evaluation, and recommendation of remedial action alternatives.

Independent of the Windiate Park and Residential RI/FS activities, a health survey and a blood lead level survey were performed by the Michigan Department of Public Health and the Genesee County Health Department for local residents. A copy of the health survey is included as Appendix A. Summaries of the blood lead data are included as Appendix B. The results of these surveys report geometric mean blood lead levels below the reference level of 10 µg/dl and no public health impact related to exposure to SOPCs of the studied population in the area.

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The Residential RI/FS Report was submitted to the MDEQ in February 1997. The Residential RI field activities addressed eighty-four properties within four Blocks in the vicinity of Windiate Park as described in Section 2. Of the eighty-four properties included in the Residential RI, twenty-two properties contain SOPCs in various media (subsurface waste fill, surface soil, and ground water) above MDEQ Generic Residential criteria or screening values. Although the presence of SOPCs above MDEQ levels is not itself indicative of a threat to human health, the remedial action objectives within the Residential RI/FS and this Residential RAP will focus on reducing exposures to media at twenty-two properties to levels below MDEQ criteria or screening values. This Residential RAP applies exclusively to the twenty-two properties included as the focus of the FS.

This Residential RAP serves to present and document the proposed activities for a "Generic (unrestricted) Residential" categorical cleanup for sixteen properties, and a "Limited Residential" categorical cleanup for six others. Table 1 summarizes the applicable land use based cleanup category per property which are further described in Section 3. This Residential RAP was prepared in accordance with Section 20120a of the 1995 amendments to Part 201 of the Natural Resources and Environmental Protect Act (NREPA), 1994 PA 451 administered by the MDEQ.

Aug 07, 2009 16:57

2. Site specifics

2.1. Site description

For the purpose of this Residential RAP, the "Site" is defined as twenty-two residential properties located within Section 29 and 30 of Township 7 North, Range 7 East, in the City of Flint, Genesee County, Michigan. The Site Location Map, Figure 1, identifies the general location of these properties within Genesee County. The Site Plan, Figure 2, identifies the location of the twenty-two residential properties addressed in this Residential RAP. The properties are located within Blocks 2 (southwest of Windiate Park) and 3 (adjacent to Windiate Park - south and west borders only) as defined in the Residential RI/FS Report and shown on Figure 3. Properties in Blocks 1 and 4, as shown on Figure 3, were not considered a concern based on the results of the Residential RI field activities and therefore are not included in this Residential RAP.

The twenty-two residential properties are part of the Windiate Park/Dixieland Subdivision residential community. They are bordered to the north by Windiate Park (used for recreational purposes) to the south and east by private residential properties and to the west by commercial/residential properties. The residential properties contain houses and other typical residential structures; such as garages, fences, pools, etc. They are covered with grass, and may include trees, bushes, gardens, driveways (gravel, asphalt, concrete), and concrete sidewalks. The properties adjacent to Windiate Park (Block 3) are topographically higher than the Park with the backyards generally sloping towards the Park. The properties southwest of Windiate Park (Block 2) are generally flat.

2.2. Site history

Residential uses of the land in the Windiate Park area date back to the early 1920s. Based on a review of historical aerial photographs, one house existed adjacent to Windiate Park in the 1920s. The Park area consisted of low lying wetland areas. Intermittent construction of additional residences occurred during the 1930s and 1940s along the west side of the Park, on Milton Drive. Construction of houses adjacent to the Park began in the early 1950s starting on the southwest side (4317 Milton Drive location) and

Aug 07, 2009 16:57

Aug 07, 2009 16:57

proceeding around the perimeter of the Park. The Park was developed and used as a recreational Park in approximately 1954, according to the records at the City of Flint offices.

In the late 1940s and early 1950s, waste fill material (ostensibly from a number of sources) was deposited in the Park and extended to some areas later used for residential properties. An additional area of waste filling was identified underneath the parking lot for the Pengelly Road Apartments and some adjacent vacant lots. This area is being separately addressed.

A RI/FS was performed for Windiate Park and identified waste fill material and SOPCs related to the waste fill (O'Brien & Gere, February 1996). The SOPCs in the waste fill material include lead, arsenic, benzo(a)anthracene and benzo(a)pyrene. Perched ground water was not adversely impacted in the Park. GM and the City of Flint implemented a remedial action for the Park which included the installation of a soil cover over the Park, deed restrictions, ground water monitoring for four quarters and future maintenance.

2.3. Nature and extent of waste fill material and related substances

Subsurface waste fill material, consisting of glass, vinyl, tin cans, rubber, cloth, slag material, wood, rebar, concrete, and general trash extended onto nine of the residential properties adjacent to Windiate Park (Block 3) as shown on Figure 4. The depth of waste fill materials ranged between 1 and 14 ft below grade (fbg) with thicknesses of up to 12 ft. SOPCs (defined as substances detected at levels above applicable MDEQ Generic Residential criteria, screening values or background values [arsenic only]) identified in the subsurface waste fill were lead, arsenic, benzo(a)anthracene and benzo(a)pyrene. Although MDEQ criteria and screening values were used as the basis for identifying the nature and extent of waste related substances, it must be recognized that exceedance of these criteria does not necessarily represent a threat to human health or the environment.

Eighteen properties with average surface soil lead concentrations above the MDEQ Generic Residential Direct Contact Value of 400 ppm were identified adjacent to and in the vicinity of the Park as shown on Figure 5. Lead concentrations exceeded 400 ppm in the surface soil to depths of approximately 6 inches to 12 inches. Localized ground water impact was identified at one property (4407 Milton Drive), associated with a detected benzene concentration in one sample exceeding draft MDEQ Volatilization to Indoor Air (VIA) screening values.

Aug 07, 2009 16:57

2.4. Property zoning

As identified in Figure 3 of the February 1997 Residential RI/FS Report, the areas adjacent to and in the vicinity of the Site are zoned for residential, commercial, and industrial uses. The twenty-two properties included in this Residential RAP which make up this "Site" are zoned for single family and two-family residential use. In accordance with Section 20120a(6) of NREPA, a property for which a RAP is proposed must have zoning that is consistent with the categorical criteria being proposed. Therefore, as the Generic Residential and Limited Residential categories are proposed, the current zoning is consistent with these categories. Deed restrictions, if necessary will be implemented as outlined in Section 3 for continued residential use of each property.

2.5. Future use

It is anticipated that these properties will remain residential into the foreseeable future.

Aug 07, 2009 16:57

Aug 07, 2009 16:57

3. Remedial Action Plan

The final remedial actions for the twenty-two residential properties, described on a per property basis in Appendix C, consist of the following elements or combinations of these elements:

- A soil cover to be installed and tied into the previously installed Park soil cover
- Excavation of surface soil at eighteen residential properties
- Excavation of subsurface waste fill material at three residential properties (4531 Milton Drive, 4525 Milton Drive, 4519 Milton Drive)
- Removal of isolated ground water impact via a recovery trench at one property (4407 Milton Drive)
- Implementation of land use restrictions in the form of a restrictive covenant at six of the residential properties (4537 Milton Drive, 4513 Milton Drive, 4507 Milton Drive, 4501 Milton Drive, 4407 Milton Drive and 4401 Milton Drive).

Table 2, attached, summarizes the final remedial action for the twenty-two residential properties. These remedial actions are consistent with the MDEQ approved remedial action for Windiate Park and are implemented in conjunction with the construction activities developed as an IRM for the residential properties.

3.1. Changes to the RAP

If significant changes to site conditions are discovered (or unanticipated conditions arise which would result in exposure to the impacted material), this Residential RAP will be modified to address these conditions. Modifications to this Residential RAP will be submitted to the MDEQ for approval prior to implementation. Additionally, proposed changes to this Residential RAP will be outlined and submitted to the MDEQ prior to implementation.

Aug 07, 2009 16:57

Aug 07, 2009 16:57

3.2. Construction activities

The construction activities developed for the residential properties are to be implemented as IRMs prior to MDEQ approval of this Residential RAP and include the excavation/collection/disposal and soil cover alternatives. The removal and disposal of impacted surface soil, waste fill material, and localized ground water impact to levels below MDEQ criteria or screening values is to be performed to eliminate the potential for exposure and off-site migration of SOPCs. Figure 6 outlines the final remedy construction activities at the twenty-two residential properties.

The soil cover is to maintain and enhance the exposure barrier to substances in the subsurface waste fill material. The physical barrier is a minimum of 24 inches of soil cover material over areas identified as containing subsurface waste fill material. The soil cover is to be constructed as a continuous barrier, integral with the existing soil cover in the Park. The implementation of deed restrictions and maintenance, recommended by the FS, are to enhance the integrity of the soil cover.

The materials used in the construction of the soil cover include clean soil and topsoil from an off-site borrow area. Samples are to be collected from off-site materials and submitted to an analytical laboratory for analysis and compared to applicable MDEQ criteria for evaluation. One sample of the topsoil and one sample of the silty sand are to be analyzed for the waste characterization parameters specified in 40 CFR 261.20 through 261.24 and total Michigan "10" metals, since these substances are naturally occurring. Four additional samples of the topsoil are to be analyzed for Michigan "10" metals as these substances are naturally occurring elements.

The installation of the soil cover will consist of the placement and compaction of soil cover material, topsoil, and sod. The soil cover design grades are shown on Figure 7. A final survey will document compliance with the design grades.

3.3. Exposure pathway evaluation

Based on investigations on the residential properties described in detail in the Residential RI/FS Report, Table 3-1 below summarizes the media types that contain SOPCs above MDEQ criteria or screening values which are addressed in the evaluation of exposure pathways.

Aug 07, 2009 16:57

The presence of SOPCs above MDEQ criteria or screening values is not itself indicative of a threat to human health or the environment, but may indicate a need for further evaluation. The human health risk assessment presented in Section 2.5 of the Residential RI/FS concluded that acceptable conditions exist for the exposure pathways following implementation of the IRM.

Table 3-1. SOPCs above MDEQ criteria or screening values per media type.

Media Type	SOPCs
Surface Soil	Lead
Waste Fill Material	Lead, Arsenic, Benzo(a)anthracene, Benzo(a)pyrene
Localized Ground Water	Benzene

Source: O'Brien & Gere Engineers, Inc.

In accordance with Section 20120a of NREPA, to obtain categorical cleanup of a site, the SOPCs remaining in the media must be protective considering reasonable and relevant migration and exposure pathways. In general, the potential migration and exposure pathways include; leaching of SOPCs from soil to ground water, migration of SOPCs in soil to surface water, inhalation of SOPCs, direct contact with SOPCs and ingestion of SOPCs.

The following paragraphs discuss in detail how protection against the migration and exposure pathways is attained per media type by implementation of the final remedial actions.

3.3.1. Surface soil

Remedial actions to be implemented for surface soil with average lead levels exceeding the MDEQ Generic Residential Direct Contact criteria of 400 ppm include either excavation and disposal or installation of a soil cover. Excavation and disposal eliminates future potential migration and exposure pathways.

The soil cover/deed restriction/maintenance alternative is protective of the ingestion and direct contact pathways by enhancing and maintaining a barrier to lead in the surface soil. Lead remaining in the former surface soil at levels above 400 ppm following placement of the soil cover is not expected to leach to ground water, as ground water samples from monitoring wells in Windiate Park, downgradient of the respective

Aug 07, 2009 16:57

Aug 07, 2009 16:57

properties, contain concentrations of lead below MDEQ Generic Residential Health Based Drinking Water criteria. Additionally, due to the presence of the soil cover barrier, the inhalation pathway is not complete. Since surface water does not exist at the residential properties or the Park, the potential for migration to surface water does not exist. The potential for substances to migrate to surface water via the Schram Drain does not exist due to the soil cover preventing run-off.

3.3.2. Subsurface waste fill material

Remedial actions to be implemented for subsurface waste fill material with SOPCs above MDEQ Generic Residential Direct Contact criteria or site specific background (arsenic) at the residential properties include either excavation and disposal or installation of a soil cover. Excavation and disposal eliminates future potential migration and exposure pathways.

The soil cover/deed restriction/maintenance alternative is protective of the ingestion and direct contact pathways by enhancing and maintaining a barrier to SOPCs in the subsurface waste fill material. SOPCs remaining in the subsurface waste fill material at levels above MDEQ criteria or background (arsenic) following placement of the soil cover are not expected to leach to ground water as ground water investigations in Windiate Park, which is downgradient of the waste fill material, demonstrated that although the waste fill material has been in place for 40 to 50 yr under shallow water table conditions, no SOPCs were detected in the ground water at concentrations exceeding Generic Residential Health Based Drinking Water criteria. This supports the lack of potential for off-site migration of SOPCs.

Additionally, due to the presence of the soil cover barrier, the inhalation pathway is not complete. Since surface water does not exist at the residential properties or the adjoining Park, the potential for migration to surface water does not exist. The potential for substances to migrate to surface water via the Schram Drain does not exist due to the soil cover preventing run-off.

3.3.3. Localized ground water

Ground water investigations (discussed in Section 2 of the Residential RI/FS Report) detected benzene at a concentration exceeding the draft MDEQ VIA screening value in one sample on the 4407 Milton Drive property. Benzene, ethylbenzene, and xylenes (BEX) were also detected in the soil vapor at 4407 Milton Drive. However, the levels of BEX in the soil

Aug 07, 2009 16:57

vapor at 4407 Milton Drive were evaluated for the inhalation exposure pathway and are within acceptable conditions based on existing soil vapor data, which is a conservative assumption as the levels of BEX are expected to be lower following implementation of the final remedy. As a proactive response to public concerns, this localized ground water impact is addressed by the excavation/collection/disposal alternative, removing the potential for future off-site migration of SOPCs. The source of this isolated impact at 4407 Milton Drive is unknown. Removal and disposal of the ground water and subsurface waste fill in the area of impact provides added protection for future migration and exposure pathways.

3.4 Limited residential category provisions

Following implementation of the final remedy, there are six presently unoccupied properties which are owned by GM with SOPCs above MDEQ criteria in the subsurface fill material and/or former surface soil (or both) remaining underneath the soil cover. The waste fill material and/or former surface soil above the waste fill are addressed by a soil cover providing a barrier to exposure of SOPCs. These properties, with depths of observed waste fill material prior to installing at least 2 ft of soil cover material, are as follows:

Table 3-2. Waste fill materials observed at residential properties.

Residential Property	Depth of Waste Fill Material Observed*
4401 Milton Drive	2 fbg - 14 fbg
4407 Milton Drive**	~2 fbg - 12 fbg
4501 Milton Drive**	~1.5 fbg - 3.5 fbg
4507 Milton Drive	~1 fbg - 2 fbg and 5.5 fbg - 6 fbg
4513 Milton Drive**	~1 fbg - 3 fbg and ~3.5 fbg - 4 fbg
4537 Milton Drive**	~1 fbg - 3.5 fbg

* = Prior to installation of the soil cover

** = Average lead concentration in former surface soil is above MDEQ criteria of 400 ppm

~ = Approximately

Source: O'Brien & Gere Engineers, Inc.

Aug 07, 2009 16:57

Aug 07, 2009 16:57

The Limited Residential cleanup category, in accordance with Part 201 of NREPA, is proposed for these six properties. In accordance with Section 20120b(3), the following provisions apply to the Limited Residential cleanup category:

- Land use or resource use restrictions
- Monitoring
- Operation and Maintenance
- Permanent markers
- Financial assurance.

The following paragraphs discuss compliance with or justification for eliminating some of these provisions.

3.4.1. Land use restrictions

Land use restrictions, in the form of a restrictive covenant, are included to maintain the integrity of the soil cover as an exposure barrier at six residential properties. Although the human health survey presented in Section 2.5 of the Residential RI/FS determined that the current exposure pathways are protective, the conclusion assumed that future uncontrolled soil excavations will be prevented.

The six residential properties are currently owned by GM. In the event they are sold, a purchase agreement and transfer of deed will occur at the time of sale of the property to the future owner. The land use restrictions outlined in the restrictive covenant will run with the land, and will be recorded with the Genesee County Register of Deeds.

The land use restrictions written in the restrictive covenant will limit on site activities which may potentially affect the integrity of the soil cover, including the prohibition of uncontrolled excavation. Routine maintenance at the residential property will be performed by the private land owner, including vegetation care such as watering, mowing, hedging and fertilizing. Activities such as replacement of topsoil or vegetation damaged from erosion, settlement, subsidence or burrowing animals will also be performed to maintain the property.

Aug 07, 2009 16:57

Aug 07, 2009 16:57

3.4.2. Monitoring

Monitoring activities are not necessary to maintain the integrity of the soil cover barrier as the deed restriction will control future site activities and leaching of SOPCs to ground water is not a concern. However, as a provision of the Park RAP, ground water monitoring activities are to be conducted for four quarters. The existing monitoring wells in the Park are positioned to detect potential ground water impact from the waste fill material. No further monitoring activities are proposed for the Residential RAP.

3.4.3. Operation and maintenance

The soil cover is to be installed on residential properties. As a condition of the purchase agreement and land use restrictions which will run with the land, the private owner will conduct normal and routine operation and maintenance activities on the property. These activities will maintain the integrity of the soil cover. No further operation and maintenance activities other than those considered normal and routine for the land owner will be necessary.

3.4.4. Permanent markers

The area for which the land use restrictions are implemented is residential and will be privately owned. The deed will record the restricted areas and the nature of land use restrictions for the owner. A permanent public marker is not a necessary component of the remedy.

3.4.5. Financial assurance

The estimated cost for normal and routine maintenance of the soil cover is \$100/yr per property. As discussed above, the maintenance activities consist of routine lawn care actions performed by a land owner. There are no exceptional monitoring activities required to maintain the integrity of the soil cover. No oversight costs associated with routine maintenance are anticipated. The yearly expenditure of \$100 per property is considered a typical, de minimus cost for routine lawn care not necessarily associated with maintenance of a soil cover. Therefore, a mechanism established for the private owner to provide financial assurance for the soil cover is not warranted or proposed for this Residential RAP.

Aug 07, 2009 16:57

Aug 07, 2009 16:57

3.5. Restrictive covenant

As discussed in Section 3.4, a restrictive covenant for each of the six properties (recorded with the Genesee County Register of Deeds and approved by the MDEQ) will specify appropriate land use restrictions. The blood lead level survey and the health survey discussed in Section 2.5 of the Residential RI/FS identified that the current exposure pathways are protective. The soil cover enhances the protection of the exposure pathways, and the land use restrictions specified in the restrictive covenant will provide added assurance that no unusual exposure to subsurface soil will occur in the future.

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4. Summary of RAP

The implementation of the construction activities at the twenty-two residential properties, supplemented by deed restrictions and routine maintenance at six residential properties will serve as a final remedy for the Site. These final remedies, implemented in conjunction with IRMs, provide for a Generic (unrestricted) Residential categorical cleanup at sixteen residential properties and a Limited Residential categorical cleanup at six residential properties as summarized on Table 1. The properties are currently zoned for single family and two family residential use which is consistent with the categorical cleanups.

Implementation of IRMs prior to approval of this RAP is not required by the MDEQ, however, the IRMs are to be voluntarily implemented by GM in the spring of 1997 to expedite the remedial action. The remedial actions for the twenty-two residential properties consist of the following elements or combinations of these elements:

- A soil cover to be installed and tied into the previously installed Park soil cover
- Excavation of surface soil at eighteen residential properties
- Excavation of subsurface waste fill material at three residential properties (4531 Milton Drive, 4525 Milton Drive, and 4519 Milton Drive).
- Removal of isolated ground water impact via a recovery trench at one property (4407 Milton Drive)
- Implementation of land use restrictions in the form of a restrictive covenant at six of the residential properties (4537 Milton Drive, 4513 Milton Drive, 4507 Milton Drive, 4501 Milton Drive, 4407 Milton Drive and 4401 Milton Drive), which will include land use restrictions and routine maintenance activities associated with the soil cover.

Aug 07, 2009 16:57

Aug 07, 2009 16:57

Categorical cleanup criteria (Generic Residential and Limited Residential) are achieved with the protection of migration and exposure pathways. Removal and disposal of materials, and the establishment of the soil cover implemented as the remedial actions maintain the protection of these pathways. Additionally, implementation of land use restrictions at six properties and performance of normal residential maintenance on the soil cover are incorporated to prevent future uncontrolled excavation activities and provide for repair of potential damages to the soil cover.

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TABLES

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Table 1
Residential RAP
Property Specific Categorical Cleanup Summary

#	Residential Property	Land Use Cleanup Category
1.	4625 Milton	Generic (Unrestricted) Residential
2.	4621 Milton	Generic (Unrestricted) Residential
3.	4605 Milton	Generic (Unrestricted) Residential
4.	4537 Milton	Limited Residential
5.	4531 Milton	Generic (Unrestricted) Residential
6.	4525 Milton	Generic (Unrestricted) Residential
7.	4519 Milton	Generic (Unrestricted) Residential
8.	4513 Milton	Limited Residential
9.	4507 Milton	Limited Residential
10.	4501 Milton	Limited Residential
11.	4407 Milton	Limited Residential
12.	4401 Milton	Limited Residential
13.	4317 Milton	Generic (Unrestricted) Residential
14.	4313 Milton	Generic (Unrestricted) Residential
15.	4309 Milton	Generic (Unrestricted) Residential
16.	4221 Milton	Generic (Unrestricted) Residential
17.	4217 Milton	Generic (Unrestricted) Residential
18.	4522 Milton	Generic (Unrestricted) Residential
19.	4518 Milton	Generic (Unrestricted) Residential
20.	4510 Milton	Generic (Unrestricted) Residential
21.	4502 Milton	Generic (Unrestricted) Residential
22.	201 Browning	Generic (Unrestricted) Residential

Note: Land use categories are in accordance with Section 20120a(1) of the 1995 amendments to Part 201 of the NREPA, 1994 PA 451 administered by the MDEQ.

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Table 2
Residential RAP
Final Remedy Summary

#	Property	Final Remedy	Construction Activity performed as an Interim Remedial Measure (IRM)	Comment
1.	4625 Milton	Excavate and replace surface soil in specific areas	Excavate and replace surface soil in specific areas	1
2.	4621 Milton	Excavate and replace surface soil in specific areas	Excavate and replace surface soil in specific areas	1
3.	4605 Milton	Excavate and replace surface soil in specific areas	Excavate and replace surface soil in specific areas	1
4.	4537 Milton	Install soil cover over waste fill, land use restrictions and maintenance	Install soil cover over waste fill	2
5.	4531 Milton	Excavate waste fill	Excavate waste fill	1
6.	4525 Milton	Excavate waste fill	Excavate waste fill	1
7.	4519 Milton	Excavate waste fill Excavate and replace surface soil	Excavate waste fill Excavate and replace surface soil	1
8.	4513 Milton	Install soil cover over waste fill and surface soil, excavate some surface soil, land use restrictions and maintenance	Install soil cover over waste fill, excavate some surface soil	2
9.	4507 Milton	Install soil cover over waste fill, excavate some surface soil to match grade of adjacent properties, land use restrictions and maintenance	Install soil cover over waste fill, excavate some surface soil to match grade of adjacent properties	2
10.	4501 Milton	Install soil cover over waste fill and surface soil, excavate some surface soil, land use restrictions and maintenance	Install soil cover over waste fill and surface soil, excavate some surface soil	2
11.	4407 Milton	Excavate waste fill, install soil cover over waste fill and surface soil, excavate some surface soil, pump and dispose limited impacted ground water, land use restrictions and maintenance	Excavate waste fill, install soil cover over waste fill and surface soil, excavate some surface soil, pump and dispose limited impacted ground water	2
12.	4401 Milton	Excavate surface soil (front yard), land use restrictions and maintenance	Excavate surface soil (front yard) Minimum of 24 inches of soil cover over waste fill already exists	2
13.	4317 Milton	Excavate and replace surface soil	Excavate and replace surface soil	1
14.	4313 Milton	Excavate and replace surface soil	Excavate and replace surface soil	1
15.	4309 Milton	Excavate and replace surface soil	Excavate and replace surface soil	1
16.	4221 Milton	Excavate and replace surface soil	Excavate and replace surface soil	1
17.	4217 Milton	Excavate and replace surface soil	Excavate and replace surface soil	1
18.	4522 Milton	Excavate and replace surface soil	Excavate and replace surface soil	1
19.	4518 Milton	Excavate and replace surface soil	Excavate and replace surface soil	1
20.	4510 Milton	Excavate and replace surface soil	Excavate and replace surface soil	1
21.	4502 Milton	Excavate and replace surface soil	Excavate and replace surface soil	1
22.	201 Browning	Excavate and replace surface soil	Excavate and replace surface soil	1

Comment: 1. IRM serves as the final remedy.

2. IRM, supplemented by land use restrictions and maintenance, serves as the final remedy.

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FIGURES

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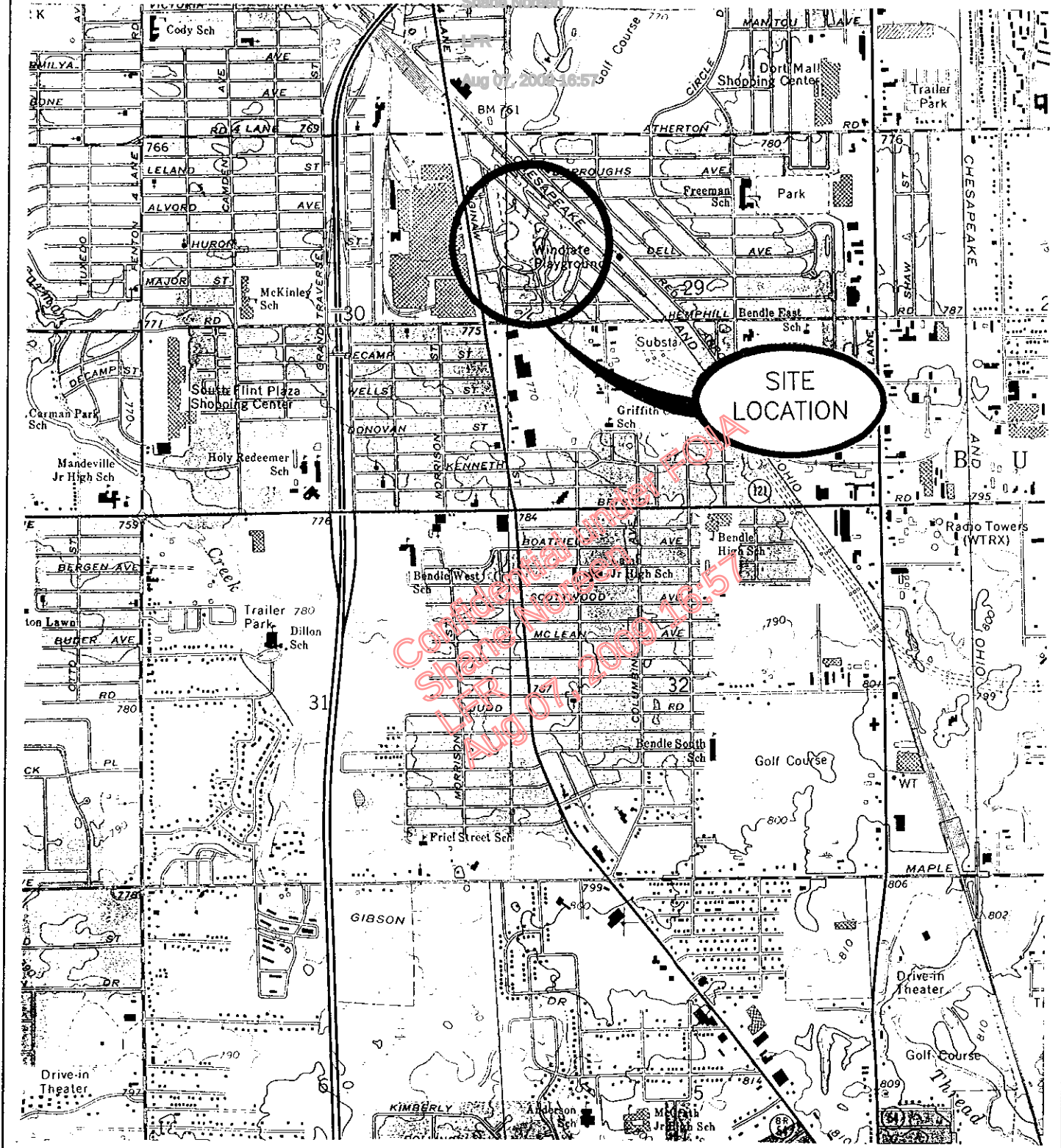
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FIGURE 1

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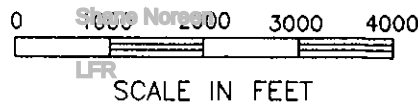
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RESIDENTIAL RAP
FLINT, MICHIGAN

SITE LOCATION MAP

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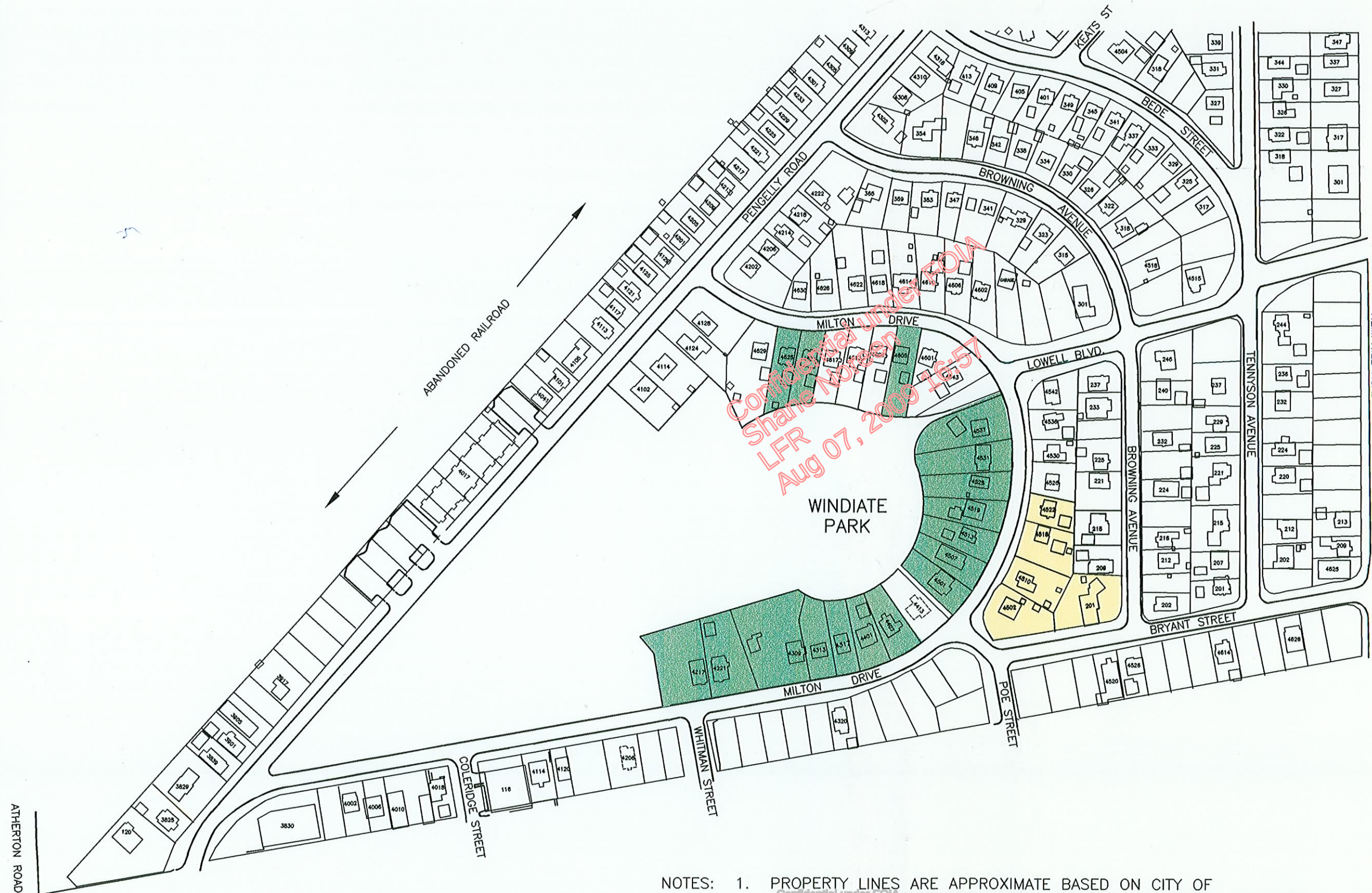


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FIGURE 2

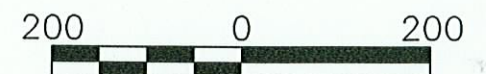


LEGEND

- IMPACTED PROPERTIES
BLOCK 2 OF SITE
- IMPACTED PROPERTIES
BLOCK 3 OF SITE
- 4102
PROPERTY ADDRESS

RESIDENTIAL RAP
FLINT, MICHIGAN

SITE PLAN



APPROXIMATE SCALE IN FEET

- NOTES: 1. PROPERTY LINES ARE APPROXIMATE BASED ON CITY OF FLINT TAX ASSESSOR MAP 1966 COMPOSITE OF SECTION 29 & 30 T7N R7E BY GENESEE COUNTY METROPOLITAN PLANNING COMMISSION.
2. SHADED PROPERTIES DEFINE THE SITE.

FILE NO. 6009-011-073

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FIGURE 3

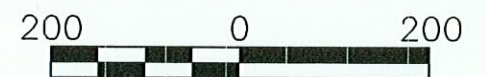


LEGEND

- BLOCK 1 OF SITE
- BLOCK 2 OF SITE
- BLOCK 3 OF SITE
- BLOCK 4 OF SITE
- 4102 PROPERTY ADDRESS

RESIDENTIAL RAP
FLINT, MICHIGAN

IDENTIFICATION OF
BLOCKS 1-4



APPROXIMATE SCALE IN FEET

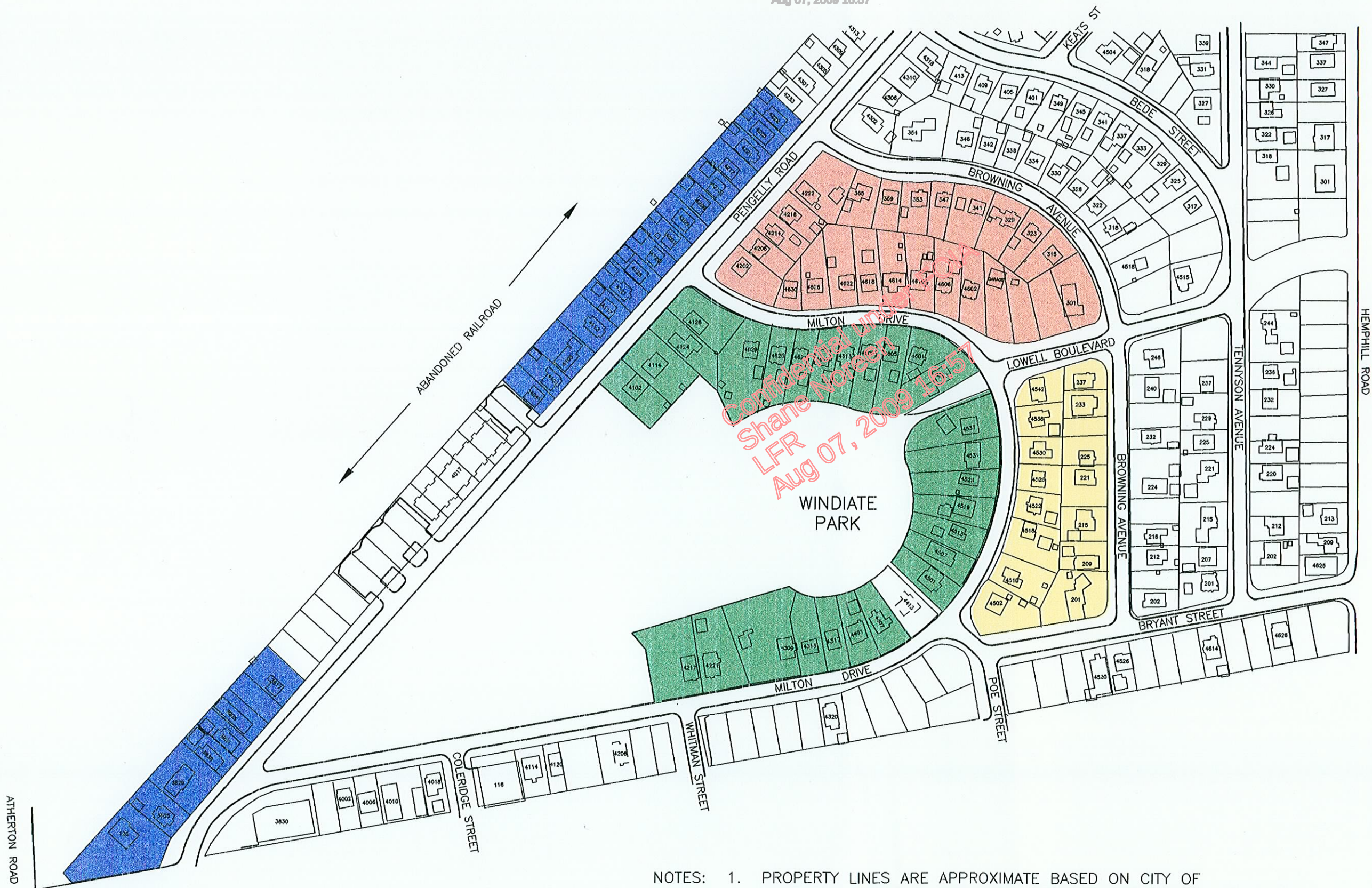
FILE NO. 6009-011-068



NOTES: 1. PROPERTY LINES ARE APPROXIMATE BASED ON CITY OF FLINT TAX ASSESSOR MAP 1966 COMPOSITE OF SECTION 29 & 30 T7N R7E BY GENESEE COUNTY METROPOLITAN PLANNING COMMISSION.

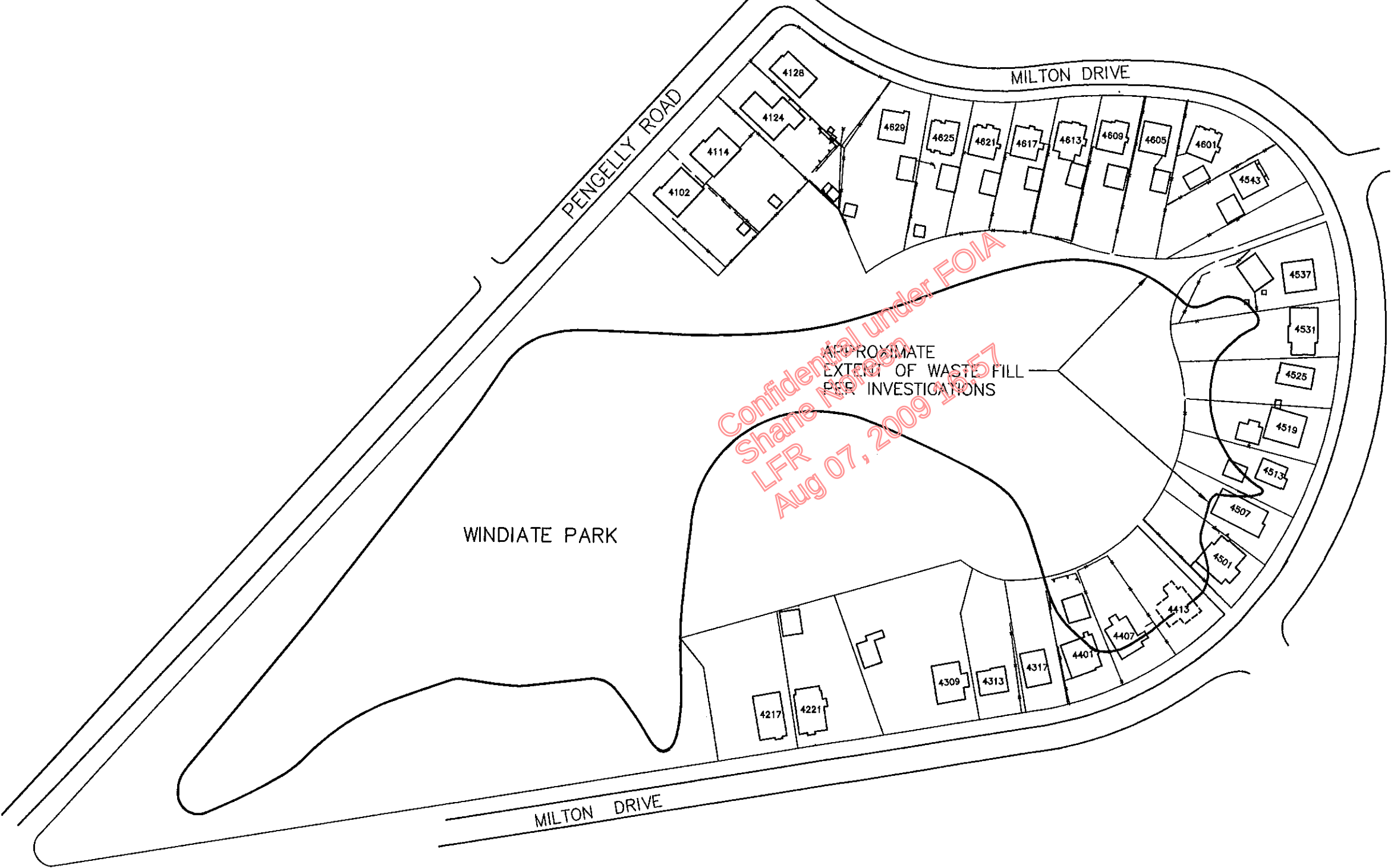
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FIGURE 4



RESIDENTIAL RAP
FLINT, MICHIGAN

APPROXIMATE EXTENT
OF SUBSURFACE WASTE
FILL



APPROXIMATE SCALE IN FEET

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FIGURE 5



NOTES:

1. "PPM" DENOTES PART PER MILLION (MG/KG).

LEGEND



SHADING DENOTES
PROPERTIES WITH AN
AVERAGE SURFACE SOIL
LEAD CONCENTRATION
EXCEEDING 400 PPM

313

AVERAGE SURFACE
SOIL LEAD CONCENTRATION
FOR PROPERTY
(VALUE IN PPM)

*

AVERAGE CONCENTRATION
BASED ON LESS THAN 12
SAMPLES PER PROPERTY

RESIDENTIAL RAP
FLINT, MI

PROPERTIES WITH
SURFACE SOIL
AVERAGE LEAD
CONCENTRATION >
400 PPM



APPROXIMATE SCALE IN FEET

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NOTES:

1. FENCING WITHIN AREAS OF WORK IS TO BE REMOVED AND REPLACED WITH 4' CHAIN LINK FENCE, UNLESS OTHERWISE NOTED.
2. HOUSE AT 4413 MILTON DRIVE WAS DEMOLISHED BY OTHERS.
3. OWNERSHIP LINES AS DEPICTED ARE FROM TITLE COMMITMENTS PROVIDED BY GENERAL MOTORS TITLE DEPARTMENT AND WERE TAKEN FROM A DRAWING PREPARED BY RICHARD H. KRAFT ENGINEERING INC., DATED FEB. 2, 1996.
4. SIDEWALKS AND ASPHALT/CONCRETE DRIVEWAYS WITHIN AREAS OF WORK ARE NOT SHOWN AND ARE TO REMAIN, UNLESS OTHERWISE NOTED.
5. GRAVEL DRIVEWAYS ARE TO BE REMOVED AND REPLACED. NEW GRAVEL PAVEMENTS SHALL CONSIST OF 4" OF DENSE GRADED AGGREGATES (MDOT TYPE 22A OR 23A) COMPACTED WITH A COMMERCIAL ROLLER.
6. GROUND WATER REMOVAL AND DISPOSAL INCLUDED WITHIN EXCAVATION AREA AT 4407 MILTON DRIVE.
7. * IDENTIFIES PROPERTIES AT WHICH LAND USE RESTRICTIONS WILL BE IMPLEMENTED AFTER COMPLETION OF INTERIM REMEDIAL MEASURES.

FIGURE 6

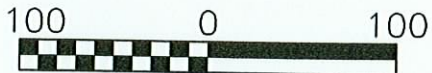


LEGEND

- AREA OF SOIL COVER INSTALLATION
- AREA OF EXCAVATION OF IMPACTED SURFACE SOIL AND REPLACEMENT OF CLEAN MATERIAL
- AREA OF EXCAVATION OF IMPACTED FILL MATERIAL AND REPLACEMENT WITH CLEAN MATERIAL FOR GRADING PURPOSES
- FENCE LINE
- TO BE REMOVED WITHOUT REPLACEMENT
- PROPERTY LINE

RESIDENTIAL RAP
FLINT, MICHIGAN

FINAL REMEDY
CONSTRUCTION
ACTIVITIES



APPROXIMATE SCALE IN FEET

FILE NO. 6009-011-075



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- PLAN NOTES
1. EXISTING TOPOGRAPHIC INFORMATION IS FROM SURVEY PERFORMED BY BARTOW & KING ENGINEERS, DATED OCTOBER 1998.
 2. CONTRACTOR IS TO REMOVE EXISTING TREES, SHRUBS, AND LAWN AS DIRECTED BY THE ON-SITE ENGINEER, PRIOR TO PLACEMENT OF SOIL COVER MATERIAL.
 3. APPROXIMATE AREAS OF REGRADING CUTS, AS SHOWN, ARE RECOMMENDED SO THAT 2' DEPTH OF SOIL COVER CAN BE ACHIEVED WITH PROPOSED GRADES.

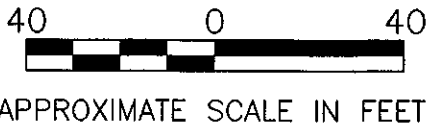
APPROXIMATE LIMIT OF WASTE FILL MATERIAL PER INVESTIGATIONS

LEGEND

- 761 PROPOSED CONTOUR
- 757 EXISTING CONTOUR
- EXISTING CATCH BASIN
- APPROXIMATE AREA OF REGRADING CUTS (SEE NOTE 3)
- APPROXIMATE EXTENT OF SUBSURFACE WASTE FILL

RESIDENTIAL RAP
FLINT, MI

SOIL COVER
FINAL DESIGN GRADES



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APPENDIX A

Report of Windiate Park Health Survey

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REPORT OF WINDLATE PARK HEALTH SURVEY

Kenneth R. Wilcox, M.D., Dr. P.H.

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Aug 07, 2009 16:57

Division of Epidemiology
Michigan Department of Community Health
James K. Haveman Jr., Director

INTRODUCTION

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Request to MDCH:

Aug 07, 2009 16:57

The Genesee County Health Department requested assistance from the Michigan Department of Community Health (MDCH) to conduct a health survey in response to concerns from the residents of the Windiate Park neighborhood. Their concerns arose out of the discovery that the park in the community and many of the houses were built on the site of a former landfill. The landfill had been used in the early 1940's as a dump for waste from a nearby General Motors Corp. plant that was building tanks for the war effort and by the City of Flint. The concern was initiated by the finding of a chemical drum buried in the area and the suspicion that a variety of toxic chemicals might be present in the ground. The MDCH agreed to assist in the conduct of a survey to learn more about the health problems that might be associated with the presence of the prior landfill.

Funding and selection of survey unit:

Resources to conduct a survey were not available from either the state or county health departments. The General Motors Corp. agreed to fund a survey to the extent of \$75,000 as a cooperative gesture. The survey work was done under contract with the Project for Urban and Regional Affairs (PURA) located at the University of Michigan-Flint. PURA was chosen on the basis of experience with household interviews, qualifications of their staff, cost for interviews, and their availability to start work quickly on the project.

Objectives of survey:

The basis for doing the study was the concern of residents about the safety of their homes in light of the history of the area. The first objective of the survey was to obtain a more complete understanding of the health status of the residents. Anecdotal reports of illness had been presented, but it was not clear how representative they were of the whole community. The second objective was to compare the illness reports found in Windiate Park to those found in a comparison area to determine if there were illness reports unique to the area that might be related to chemicals in the ground in the neighborhood. It was important to obtain information about as many residents and their reported illnesses as possible in this initial survey in the Windiate neighborhood. To best use the limited funds available, it was decided to rely on self reported conditions and symptoms for the survey rather than obtain medical records. It is widely recognized that surveys relying on only self reported responses are not as accurate as those using confirmed data, such as medical records, but resources were not available to obtain such records.

METHODS

The primary focus of the survey was the households surrounding Windiate Park and along the

path of water flow and past flooding during heavy rains. For this reason, all households from both sides of Milton Dr. and Pengelly Road around the park and the houses adjacent to Lowell Ave. were selected for interview. These residents were closest to the area of concern, and the expected number of interviews could be performed within the projected budget for the survey. All residents of these households were included as part of the survey target.

To select a comparison group, the census tracts in Flint were reviewed to identify tracts having similar demographic characteristics to the tract in which Windiate is located. Census tract 24 was selected as being most similar. Among the characteristics that were similar were family size, type of employment and age of housing. The Windiate tract had a somewhat younger population, had a higher percentage in administrative and managerial jobs, and had more residents who had moved in recently. Census tract 24 was the best match available and was close enough to use as a comparison area. An environmental review of the area revealed no known source of unusual environmental contamination. The census tract was larger than the Windiate area, so to give a more compact survey area, the central portion of the tract bounded by Richfield Rd., Branch Rd., Leith St. and Western Rd. was chosen for household sampling. Households were selected randomly to approximate the number of respondents in the Windiate area. See map on p. 25 for location of areas.

The basis for the survey format was a questionnaire that had been used by the Agency for Toxic Substances and Disease Registry (ATSDR) for community surveys elsewhere. It was designed to elicit responses about conditions and symptoms commonly associated with effects of chemical exposures. The questionnaire was modified by the PURA staff in consultation with an advisory committee to reflect the special needs of this particular group, mainly for exposures within the area and observed animal illnesses. The questionnaires for the comparison group were the same in most respects and were changed only to make the interviews specific to that site. The revised questionnaire was field tested on a small group of unrelated households and found acceptable as an interview tool.

Residents of both areas were told about the survey by letters and public meetings. Appointments for interviews were made by telephone. Adult members of households reported for themselves. For children under 12, the parent or guardian was interviewed, although responses from the children in presence of their parents were accepted. Children between 12 and 18 reported for themselves, but the parents or guardian could be present if they wished. Adults signed an informed consent form approved by the Department prior to interview, and parents signed forms for children under 18. In the comparison area, a minor incentive of a free pass to a movie or a video rental was given for each interview completed.

Because of the importance of the length of residence in the Windiate area as an indicator of possible exposure, prior residents were sought if the present Windiate resident had lived there less than ten years. Towards the end of the survey, this period was extended back decade by decade as far as the funds would permit. Prior residents were interviewed in person if they lived in the Flint area and by phone if they were located elsewhere.

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The data from the interview questionnaires were entered into a database for analysis by PURA staff and supplied to the Department. Analysis was done using SPSS, Excel and Epi Info software. Evaluation of the conditions and symptoms reported was done using relative risks and their confidence limits. The relative risk is the proportion of the persons reporting a condition in the Windiate group divided by the proportion of the persons reporting the condition in the comparison group. Thus, a relative risk of one means the proportions are the same. A relative risk of five means the condition is five times as likely to occur in the Windiate group. Since chance variation of these proportions occurs, a confidence limit is used to assess whether the relative risk is likely to be different than one due to chance. Thus, if the confidence limits of a relative risk are 0.8 and 1.5, we have to assume that the risk is really not different from one. On the other hand, if the confidence limits are 3.2 and 6.7, we can be 95% sure that the relative risk is greater than one, and that the rate is higher in Windiate.

RESULTS

Interviews were completed on 189 current Windiate residents in 82 households, 84 prior residents, and 257 residents in 108 household in the comparison area. In Windiate households where a response could be obtained, there were only 19 refusals for a response rate of 91%. If the population for households not responding is estimated, the overall response rate was about 75%. In the comparison area, there were 56 refusals resulting in a response rate of 73%. In terms of households, of the 122 total households in the Windiate Park area, 82 (67%) had interviews, 11 (9%) refused interview, and 29 (24%) could not be reached after several tries. In the comparison area, 185 households were selected for the sample, and 108 (58%) had interviews, 65 (35%) refused interviews, and 12 (7%) could not be reached.

Characteristics of Survey Groups:

Since one of the objectives was to relate exposure in the Windiate area to health conditions, the combination of the current and prior resident groups was analyzed. The age and sex distributions of the two groups were similar, although males tended to be slightly younger in the prior residents (Table 1). The length of time lived in the Windiate area was not greatly different for the two groups (Table 2). A greater proportion of the current residents had been there one year or less, but about the same proportion had been there less than five years (56% and 57%). In addition, the same proportion for both groups had lived there 20 or more years (15%).

Because of the small number of subjects in the study, these two groups were combined for further analysis. In addition, four individuals in two households were interviewed as residents of the comparison area who had previously lived in Windiate. These persons were also included in the exposed group. The combined group will be referred to as the "ever lived" in Windiate group.

Table 1. Windiate Survey. Age and Sex Distribution of Respondents

Aug 07, 2009 16:57

	Current Residents		Prior Residents	
Males	No.	%	No.	%
< 20	31	33%	18	46%
20 to 39	37	39%	11	28%
40 or older	26	28%	10	26%
Total	94	-	39	-
Females				
< 20	24	25%	12	27%
20 to 39	40	42%	16	36%
40 or older	30	32%	17	38%
Total	94*	-	45	-

* One missing age, not included

Table 2. Windiate Survey. Length of Residence

Years Resident	Current Resident			Prior Resident		
	No.	%	Cum. %	No.	%	Cum. %
1 or less	55	31%	31%	22	26%	26%
2 to 4	44	25%	56%	26	31%	57%
5 to 9	17	10%	66%	16	19%	76%
10 to 19	34	19%	85%	7	8%	85%
20 or more	27	15%	100%	13	15%	100%
Total	177*			84		

* 12 cases had no data, not included

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The characteristics of the comparison group, which will be called the "never lived" group, were similar. The age distribution of the two groups was similar enough that age adjustment was not attempted with the data (Table 3). The proportion of persons in the "ever lived" group that had lived at Windiate one year or less was greater than the proportion of the "never lived" group that had lived in their present residence (Table 4). However, the proportion that lived there ten years or more was the same (32%).

Table 3. Windiate Survey. Age Distribution of "ever lived" and "never lived"

	"ever lived"		"never lived"		Total
	No.	%	No.	%	No.
Males					
<20	48	36%	41	37%	89
20 to 39	46	35%	43	39%	89
40 or older	38	29%	27	24%	65
Total	132	-	111	-	243
Females					
<20	37	26%	41	29%	78
20 to 39	60	41%	54	38%	114
40 or older	47	32%	47	33%	97
Total	145*	-	142	-	287*

* One person with unstated age included in totals

Table 4. Windiate Survey. Residence Length, "ever lived" and "never lived"

Years Resident	"ever lived"			"never lived"		
	No.	%	Cum. %	No.	%	Cum. %
1 or less	78	29%	29%	44	18%	18%
2 to 4	70	26%	56%	77	31%	48%
5 to 9	33	12%	68%	50	20%	68%
10 to 19	41	15%	84%	38	15%	83%
20 or more	43	16%	100%	42	17%	100%
Total	265*	-	-	251**	-	-

* 12 cases have missing data

** 2 cases have missing data

Both groups were predominantly white (Table 5). There were a few more African-Americans in the "ever lived" group and a few more Native Americans and Other in the "never lived" group. The proportion of Hispanics was about the same (2.8% vs 3.6%). It was not felt that the minor differences in racial composition required special considerations in the analysis.

Table 5. Windiate Survey. Racial Distribution

	"Ever lived" in Windiate		"Never lived" in Windiate	
White	243	88.0%	223	88.5%
African-American	18	6.5%	3	1.2%
Asian-Pac. Islander	2	0.7%	0	0%
Aleut/Esk/NatAmer ican	4	1.4%	7	2.8%
None of above	9	3.3%	19	7.5%
Total	276		252	-

The education level in persons 18 or older was similar in the two groups with the comparison group having slightly higher proportions at each level (Table 6). Both groups had about 80% high school graduates. The usual types of employment for the two groups was similar with the Windiate group having a little higher proportion in manual labor work and the comparison group a little higher in service work (Table 7).

Table 6. Windiate Survey. Education Level of Persons 18 or Older

	"ever lived"		"never lived"	
	No.	%	No.	%
Total	198	-	177	-
Completed High School	154	78%	143	81%
education after high school	74	37%	74	42%
Completed college	15	8%	17	10%

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Table 7. Windiate Survey. Types of Usual Employment

	"ever lived"		"never lived"	
	No.	%	No.	%
Manual work	65	33%	50	29%
Transportation/Utility	7	4%	7	4%
Business	44	22%	37	21%
Service	84	42%	80	46%
Total	200	-	174	-

A higher percentage of Windiate residents smoke than the state as a whole (43% vs 25% in 1993)(Table 8). However, the proportion was less than the comparison group (46%). The proportion who drank alcoholic beverages was slightly lower in the Windiate group, also (35% vs 38%).

Table 8. Windiate Survey. Smoking and Alcohol Use

	"ever lived" in Windiate	"never lived" in Windiate
Smoke now	43%	46%
Ever smoked	60%	68%
Drink alcohol now	35%	38%
Ever drank alcohol	76%	86%

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Perception of Health Status:

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The overall perception of the status of their health was lower in Windiate than the comparison area (Table 9). Twenty four percent of Residents ever living in Windiate perceived their health as excellent compared to 33% in the comparison group. On the other hand, 31% of the ever lived group perceived their health as fair or poor compared to 14% in the comparison group. The health perceptions of the current Windiate residents were only slightly better than for the previous residents (Table 10).

Table 9. Windiate Survey. Perception of Health Status

Overall Perception of Health	"Ever lived" in Windiate		"Never lived" in Windiate	
Excellent	66	(23.8%)	84	(33.2%)
Good	125	(45.1%)	134	(48.9%)
Fair	69	(24.9%)	29	(11.5%)
Poor	17	(6.1%)	6	(2.4%)
Total	277	-	253	-

Table 10. Windiate Survey. Health Perceptions of Windiate Groups

Health Perception	Current Resident		Prior Resident	
Excellent	49	25.9%	17	20.2%
Good	85	45.0%	38	45.2%
Fair	43	22.8%	24	28.6%
Poor	12	6.3%	5	6.0%
Total	189	-	84	-

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Pregnancy History:

One of the initial concerns in investigating possible chemical exposure is the outcome of pregnancy. Both loss of pregnancies and birth defects could be caused by such exposures. The survey included 119 "ever lived" and 108 "never lived" women ages 15 and older (Table 11). There were 288 and 253 pregnancies in 95 and 90 women for the two groups with 225 and 191 live births. The number of pregnancies per woman was similar in the two groups (2.42 and 2.36) as was the number per woman who had ever been pregnant (3.0 and 2.81). The number of miscarriages per pregnancy (.135 and .178) were similar as were the number of birth defects per live birth (.04 and .037). There was no evidence of an adverse effect on pregnancy or childbirth from living in the Windiate area.

Table 11. Windiate Survey. Pregnancy History

	Ever lived in Windiate	never lived in Windiate
Total women 15 or over	119	108
Women ever pregnant	96	90
Total pregnancies	288	253
Live births	225	191
Miscarriages	39	45
Stillbirths	0	1
Infants with birth defects	9	7
Pregnancy rate	2.42	2.36
Pregnancy rate in ever pregnant	3.00	2.81
Live births /ever pregnant	2.34	2.12
% live birth pregnancies	78%	75%
Miscarriages / pregnancy	.135	.178
Infants with birth defects/ live birth	.040	.037

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Conditions and Symptoms:

The assessment of the occurrence of illnesses and conditions was on the basis of self reports of ever having the symptoms and conditions included in the questionnaire. The basic hypothesis was that living in the Windiate area posed a risk of increased occurrence of conditions. Therefore, only those conditions occurring after the person moved into the Windiate area were included, and those having onset earlier were excluded from both the numerator and denominator for calculating rates. Relative risks were calculated for the symptoms and conditions, and 95% confidence limits calculated. Those conditions having confidence limits not including one were considered as significantly different. The responses were divided into three groups: conditions which a doctor had indicated the person had, symptoms for which the person had sought medical advice, and symptoms for which medical advice had not been sought. The latter two were separated on the basis of the assumption that usually more serious symptoms would draw medical attention. The numbers of persons reporting conditions or symptoms, the percent of responses, and the relative risks with confidence limits are shown in Tables 12, 13, and 14.

The conditions having significant Relative Risks were bowel problems, asthma, anxiety, ulcer, weakness and tremors (Table 14). The symptoms having significant Relative Risks were headaches, poor coordination, nasal irritation, vomiting, rash, tingling, fatigue, trouble sleeping and dizziness. The symptoms for which medical consultation were sought that had significant relative risks were headaches, poor coordination, nasal irritation, and vomiting.

The Relative Risks for responses were analyzed by age group to see if there were any particular association of age and condition (Table 15). The interpretation of the results must be limited, because considering age groups further decreased the number of subjects per group and the power of the analysis to find differences.

- For conditions, there were none found to be significant for persons under 20, anxiety and weakness for persons 20 to 39, and only hayfever for persons 40 and older.
- For symptoms resulting in medical inquiry, there were none significant for persons under 20, headache and vomiting for those 20 and older. In addition, there were trouble sleeping, poor coordination and chest pain for 20 to 39 year olds, and nasal and eye irritation for those over 40.
- For symptoms, all ages had headaches and vomiting in excess, those below 40 had trouble sleeping, those 20 and over had nasal irritation. Additional symptoms were rashes for those under 20, trouble sleeping, chest pain, joint pain and dizziness for those 20 to 39, and eye irritation for those 40 and older.

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Table 12. Windiate Survey: No. of Conditions and Symptoms Reported^{*}

Condition	ever lived	never lived	Condition	ever lived	never lived
Bowel problems	20	8	Gallstones	11	8
Asthma	15	5	Other heart disease	14	10
Anxiety	34	11	Hyper-tension	29	21
Ulcer	20	6	Pneumonia	26	19
Weakness	28	6	Heart attack	10	7
Tremors	16	2	Arthritis	30	20
			Seizures	5	3
Thyroid	5	5	Urinary disease	18	11
Emphysema	3	3	Tumors*	21	9
Stroke	6	5	Anemia	14	6
Hayfever	18	15	Other neurologic	5	2
Eczema	14	11	Hepatitis	11	4
Diabetes	14	11	Neurologic disease	9	3
Chronic bronchitis	18	15	Kidney disease	6	2

* Those significantly different are listed above the shaded area

* Of tumors reported, 7 in the ever lived and 8 in the never lived were called cancer

Table 12. (cont.) No. of Conditions and Symptoms Reported

Symptom	ever lived	never lived	Symptom with medical visit	ever lived	never lived
Headaches	77	27	Headaches	41	16
Poor coordin.	32	9	Poor coordin.	16	4
Nasal irritation	34	7	Nasal irritation	15	2
Vomiting	52	6	Vomiting	23	3
Rash	49	32			
Tingling	47	30	Rash	29	25
Fatigue	56	32	Tingling	21	8
Trouble sleeping	50	27	Fatigue	12	8
Dizziness	43	21	Trouble sleeping	16	9
			Dizziness	21	14
Fainting	19	15	Fainting	12	8
Joint pains	76	58	Joint pains	32	29
Eye irritation	56	39	Eye irritation	27	16
Chest pain	61	43	Chest pain	37	33
Numbness	52	34	Numbness	28	19
Bleeding gums	20	11	Bleeding gums	12	10

Table 13. Windiate Survey. Percent of Persons Reporting Conditions and Symptoms

Aug 07, 2009 16:57

Condition	ever lived	never lived	Condition	ever lived	never lived
Bowel problems	7.3%	3.2%	Gallstones	4.2%	3.2%
Asthma	6.1	2.1	Other heart disease	5.4	4.1
Anxiety	14.2	4.9	Hyper-tension	11.3	8.7
Ulcer	7.9	2.6	Pneumonia	12.7	9.1
Weakness	10.7	2.4	Heart attack	3.7	2.8
Tremors	6.0	1.2	Arthritis	12.6	8.8
			Seizures	1.9	1.2
Thyroid	1.9	2.1	Urinary disease	7.0	4.5
Emphysema	1.1	1.2	Tumors*	7.7	3.7
Stroke	2.2	2.0	Anemia	6.0	2.6
Hayfever	7.7	6.6	Other neurologic	1.9	0.8
Eczema	5.4	4.6	Hepatitis	4.3	1.7
Diabetes	5.2	4.4	Neurologic disease	3.3	1.2
Chronic bronchitis	6.5	6.0	Kidney disease	2.2	0.8

* cancers occurred in 2.7% of the ever lived group and 3.3% of the never lived group.

Table 13. (cont.) Percent of Persons Reporting Conditions and Symptoms

Symptom	ever lived	never lived	Symptom with medical visit	ever lived	never lived
Headaches	33.9%	12.4%	Headaches	21.5%	7.8%
Poor coordin.	12.6	3.6	Poor coordin.	6.7	1.6
Nasal irritation	13.8	2.9	Nasal irritation	6.6	0.92
Vomiting	20.3	2.4	Vomiting	9.7	1.2
Rash	20.7	13.4			
Tingling	20.9	13.0	Rash	13.4	10.8
Fatigue	23.1	13.9	Tingling	10.6	7.9
Trouble sleeping	22.9	11.7	Fatigue	12.0	7.0
Dizziness	17.7	8.9	Trouble sleeping	8.7	4.2
			Dizziness	9.5	6.1
Fainting	7.5	6.2	Fainting	4.9	3.4
Joint pains	34.2	27.1	Joint pains	11.5	15.7
Eye irritation	24.3	17.8	Eye irritation	13.4	8.2
Chest pain	26.0	18.4	Chest pain	17.5	14.7
Numbness	21.8	14.6	Numbness	13.1	8.8
Bleeding gums	8.1	4.6	Bleeding gums	5.0	4.2

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Table 14. Windiate Survey. Relative Risks and Confidence Limits for Conditions and Symptoms Reported

Condition	Relative Risk	Low confidence limit.	High confidence limit.	Condition	Relative Risk	Low confidence limit.	High confidence limit.
Bowel problems	2.29	1.03	5.10	Gallstones	1.28	.52	3.13
Asthma	2.90	1.07	7.86	Other heart disease	1.30	.59	2.88
Anxiety	2.91	1.51	5.60	Hyper-tension	1.31	.78	2.23
Ulcer	3.11	1.27	7.61	Pneumonia	1.34	.77	2.38
Weakness	4.40	1.85	10.4	Heart attack	1.35	.52	3.49
Tremors	4.95	1.46	16.3	Arthritis	1.44	.79	2.48
				Seizures	1.52	.37	6.31
Thyroid	.91	.27	3.09	Urinary disease	1.55	.75	3.21
Emphysema	.93	.19	4.56	Tumors*	2.01	.93	4.33
Stroke	1.10	.34	3.53	Anemia	2.23	.87	5.71
Hayfever	1.13	.59	2.19	Other neurologic	2.31	.45	11.80
Eczema	1.18	.55	2.55	Hepatitis	2.56	.83	7.93
Diabetes	1.19	.55	2.57	Neurologic disease	2.74	.75	10.00
Chronic bronchitis	1.20	.62	2.33	Kidney disease	2.77	.56	13.60

* The Relative Risk for cancer was .83 with confidence limits of 0.3 and 2.25

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Aug 07, 2009 16:57

Table 14. (cont.) Relative Risks and Confidence
Limits for Conditions and Symptoms Reported

Symptom	Relative Risk	Low conf lim.	High conf lim.	Symptom with medical visit	Relative Risk	Low conf lim.	High conf lim.
Headaches	2.73	1.83	4.05	Headaches	2.76	1.61	4.76
Poor coordin.	3.47	1.69	7.12	Poor coordin.	4.08	1.39	12.0
Nasal irritation	4.70	2.12	10.4	Nasal irritation	7.70	1.78	33.30
Vomiting	8.33	3.64	19.0	Vomiting	8.21	2.5	27.0
Rash	1.54	1.03	2.32				
Tingling	1.61	1.06	2.45	Rash	1.24	.75	2.05
Fatigue	1.67	1.13	2.48	Tingling	1.28	.70	2.34
Trouble sleeping	1.96	1.28	3.02	Fatigue	1.75	.95	3.21
Dizziness	2.00	1.22	3.26	Trouble sleeping	2.06	.93	4.55
				Dizziness	1.56	.81	2.99
Fainting	1.22	.64	2.35	Fainting	1.44	.60	3.47
Joint pains	1.26	.95	1.68	Joint pains	1.15	.73	1.81
Eye irritation	1.37	.95	1.97	Eye irritation	1.65	.92	2.96
Chest pain	1.41	1.00	2.00	Chest pain	1.19	.77	1.83
Numbness	1.48	1.00	2.20	Numbness	1.49	.96	2.58
Bleeding gums	1.77	.87	3.60	Bleeding gums	1.20	.53	2.72

Table 15. Windiate Survey. Conditions Found
Significantly Higher in Windiate Residents by Age Group

Age < 20	20 to 39	40 & older
Medical Conditions		
None	Anxiety Weakness	Hayfever
Symptoms with medical visit		
None	Headaches Vomiting Trouble sleeping Poor coordination Chest pain	Headaches Vomiting Nasal irritation Eye Irritation
Symptoms		
Headache Vomiting Trouble sleeping Rashes	Headache Vomiting Trouble sleeping Chest pain Nasal irritation Joint pain Dizziness	Headaches Vomiting Nasal irritation Eye irritation

Associations with Exposure:

Exposure to the soil and standing water in the park area were of concern as a possible source of exposure to any chemicals that might be on the soil surface. Questions were asked of the Windiate Park residents about the extent of their usual exposure to soil and water in the park area. In the residents, some of the conditions and symptoms had significantly elevated relative risks for those with exposures as compared to those not reporting substantial exposures (Table 16). Exposure to standing water was associated with elevated risks for most of the conditions and symptoms. Playing frequently in the park and eating produce from the soil were associated with anxiety, tremor, nasal irritation and tingling. Exposure to the soil was associated only with asthma. The relative risks were higher for all conditions and symptoms except ulcer for Windiate Park residents who responded that they were concerned about chemical exposure in the neighborhood than those who did not. The relative risks were also higher for ulcer, nasal irritation, fatigue and poor coordination for residents who were concerned about chemical exposure at work than for those who were not. Of the other exposures assessed, only the association of smoking and fatigue was significant.

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**Table 16. Windiate Survey. Exposures of Residents in Windiate Park
Having Significantly Elevated Relative Risks for Conditions or Symptoms**

Aug 07, 2009 16:57

	Played Frequently in Park	Exposed to Standing Water	Exposed to Soil in Windiate	Ate Produce from Windiate Soil
Medical Conditions				
Asthma			X	
Anxiety	X	X		X
Weakness		X		
Tremor	X			X
Symptoms, Doctor Seen				
Poor Coordination		X		
Nasal Irritation	X			X
Symptoms				
Rash		X		
Tingling	X	X		X
Fatigue		X		
Trouble Sleeping		X		
Dizziness		X		
Headache		X		
Poor Coordination		X		
Nasal Irritation				X

Consideration of Stress:

One concern that arises when people are in a position of stress is that symptoms or conditions will result from the stress of the situation. It is usually difficult to separate health problems having their origin in stress from those due to other causes. In this case the question is whether the stress caused excess symptoms in those who had lived in Windiate. Since the presence of

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Aug 07, 2009 16:57

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materials underground was only brought to light in 1993, only those symptoms or conditions arising after 1992 could be related to the stress of the situation. One measure of the effect of stress would be the proportion of symptoms and conditions arising since 1992 in both groups. Analysis from this standpoint did not show any significant difference in the proportion of illnesses having onset since 1992 in the two groups, although the numbers were small for some of the measures (Table 17). This would be evidence against the difference in health findings being due to the stress of the Windiate Park situation.

Table 17. Windiate Survey. Proportion of Conditions and Symptoms with Onset Since 1992.

Conditions	% since 1992 in "Ever Lived" in Windiate	% since 1992 in "Never Lived" in Windiate	Significance (probability difference due to chance)
Bowel Problems	65%	25%	NS*(0.10)
Asthma	53	80	NS (0.60)
Anxiety	38	27	NS (0.72)
Ulcer	53	29	NS (0.39)
Weakness	36	67	NS (0.20)
Tremors	25	33	NS (1.0)
Symptoms			
Headaches	38%	43%	NS (0.83)
Poor Coord.	38	44	NS (0.72)
Nasal Irrit.	58	30	NS (0.44)
Vomiting	65	57	NS (0.70)
Rash	45	44	NS (0.90)
Tingling	32	47	NS (0.29)
Fatigue	43	47	NS (0.86)
Trouble Sleep	51	39	NS (0.45)
Dizziness	58	38	NS (0.21)

*NS means not significant, i.e. probability greater than 0.05

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Aug 07, 2009 16:57

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Combinations of Symptoms:

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The possibility of groups of symptoms being significantly different in the two populations was explored. All possible combinations could not be explored because of the huge numbers of possibilities. One of interest was the possible combination of asthma and nasal irritation. In the "ever lived" group, four (9%) of the 45 persons having asthma or nasal irritation had both. In the comparison group, one of eleven (9%) had both. There is no basis for linking the two conditions in Windiate. Another combination looked at was anxiety, trouble sleeping and fatigue, which might indicate depression. In the Windiate group, 10 (10%) had all three symptoms, 23 (24%) had two of the three, and 64 (66%) had only one of them. In the comparison group, one (2%) had all three, 9 (15%) had two, and 49 (83%) had only one. The results are different, but it is difficult to evaluate the significance of the differences because of the small numbers. The third combination examined was nasal irritation, headache and vomiting. In the Windiate group, 10 (9%) had all three symptoms, 31 (28%) had two, and 71 (63%) had only one. In the comparison group, none had all three, 2 (5%) had two, and 36 (95%) had only one. The difference between the two groups is large and probably of significance. However, the number of residents reporting combinations of symptoms is relatively small compared to the total group. It does not appear that a set of symptoms or a syndrome emerged as a distinct entity to characterize the excess in conditions and symptoms in Windiate residents.

The clustering of symptoms in households was examined to see if there were households with particularly more illness in them than other households. The number of conditions and symptoms occurring in each household was divided by the number of persons in the household. There were relatively more households in Windiate that had higher rates of symptoms than the comparison group (Table 18). However, no particular pattern of conditions or symptoms grouped themselves in the households with multiple conditions or symptoms per person. The locations of the ten households and also the twenty five households with the highest rate of conditions or symptoms were determined. There was no clear area in Windiate where these households clustered. One group of 30 households containing seven of the 25 households with the highest complaint rate was compared to the remainder of the Windiate area. The overall rates of conditions and symptoms were not significantly different between the two groups. We could not identify groups of households within Windiate that seemed to be at increased risk of having illnesses.

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Aug 07, 2009 16:57

Table 18. Windiate Survey. Number of Households by Number of Conditions or Symptoms per Person.

No. of conditions or symptoms per person in household	"Ever lived in Windiate"	"Never lived in Windiate"
0	20	34
<1	12	26
1 to 1.9	24	33
2 to 2.9	13	6
3 to 3.9	14	7
4 or greater	8	3
Total	91	109

p = 0.007 (Chi square)

Illnesses in Animals:

The number of households in Windiate reporting illness in their pets was significantly greater than the comparison group (Relative risk = 1.87, C.I. 1.18 to 2.96). However, the Windiate residents were not more likely to take their pets to a veterinarian for illnesses. The types of illnesses reported in the pets showed no predominant cause in Windiate, and overall there were not major differences in causes for the two groups. The Windiate residents were also more likely to observe wild animals with illnesses in the neighborhood.

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DISCUSSION

Aug 07, 2009 16:57

Generally, if evaluation of an exposure to known chemicals is undertaken, the inquiry can be directed towards the likely symptoms or conditions related to those substances. In this case, that direction was lacking, because there was not a predominant chemical present but rather the suggestion of a variety of possible chemicals. Reliance had to be put on the appearance in the survey of a set of symptoms and conditions that were common to many people thought to be exposed. In Windiate Park, no "syndrome" appeared based on clustering of symptoms. Headache and joint pain were the two most common, affecting about one-third of the residents. These are relatively common and non-specific. Examination of several possible combinations revealed none that were prominent.

Lacking a "syndrome", comparison of conditions and symptoms between the Windiate and comparison group showed 15 that were significantly more common in Windiate. This finding relates these conditions and symptoms with the Windiate area, but it leaves unanswered the question of the causes for the differences.

The first consideration when differences are observed is whether they have arisen by chance. That is, did the natural variation in populations cause the findings for the two groups to be different? If the conditions or symptoms were not significantly different, the ratios between the rate for Windiate residents and comparison residents would be around one, and the confidence limits would include one. In this case, the relative risks for 14 of the conditions in question were above one, and the confidence limits did not include one, which indicates that the differences are outside the variation expected in the populations. The confidence limits are based on the likelihood of only 1 in 20 chances of a single ratio being the same when the test calls it different. Since we had a list of 42 conditions and symptoms in the questionnaire, it would not be unusual to have two or three called significant by chance when they actually weren't. However, with 14 being significant, it seems unlikely that chance could explain the differences between the Windiate and comparison groups.

A potential problem in studying communities where there is a level of concern about their exposure is bias in reporting. One manifestation of this is a tendency of the concerned group to report more relatively minor illnesses that the comparison group doesn't report because they don't consider them important. Another manifestation is a tendency of a concerned group to have better memory of their complaints because of their association with the situation. One method to correct for memory differences is to use medical or other records, but there was not the opportunity to do that here. It is not possible to assess the effect of reporting bias on this survey's results.

In certain circumstances, the stress accompanying the uncertainty or threat of harm due to a situation may cause physical or emotional complaints. In some cases it may be difficult to separate these from complaints due to the environmental effects being studied. In this instance,

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Aug 07, 2009 16:57

such an explanation seems unlikely, because there was not evidence of an increased onset of complaints after the history of the park was discovered.

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Relating the increase in complaints to chemicals that might be in or under the soil from the old landfill is difficult because the exact nature of the past or present exposure is not clear. One environmental finding of concern is the reported "high" levels of lead in some soils. However, "high" was defined by the levels developed in a computer model for regulatory purposes and may not have relevance to the Windiate situation. The fact that the children tested by the Genesee County Health Department had generally acceptable levels indicates that there is not an immediate problem. Much of soil contamination in the past has been due to fall out from leaded gasoline through automobile exhaust, and with the use of unleaded gas, this source has decreased markedly. It is likely for that reason that soils in Windiate may have had higher levels in the past.

The volatile chemical of possible interest reported in one barrel found at the site was benzene. There was no evidence that there was any chance of widespread exposure. The serious long term consequence of benzene is leukemia, and there was none reported in either group. Other chemicals of possible concern found were arsenic, benzo(a)anthracene and benzo(a)pyrene. These were found in low levels that would require daily, intense exposure to cause cancers. It is somewhat early to judge a possible effect of past exposures, particularly if it was to higher concentration, but it would be doubtful that a sustained exposure at the necessary level would be likely.

The question must be raised as to whether there are other environmental influences that might lead to the differences seen in the Windiate Park complaint rates. One possibility would be past or present air pollution from a nearby industry. Another might be sources of indoor pollution, although that seems somewhat unlikely because of the lack of family clusters of similar complaints. A thorough environmental review of the area might be helpful if further exploration of the excess complaints seems warranted.

As mentioned above, this survey has limitations due to its size and self reporting nature. Within these limitations, it is reasonable to conclude that there are increased health complaints in Windiate Park residents, but there is no overall disease pattern that suggests that there is an immediate environmental threat to the residents. It is not possible to project whether any effects will occur in the future, such as increased cancer rates, but there is no evidence from the survey of a serious overall threat from the environment. This is not to say that the health problems of individual residents are not important, but rather that there is not a coherent picture of disease affecting the residents as a whole. Because of the uncertainties involved, it would be prudent to take steps to protect residents from further exposure to any chemicals present, and individuals should continue consulting their physicians concerning illnesses that occur. It would also be reasonable to consider other environmental sources of illnesses, particularly air pollution, as a possible source of asthma and nasal irritation.

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SUMMARY

Aug 07, 2009 16:57

Concerns about possible health effects were raised by the discovery that houses in the Windiate Park area of Flint had been built on a prior landfill that had been used for waste from a defense plant and the City of Flint. The finding of chemical drums raised the possibility that solvents and other chemicals that might cause health effects were disposed of in the site. In response to a request of a citizen group through the Genesee County Health Department, a health survey was carried out in the Windiate Park neighborhood. Household interviews were done with 273 current and former Windiate Park residents and 257 residents of a similar neighborhood elsewhere in Flint. The results were based on self reporting of health conditions and symptoms.

The perception of the status of their health was lower in Windiate Park residents. Out of 27 conditions and 15 symptoms asked about, the residents had significantly increased relative risks for 6 conditions and 9 symptoms. The conditions in excess were: bowel problems, asthma, anxiety, ulcer, weakness and tremors. The symptoms in excess were: headaches, poor coordination, nasal irritation, vomiting, rash, tingling, fatigue, trouble sleeping and dizziness. There was no evidence of an increased cancer occurrence or an adverse reproductive effect. A set of conditions or a syndrome of a common illness pattern did not emerge from the analysis. There was some increase in household clustering for a few conditions, but there was not a clustering of households with excess reported conditions within the area.

The reasons for the excess of conditions and symptoms was not apparent. It was unlikely that it was due to the stress of the situation, but reporting bias could not be ruled out. The excess conditions and symptoms could not be attributed by the survey data to specific chemicals found by environmental testing in the neighborhood, but environmental factors could not be ruled out as contributors.

Within the limitations of the survey, it is reasonable to conclude that there are increased health complaints in Windiate Park residents, but there is no overall disease pattern that suggests that there is an immediate environmental threat to the residents. This is not to say that the health problems of individual residents are not important, but rather that there is not a coherent picture of disease affecting the residents as a whole. Because of the uncertainties involved, it would be prudent to take steps to protect residents from further exposure to any chemicals present, and individuals should continue consulting their physicians concerning illnesses that occur.

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Aug 07, 2009 16:57

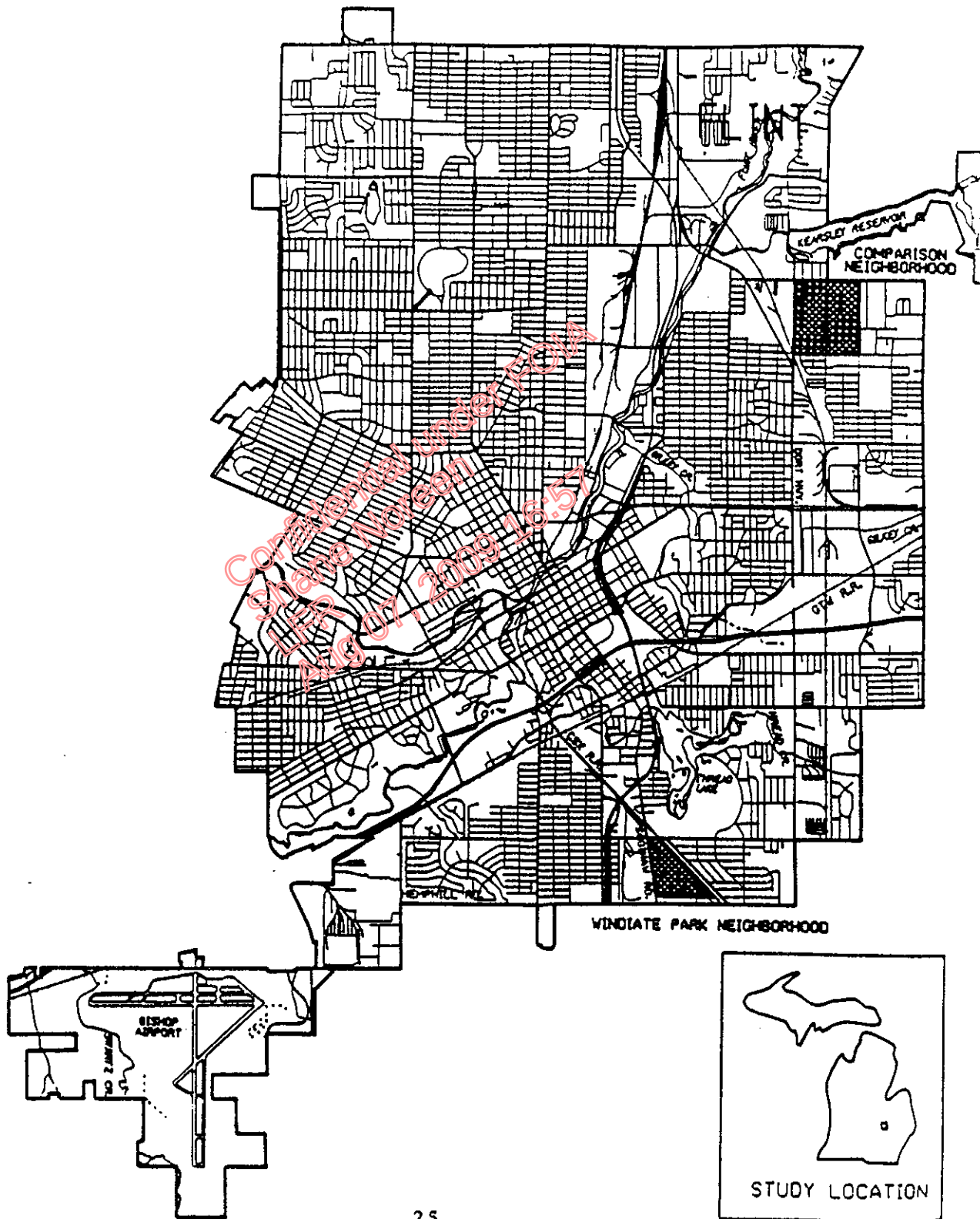
WINDIATE PARK HEALTH SURVEY

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STUDY AREAS

Aug 07, 2009 16:57



Blood Lead Level Survey Data

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GENESEE COUNTY HEALTH DEPARTMENT BLOOD LEAD DATA

Blood Lead Level (ug/dl)	Number of Individuals with Blood Lead Level
0	2
2	192
3	105
4	55
5	28
6	12
7	7
8	5
11	9
13	1

- Notes: 1) 408 total individuals in the survey per the October 11, 1995 fax transmission from the Genesee County Health Department
- 2) 43 of total are assumed to be children (<6 yrs. of age) based on November 28, 1995 fax transmission from the Genesee County Health Department

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FAX TRANSMISSION

GENESEE COUNTY HEALTH DEPARTMENT

630 SOUTH SAGINAW STREET

FULT, MI 48502-1540

(810) 257-3129

FAX: (810) 257-3125

To: Bob Metcalf

Date: November 28, 1995

Fax #: 236-7391

Pages: One, including this cover sheet.

From: John Pettit

Subject: Windiate Blood Leads

COMMENTS:

The following is the list of 44 blood lead levels for the children less than six years old. Call me if you have any questions.

2	3	5
2	3	5
2	3	5
2	3	5
2	3	5
2	3	5
2	4	6
2	4	6
2	4	6
2	4	7
2	4	7
2	4	7
2	4	8
3	4	11
3	4	
3	4	

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APPENDIX C

Property Specific Final Remedy Description

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APPENDIX C**Property Specific Final Remedy Descriptions****4625 Milton Drive**

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4621 Milton Drive

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4605 Milton Drive

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4537 Milton Drive

The environmental condition at this property is identified as waste fill material. It is recommended that the soil cover/deed restrictions/ maintenance alternative as described in Section 3.2.6 be implemented to address this media. For properties owned by GM, this alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, a soil cover of over 2 ft thick currently overlies the waste fill; therefore, a soil cover IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, IRM activities supplemented by implementation of land use restrictions, in the form of a restrictive covenant, and performance of future maintenance activities on the soil cover will provide a final remedy for this property.

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Aug 07, 2009 16:57

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4531 Milton Drive

Aug 07, 2009 16:57

The environmental condition at this property is identified as waste fill material. Due to the private ownership of this property, the implementation of land use restrictions may not be feasible by GM, making the soil cover/deed restriction/maintenance alternative an unacceptable final remedy for waste fill remediation. Therefore, the excavation/disposal alternative as described in Section 3.2.6 for the waste fill material is the recommended alternative to address the impacted media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the excavation/disposal final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4525 Milton Drive

The environmental condition at this property is identified as waste fill material. Due to the private ownership of this property, the implementation of land use restrictions may not be feasible by GM, making the soil cover/deed restriction/maintenance alternative an unacceptable final remedy for waste fill remediation. Therefore, the excavation/disposal alternative as described in Section 3.2.6 for the waste fill material is the recommended alternative to address the impacted media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the excavation/disposal final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4519 Milton Drive

The environmental condition at this property is identified as impacted surface soil and waste fill material. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address the impacted surface soil due to the logistical difficulties with placing a 2 ft minimum soil cover around the house. Due to the private ownership of this property, the implementation of land use restrictions may not be feasible by GM, making the soil cover/deed restriction/maintenance alternative an unacceptable final remedy for waste fill remediation. Therefore, it is recommended that excavation/disposal of the waste fill material as described in Section 3.2.6 be implemented. This alternative comparably addressed the evaluation criteria for these media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for the surface soil and waste fill material on this property, which is consistent with the excavation/disposal final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

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Aug 07, 2009 16:57

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4513 Milton Drive

The environmental condition at this property is identified as impacted surface soil and waste fill material. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address the impacted surface soil due to the logistical difficulties with placing a 2 ft minimum soil cover around the house. The soil cover/deed restrictions/maintenance alternative as described in Section 3.2.6 is recommended to be implemented to address the waste fill material. These alternatives comparably addressed the evaluation criteria for these media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an IRM is developed for this property which includes surface soil excavation/disposal and installation of a soil cover over the waste fill material. Surface soil which overlies waste fill material will also be addressed by the installation of the soil cover IRM installed to address the waste fill material. This soil cover will make the excavation of the surface soil overlying the waste fill material unnecessary. This IRM provides an equivalent remedy as the final remedy recommended by this FS. Therefore, IRM activities supplemented by implementation of land use restrictions, in the form of a restrictive covenant, and performance of future maintenance activities on the soil cover will provide a final remedy for this property.

4507 Milton Drive

The environmental condition at this property is identified as waste fill material. The soil cover/deed restrictions/maintenance alternative as described in Section 3.2.6 is recommended to be implemented to address the waste fill material. For properties owned by GM, this alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, a soil cover IRM is developed for this property which is consistent with the final remedy recommended by this FS. Therefore, IRM activities supplemented by implementation of land use restrictions, in the form of a restrictive covenant, and performance of future maintenance activities on the soil cover will provide a final remedy for this property. In an effort to remain consistent with adjacent properties, the IRM also includes excavation of surface soil and regrading.

4501 Milton Drive

The environmental condition at this property is identified as impacted surface soil and waste fill material. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address the impacted surface soil due to the logistical difficulties with placing a 2 ft minimum soil cover around the house. The soil cover/deed restrictions/maintenance alternative as described in Section 3.2.6 is recommended to be implemented to address the waste fill material. These alternatives comparably addressed the evaluation criteria for these media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an IRM is developed for this property which includes surface soil excavation/disposal and installation of a soil cover over the waste fill material. Surface soil which overlies waste fill material will also be addressed by the installation of the soil cover IRM installed to address the waste fill material. This soil cover will make the excavation of the surface soil overlying the waste fill material unnecessary. This IRM provides an equivalent remedy as the final remedy recommended by this FS. Therefore, IRM activities supplemented by implementation of land use restrictions, in the form of a restrictive covenant, and performance of future maintenance activities on the soil cover will provide a final remedy for this property.

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4407 Milton Drive

The environmental condition at this property is identified as impacted surface soil, waste fill material, and localized ground water impact. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address the impacted surface soil. It is recommended that the soil cover/deed restrictions/maintenance alternative as described in Section 3.2.6 be implemented to address the waste fill material. It is recommended that the excavation/collection/disposal alternative as described in Section 3.2.6 be implemented to address the localized ground water impact. For properties owned by GM, these alternatives comparably addressed the evaluation criteria for these media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an IRM is developed for this property which includes surface soil excavation/disposal, excavation/collection/disposal of localized ground water impact, and installation of a soil cover over the waste fill material. Surface soil which overlies waste fill material will also be addressed by the installation of the soil cover IRM installed to address the waste fill material. This soil cover will make the excavation of the surface soil overlying the waste fill material unnecessary. This IRM provides an equivalent remedy as the final remedy recommended by this FS. Therefore, IRM activities, supplemented by implementation of land use restrictions, in the form of a restrictive covenant, and performance of future maintenance activities on the soil cover will provide a final remedy for this property.

4401 Milton Drive

The environmental condition at this property is identified as impacted surface soil and waste fill material. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address the impacted surface soil due to logistical difficulties with placing a 2 ft minimum soil cover around the house. As identified in Section 2.4, there is sufficient clean soil cover existing over the waste fill material to address the evaluation criteria for this media. It is recommended that deed restrictions/maintenance be implemented to maintain the existing soil cover. For properties owned by GM, these alternatives comparably addressed the evaluation criteria for this media, as presented in this FS. These actions will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM for the surface soil is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, IRM activities supplemented by implementation of land use restrictions, in the form of a restrictive covenant, and performance of future maintenance activities on the soil cover will provide a final remedy for this property.

4317 Milton Drive

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

Shane Noreen

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Aug 07, 2009 16:57

Shane Noreen

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4313 Milton Drive

Aug 07, 2009 16:57

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4309 Milton Drive

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4221 Milton Drive

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4217 Milton Drive

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4522 Milton Drive

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

Shane Noreen

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Aug 07, 2009 16:57

Shane Noreen

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Aug 07, 2009 16:57

4518 Milton Drive

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4510 Milton Drive

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

4502 Milton Drive

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

201 Browning

The environmental condition at this property is identified as impacted surface soil. It is recommended that the excavation/disposal alternative as described in Section 3.2.6 be implemented to address this media. This alternative comparably addressed the evaluation criteria for this media, as presented in this FS. This action will provide an acceptable final remedy for this property. As discussed in Section 2.4, an excavation/disposal IRM is developed for this property, which is consistent with the final remedy recommended by this FS. Therefore, no action further than the IRM is necessary for this property.

Shane Noreen

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Aug 07, 2009 16:57